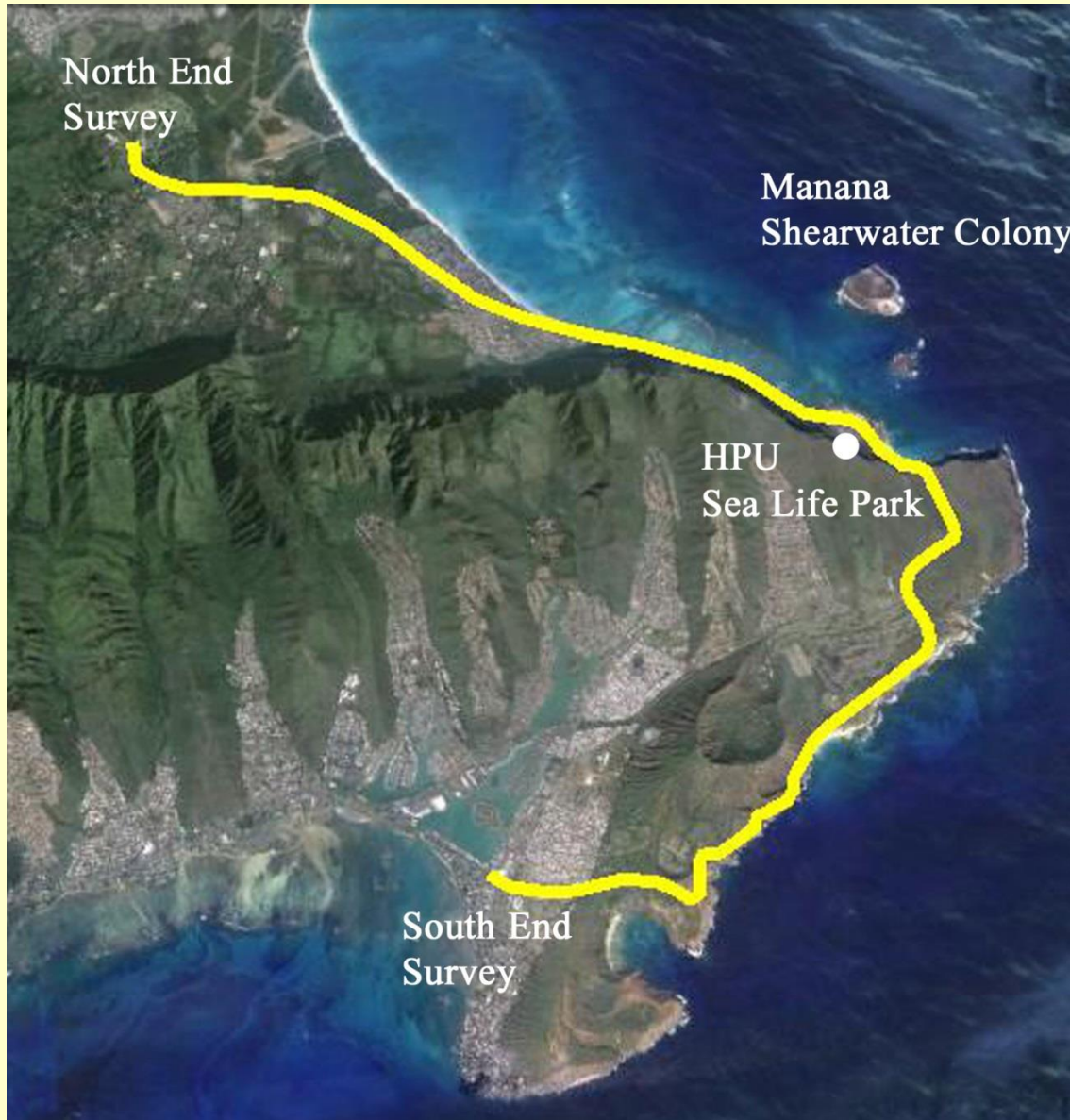


WHEN SEABIRDS AND HIGHWAYS COLLIDE: WEDGE-TAILED SHEARWATER FALLOUT ALONG SOUTHEASTERN O'AHU: 2011 - 2015



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The Study Area



- 16-km survey of Kalaniana'ole Hwy.
- From Olomana Golf Course, through Waimanalo, to Hawai'i Kai (south)
- Manana Island (~ 25,000 pairs)
(Shallenberger 1973)



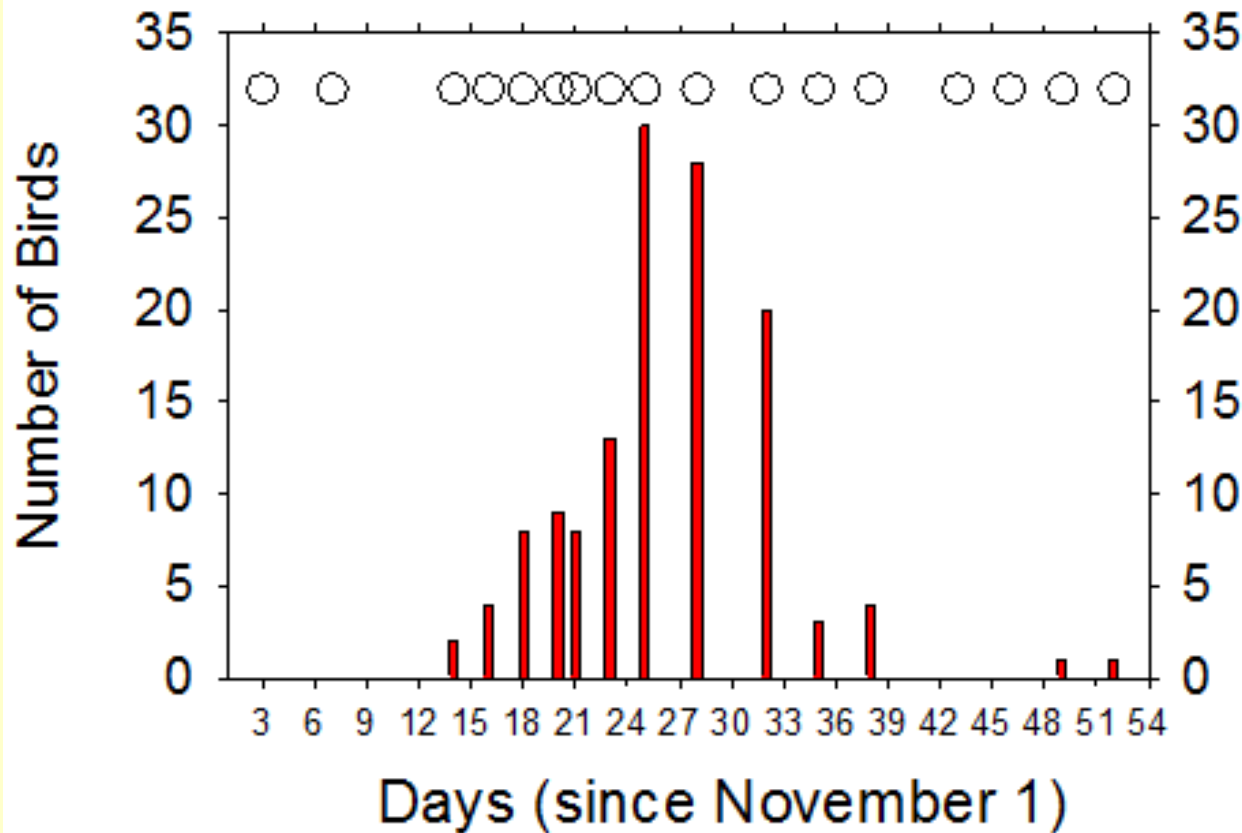
Methods

- November - December, 2011-15
- 17 surveys / year
- Mornings, 6:30 - 9:30
- By car (Guinard et al. 2012)
 - Speed: 25 - 35 mph
 - 2 drive-throughs
- Record location, closest pole
- Gather photographic evidence
- In 2012-15 scavenging trial
 - Randomly selected (n = 54)
 - Marked and resighted



First Year Surveys

Shearwater Deposition, Kalaniana'ole Hwy , 2011



Project started
by Keith Swindle



17 surveys

128 shearwaters

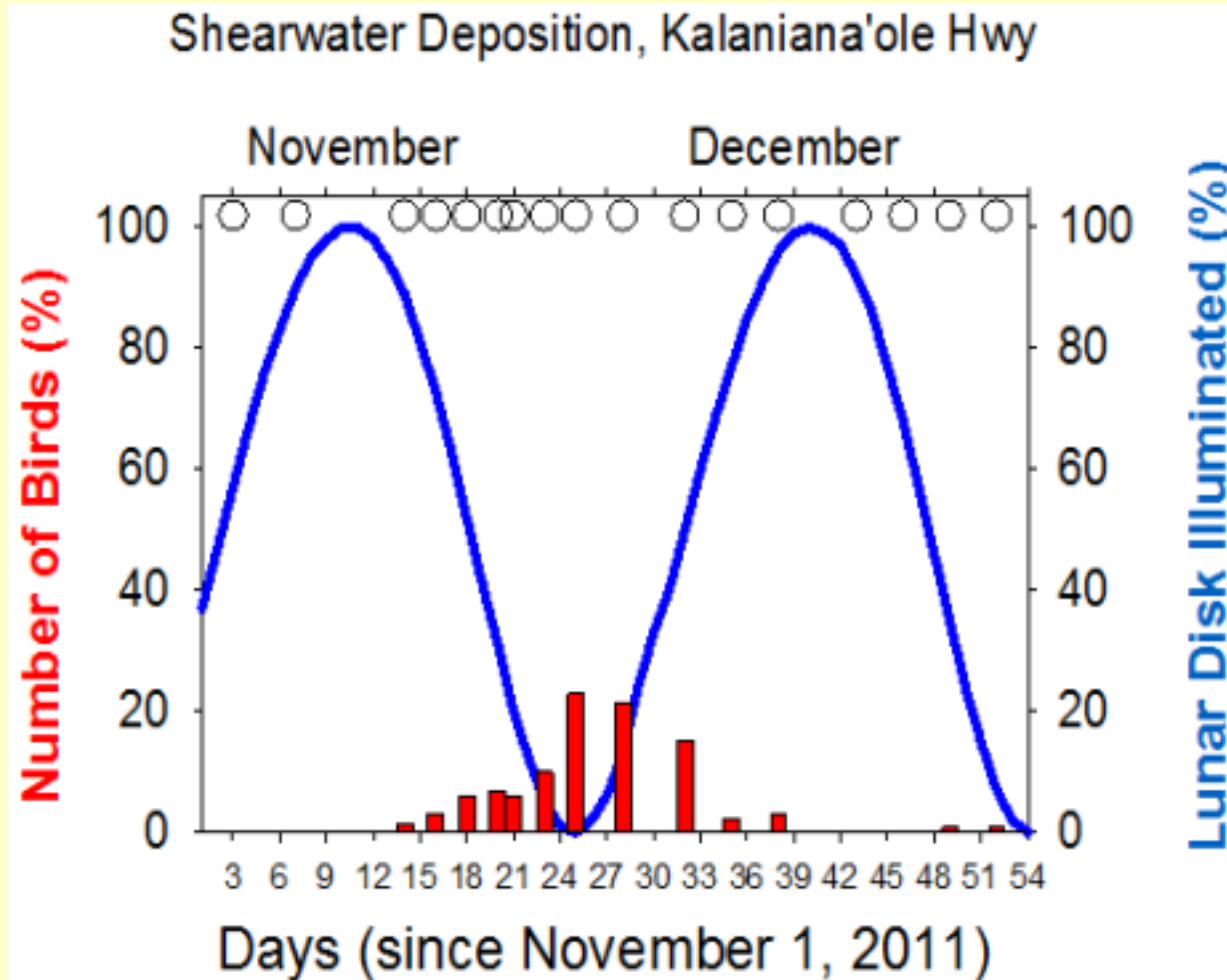
Nov 14 - Dec 22

First Year Results



Moon Phase Data:

www.aa.usno.navy.mil/data/docs/MoonFraction.php



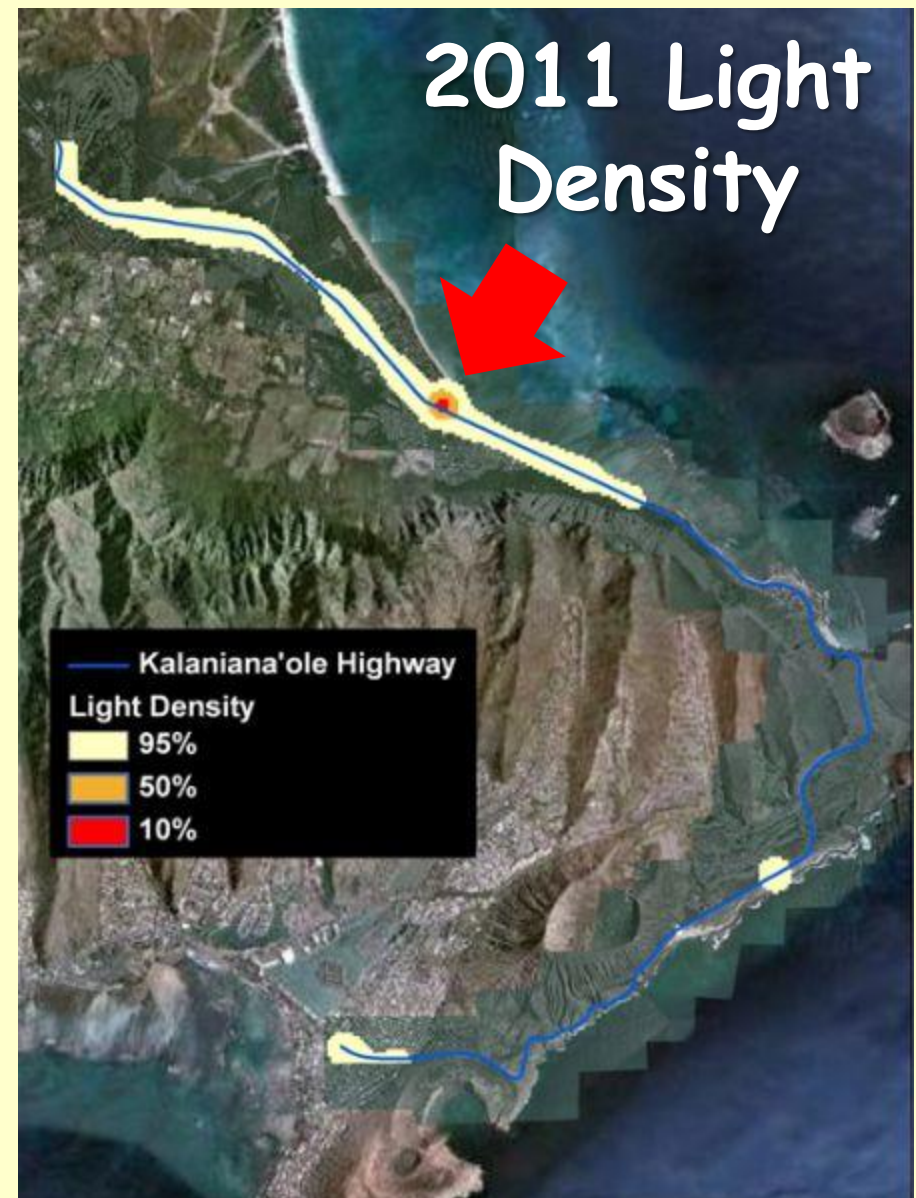
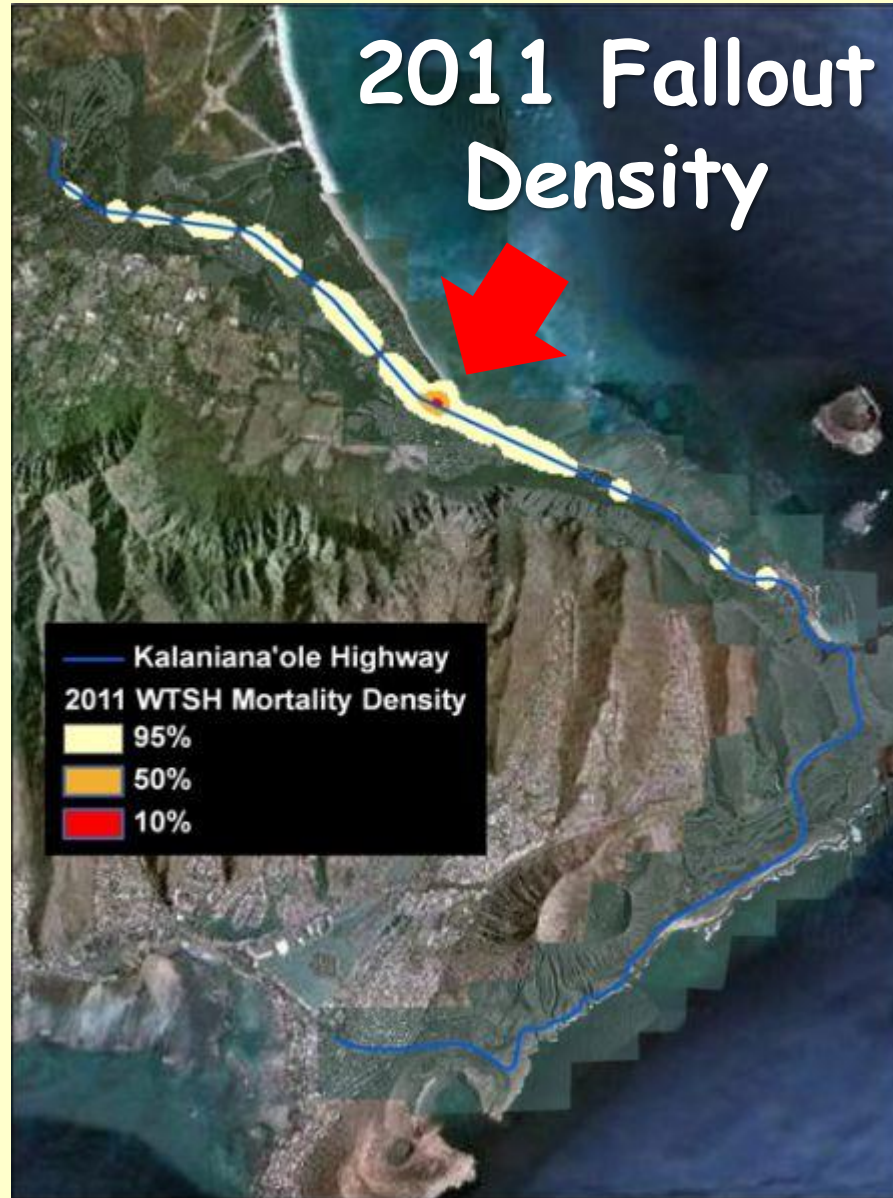
Higher fallout during no moon nights:

17 surveys

$r = -0.65$

($p = 0.005$)

Mapping Fallout and Light Posts



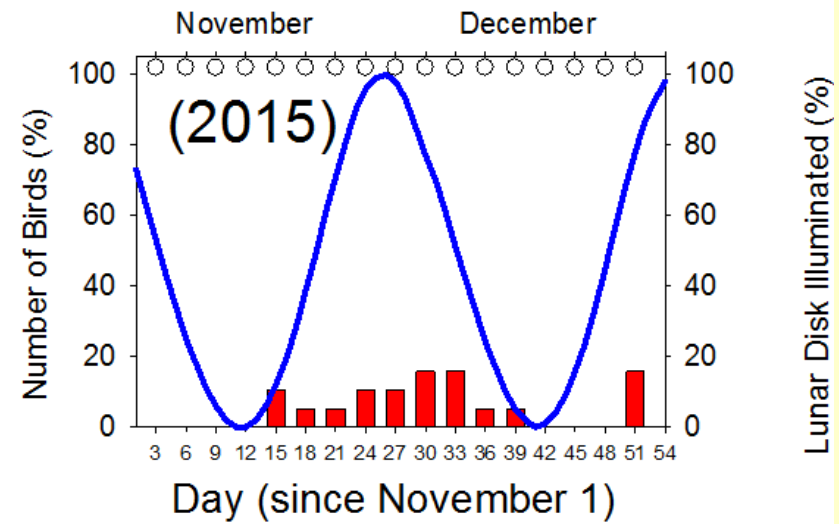
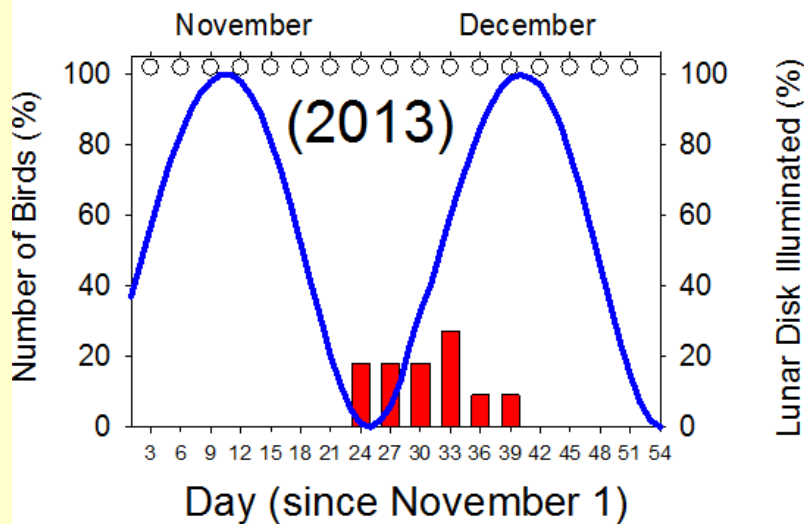
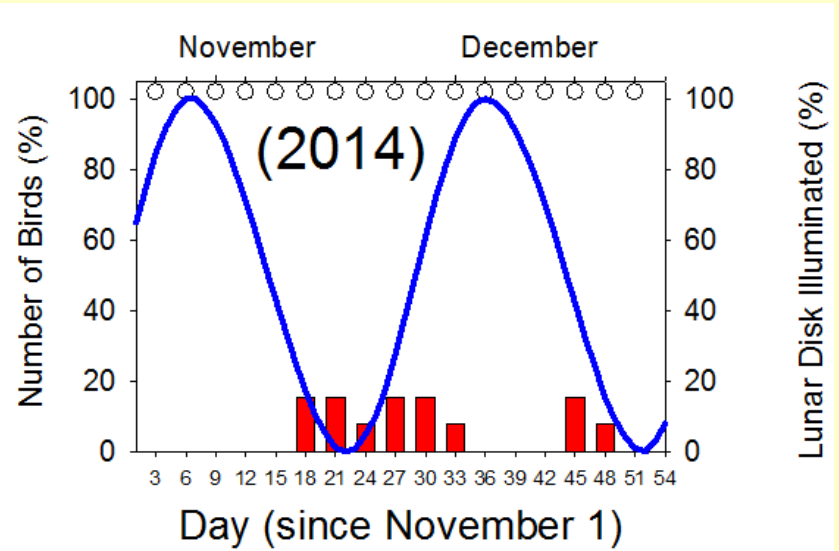
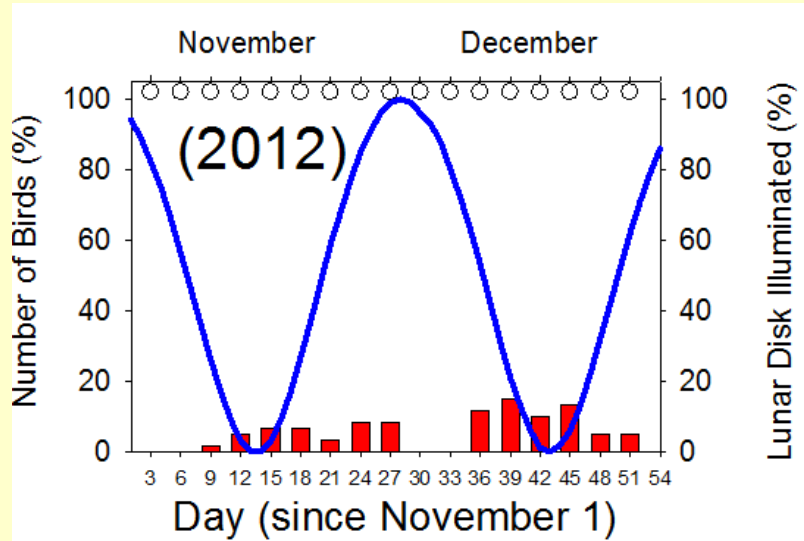
Four More Years of Surveys

2012 (60)

2013 (11)

2014 (13)

2015 (19)



Analysis of Five Survey Years

- Log Shearwater Fallout (# per survey)
- 85 data points = 5 years, 17 surveys / year
- GLM:
 - Year (2011, 2012, 2013, 2014, 2015)
 - Julian Date (Nov 3 - Dec 21)
 - Moon Phase (% disk illuminated)

<u>Source</u>	<u>df</u>	<u>F-ratio</u>	<u>P</u>
YEAR	4	12.876	< 0.001
DATE	1	1.908	0.171
MOON	1	21.179	< 0.001
Error	78		

Multiple R
Squared =
0.45

Analysis of Five Survey Years

- Year-to-year Differences (# per survey)

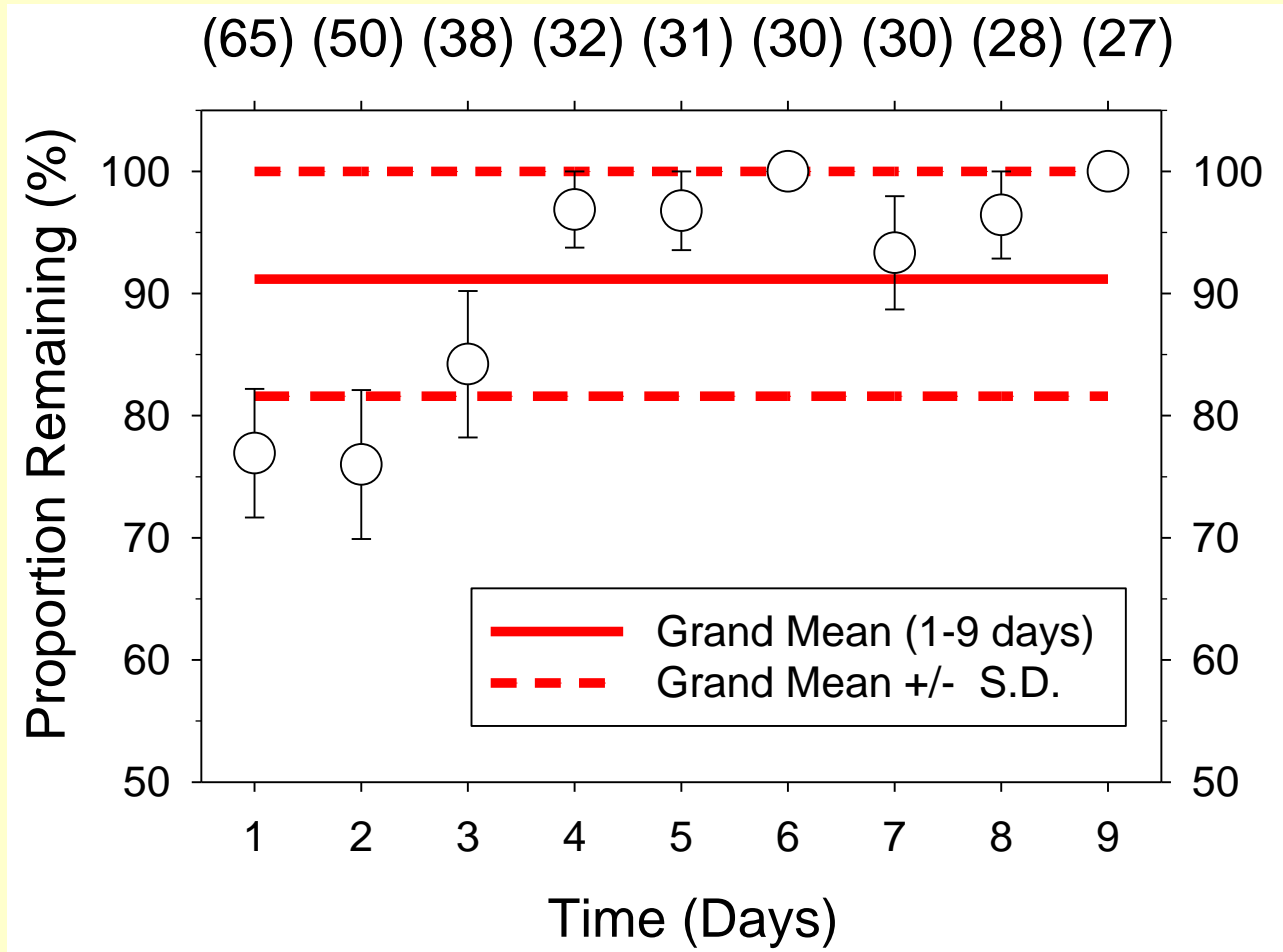
2011 - 2012

2013 - 2014 - 2015

- Based on Pairwise Post-hoc tests:

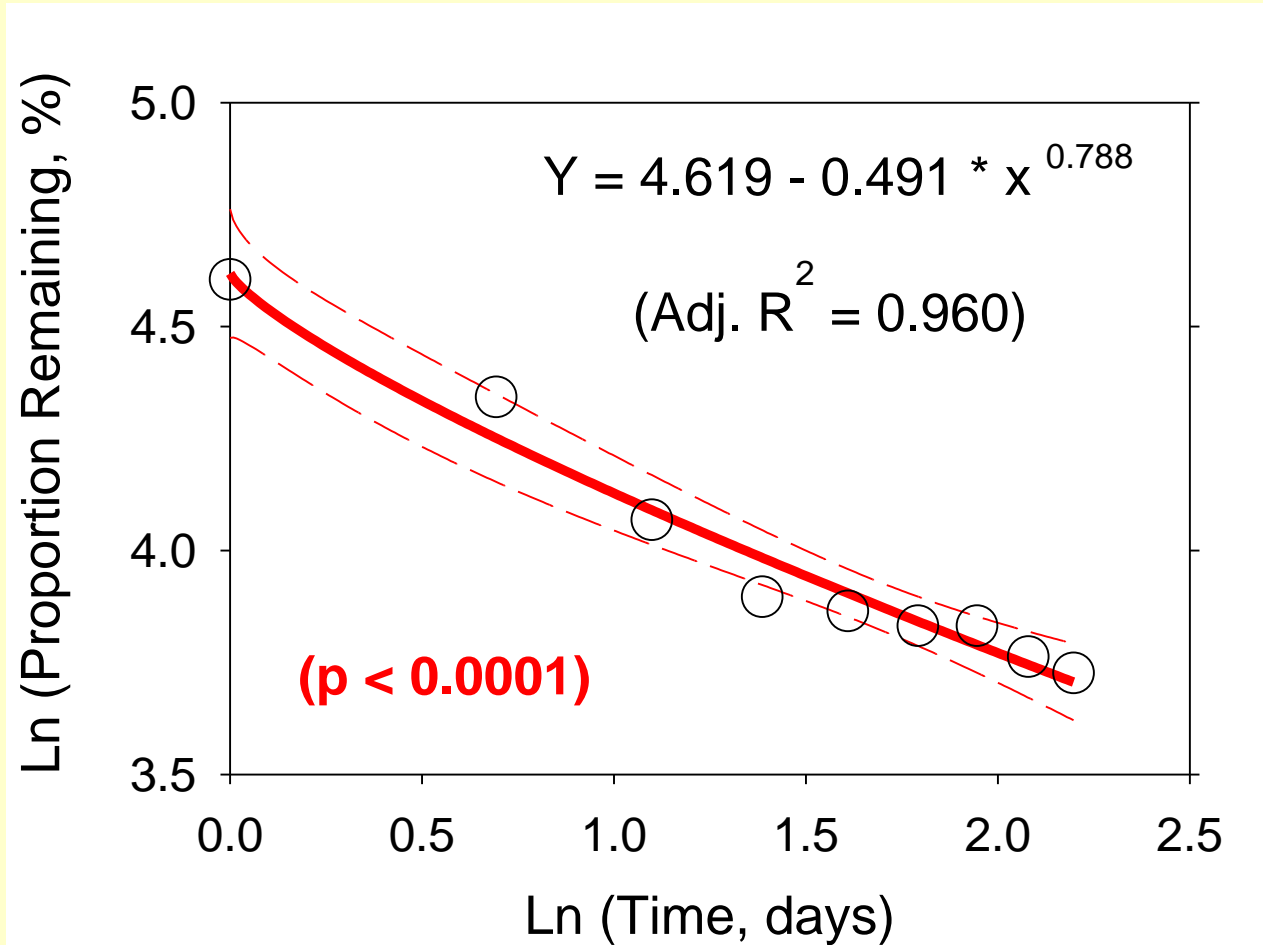
	2011	2012	2013	2014
	-			
2012	0.599	-		
2013	< 0.001	0.007	-	
2014	< 0.001	0.025	0.992	-
2015	< 0.001	< 0.001	0.639	0.407

Results: Mark - Recapture



Fresh carcasses (1 - 3 days) lost at higher rate

Results: Mark - Recapture



Time-dependent change in the carcass loss rate

Conclusions



- Higher fallout during no moon nights
- Fallout concentrated in Waimanalo Recreational Field (in 2011)
- After night lights turned off (2012-15) fallout scattered throughout study area



- Year-to-year variability in fallout
- Time dependent loss of carcasses
- 3-day surveys underestimate fallout

Thanks

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Norma Creps

