Evaluating the Efficacy of Descender Devices in Increasing the Survival of Deepwater Groupers Using Telemetry

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J. Krause,
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SeaQualizer,
N. Wegner,
J. Curtis,
C. Conroy.

Discards and trauma – overall trends

Reasons for discards – regulations

- Size limits
- Bag limits
- Seasonal closures
- Total closures

Potential causes of injury → mortality

- Exhaustion or fatigue
- Water column predators
- **Barotrauma**

Immediate mortality is easier to determine – severe injuries, floating

Delayed is difficult – better estimates needed in US southeast

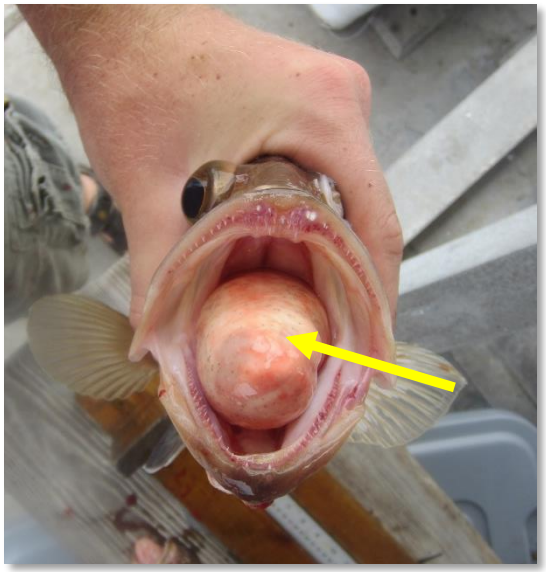


Photo: Personal

Deepwater groupers

Snowy grouper

Scamp

Speckled hind

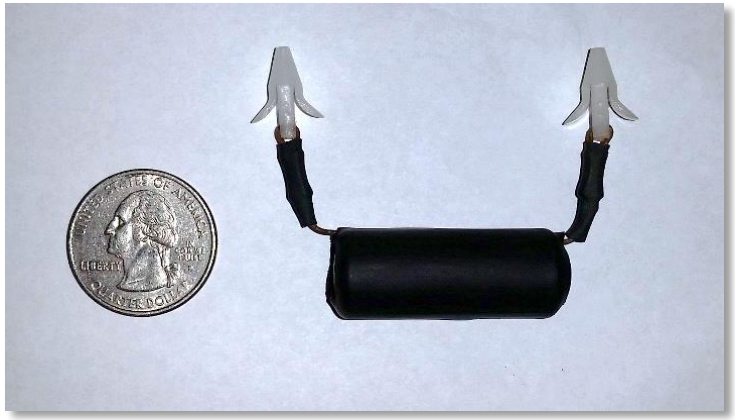
- Deeper water → severe barotrauma
  - Higher discard mortality rates (near 100%)
  - Some regulations reflect this rate
    - e.g. no size limit for snowy grouper

Can we increase survival by forced recompression using a descender device?

Photos: Personal, Pat Lyon

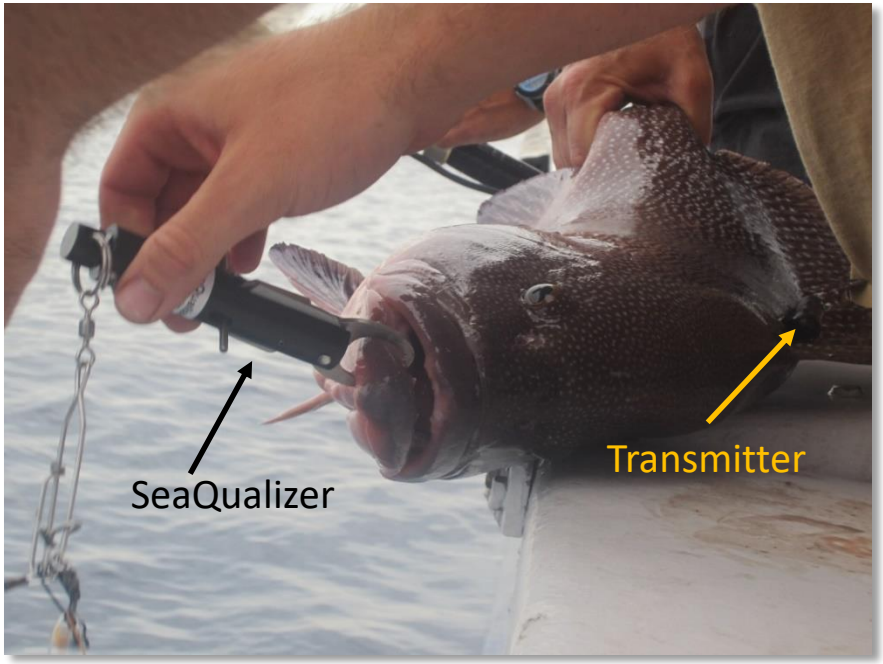
Acoustic telemetry methods

- Conventional tagging would not be effective – low sample sizes
- V13AP tags record acceleration and depth
  - Behavior → proxy for fate (survival or death)
- External attachment to avoid venting, long deck time, anesthesia



Photos: Personal, Pat Lyon

Recompression – *SeaQualizer*



Device attached to lower jaw

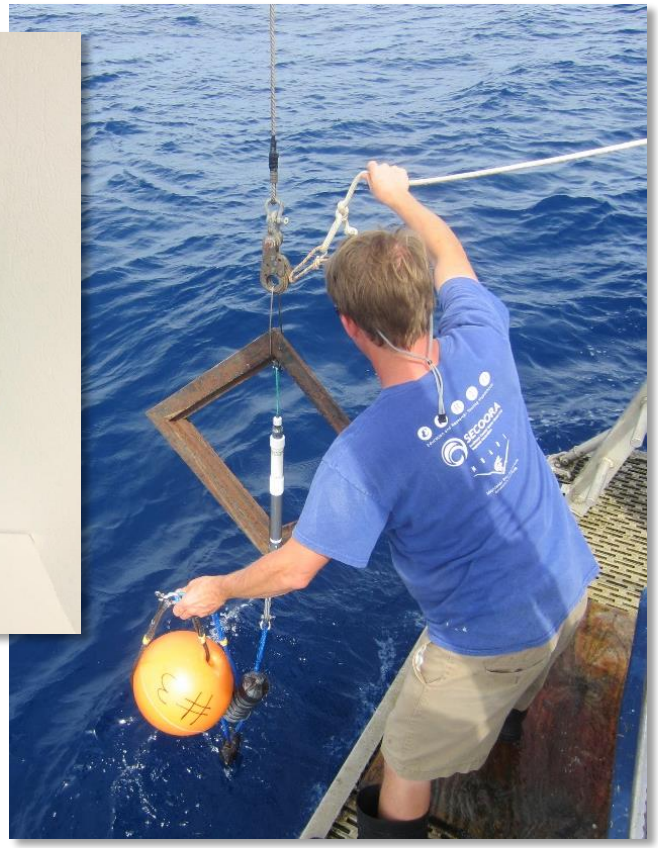
Weighted rig lowered into ocean

Photos: Personal, Pat Lyon

(This is a video)

Acoustic receiver deployment

- VR2W receivers moored to SubSeaSonics acoustic releases (AR-50-AA)



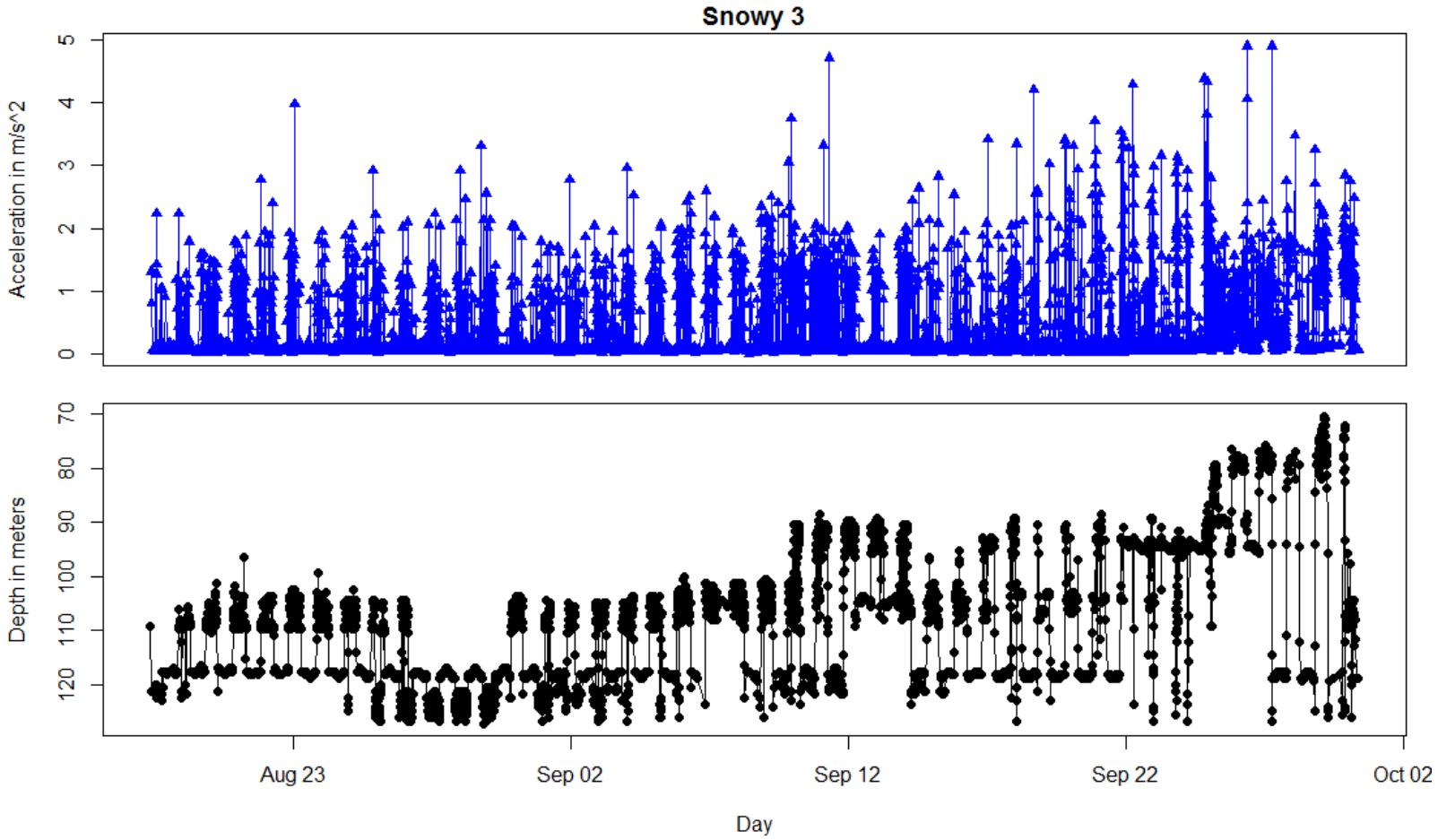
- Moorings retrieved by signaling acoustic release on September 30, 2015 (44 day study)

Photos: Personal, subseasonics.com

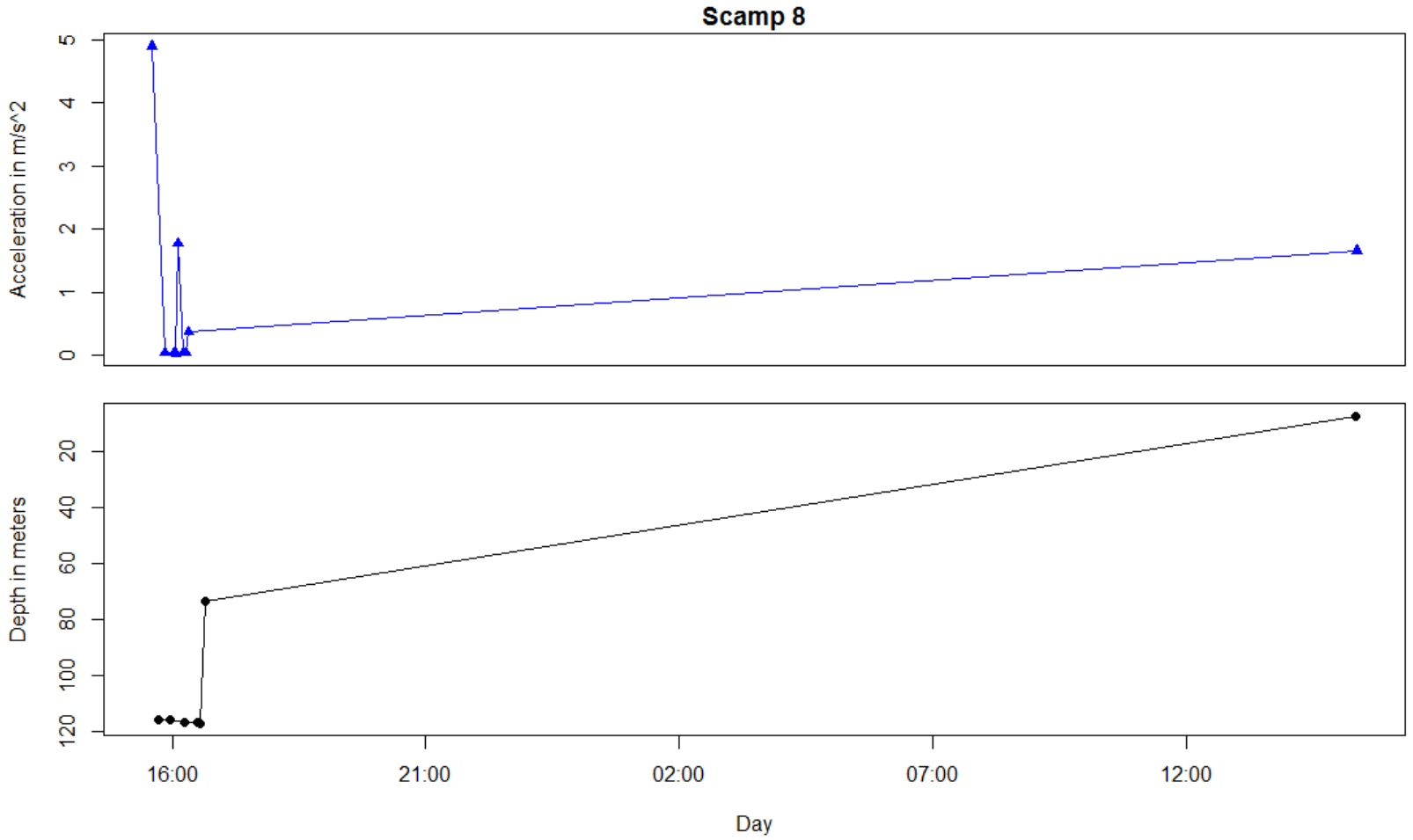
60,000 detections over 44 days

	A	B	C	D	E	F	G	H	I	J
1	Date and Time (UTC)	Receiver	Transmitter	Transmitter Name	Transmitt	Sensor Value	Sensor Unit	Station Na	Latitude	Longitud
2	8/17/2015 10:18	VR2W-102532	A69-9004-1893	Control 1 depth	1221344	0.0002	m			
3	8/17/2015 11:33	VR2W-102532	A69-9004-1893	Control 1 depth	1221344	0.0002	m			
4	8/17/2015 11:36	VR2W-102532	A69-9004-1892	Control 1 acc	1221344	4.9011	m/s²			
5	8/17/2015 11:38	VR2W-102532	A69-9004-1893	Control 1 depth	1221344	95.2207	m			
6	8/17/2015 11:41	VR2W-102532	A69-9004-1892	Control 1 acc	1221344	0.05766	m/s²			
7	8/17/2015 11:43	VR2W-102532	A69-9004-1893	Control 1 depth	1221344	95.2207	m			
8	8/17/2015 11:46	VR2W-102532	A69-9004-1892	Control 1 acc	1221344	0.05766	m/s²			
9	8/17/2015 11:50	VR2W-102532	A69-9004-1892	Control 1 acc	1221344	0.05766	m/s²			
10	8/17/2015 11:54	VR2W-102532	A69-9004-1893	Control 1 depth	1221344	95.2207	m			
11	8/17/2015 11:56	VR2W-102532	A69-9004-1892	Control 1 acc	1221344	0.03844	m/s²			
12	8/17/2015 11:58	VR2W-102532	A69-9004-1893	Control 1 depth	1221344	95.8272	m			
13	8/17/2015 12:00	VR2W-102532	A69-9004-1892	Control 1 acc	1221344	0.03844	m/s²			
14	8/17/2015 12:02	VR2W-102532	A69-9004-1893	Control 1 depth	1221344	95.2207	m			
15	8/17/2015 12:04	VR2W-102532	A69-9004-1892	Control 1 acc	1221344	0.03844	m/s²			
16	8/17/2015 12:08	VR2W-102532	A69-9004-1892	Control 1 acc	1221344	0.03844	m/s²			
17	8/17/2015 12:11	VR2W-102532	A69-9004-1892	Control 1 acc	1221344	0.03844	m/s²			
18	8/17/2015 12:12	VR2W-102532	A69-9004-1893	Control 1 depth	1221344	95.2207	m			
19	8/17/2015 12:17	VR2W-102532	A69-9004-1893	Control 1 depth	1221344	95.2207	m			
20	8/17/2015 12:20	VR2W-102532	A69-9004-1892	Control 1 acc	1221344	0.03844	m/s²			
21	8/17/2015 12:22	VR2W-102532	A69-9004-1893	Control 1 depth	1221344	95.8272	m			
22	8/17/2015 12:24	VR2W-102532	A69-9004-1892	Control 1 acc	1221344	0.03844	m/s²			
23	8/17/2015 12:26	VR2W-102532	A69-9004-1893	Control 1 depth	1221344	95.8272	m			
24	8/17/2015 12:27	VR2W-102532	A69-9004-1892	Control 1 acc	1221344	0.01922	m/s²			
25	8/17/2015 12:28	VR2W-102532	A69-9004-1893	Control 1 depth	1221344	95.8272	m			
26	8/17/2015 12:30	VR2W-102532	A69-9004-1892	Control 1 acc	1221344	0.03844	m/s²			
27	8/17/2015 12:32	VR2W-102532	A69-9004-1893	Control 1 depth	1221344	95.2207	m			
28	8/17/2015 12:34	VR2W-102532	A69-9004-1892	Control 1 acc	1221344	0.01922	m/s²			
29	8/17/2015 12:36	VR2W-102532	A69-9004-1893	Control 1 depth	1221344	95.8272	m			
30	8/17/2015 12:38	VR2W-102532	A69-9004-1892	Control 1 acc	1221344	0.01922	m/s²			
31	8/17/2015 12:39	VR2W-102532	A69-9004-1893	Control 1 depth	1221344	95.2207	m			
32	8/17/2015 12:41	VR2W-102532	A69-9004-1892	Control 1 acc	1221344	0.01922	m/s²			
33	8/17/2015 12:44	VR2W-102532	A69-9004-1893	Control 1 depth	1221344	95.2207	m			

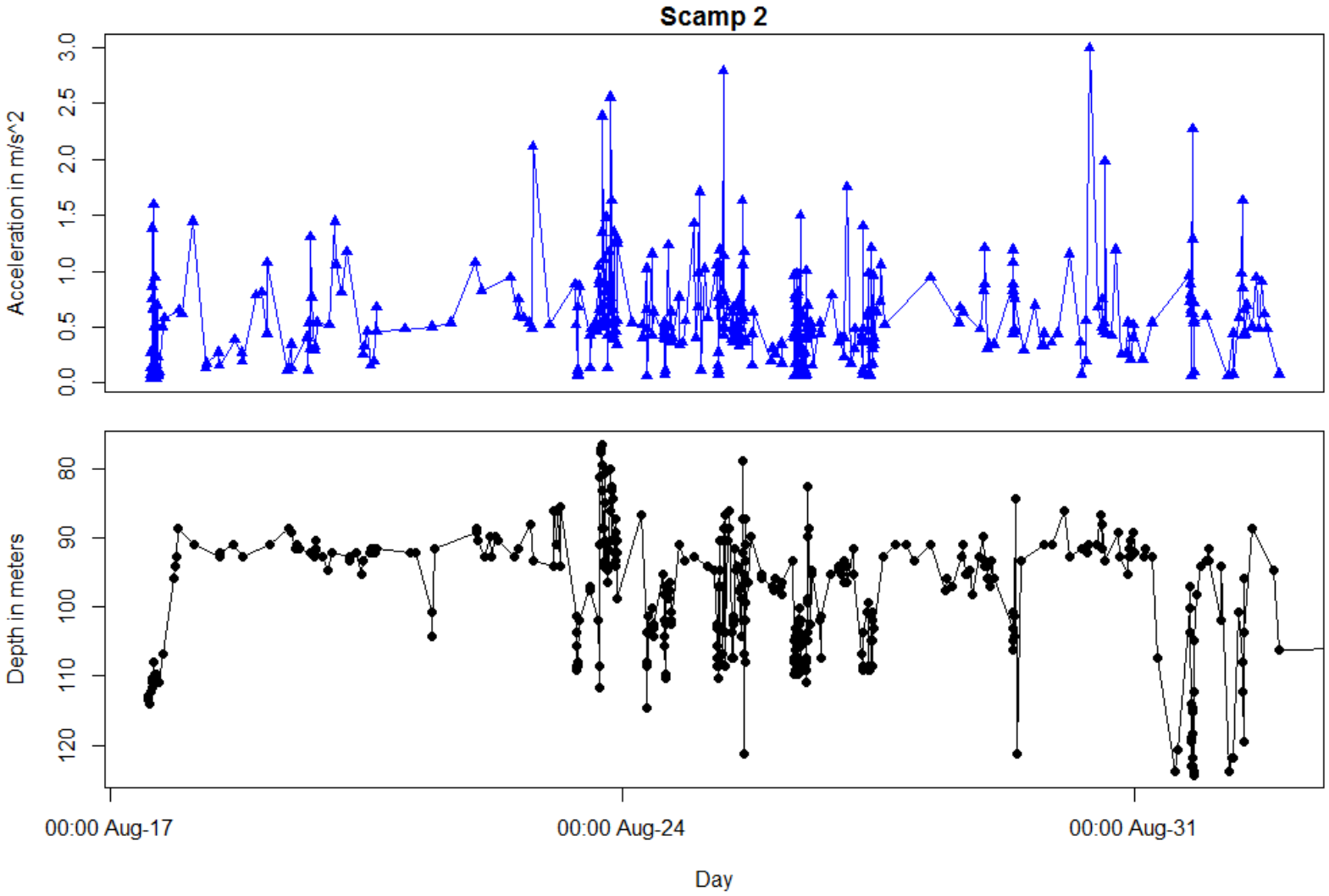
Dead or alive?



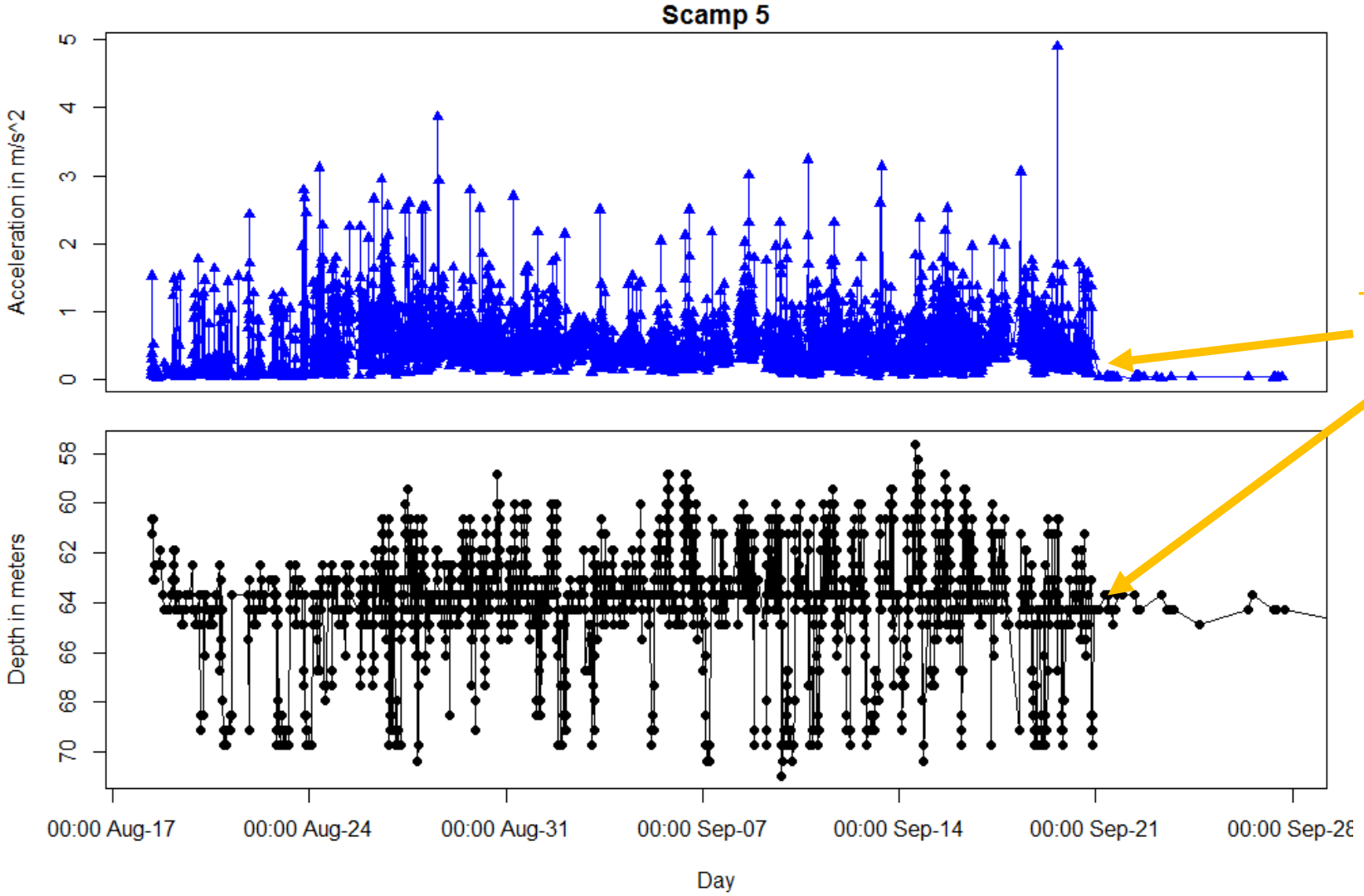
Dead or alive?

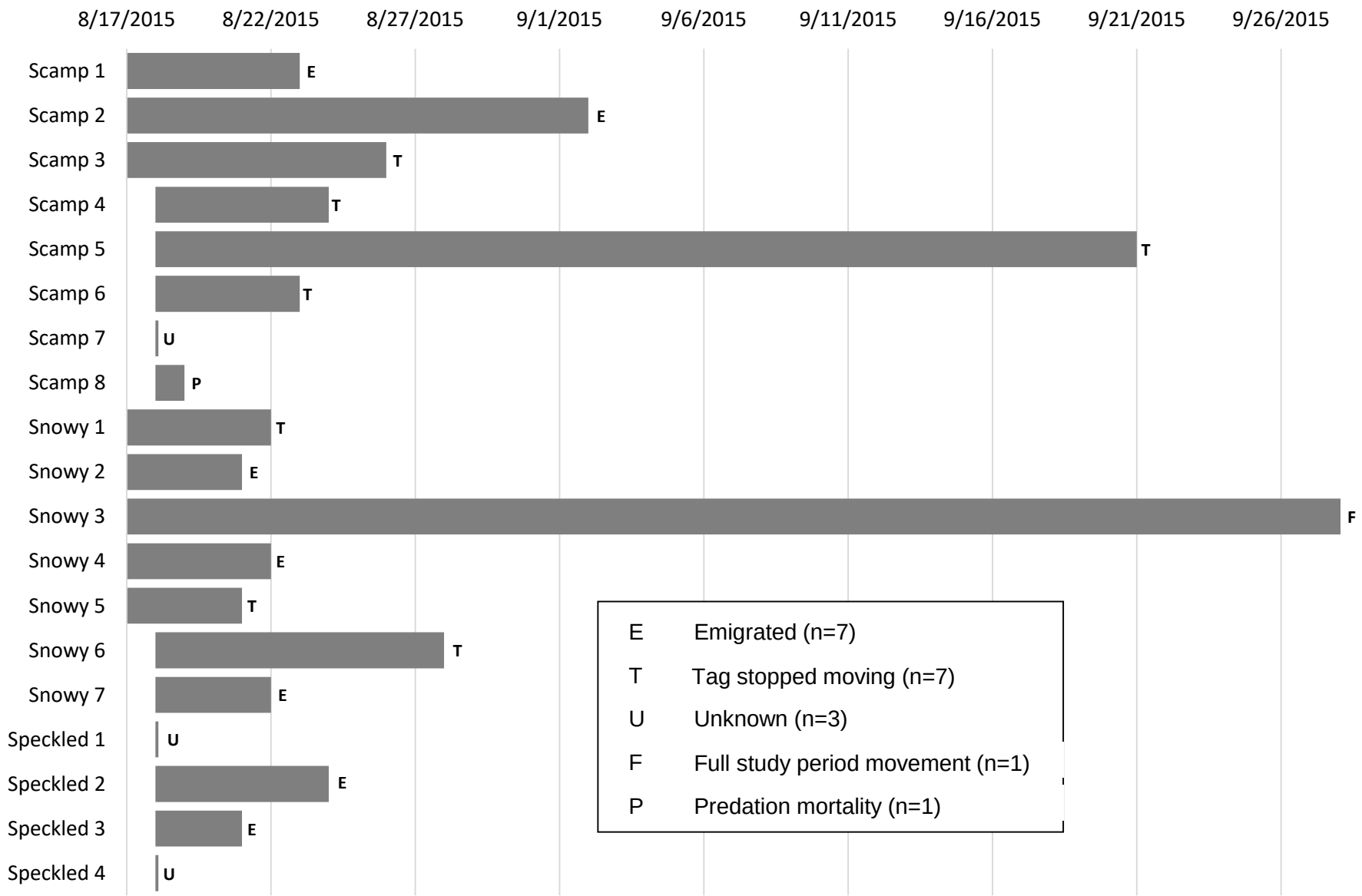


Dead or alive?



Dead or alive?




8/17/2015
8/22/2015
8/27/2015
9/1/2015
9/6/2015
9/11/2015
9/16/2015
9/21/2015
9/26/2015
Scamp 1
Scamp 2
Scamp 3
Scamp 4
Scamp 5
Scamp 6
Scamp 7
Scamp 8
Snowy 1
Snowy 2
Snowy 3
Snowy 4
Snowy 5
Snowy 6
Snowy 7
Speckled 1
Speckled 2
Speckled 3
Speckled 4
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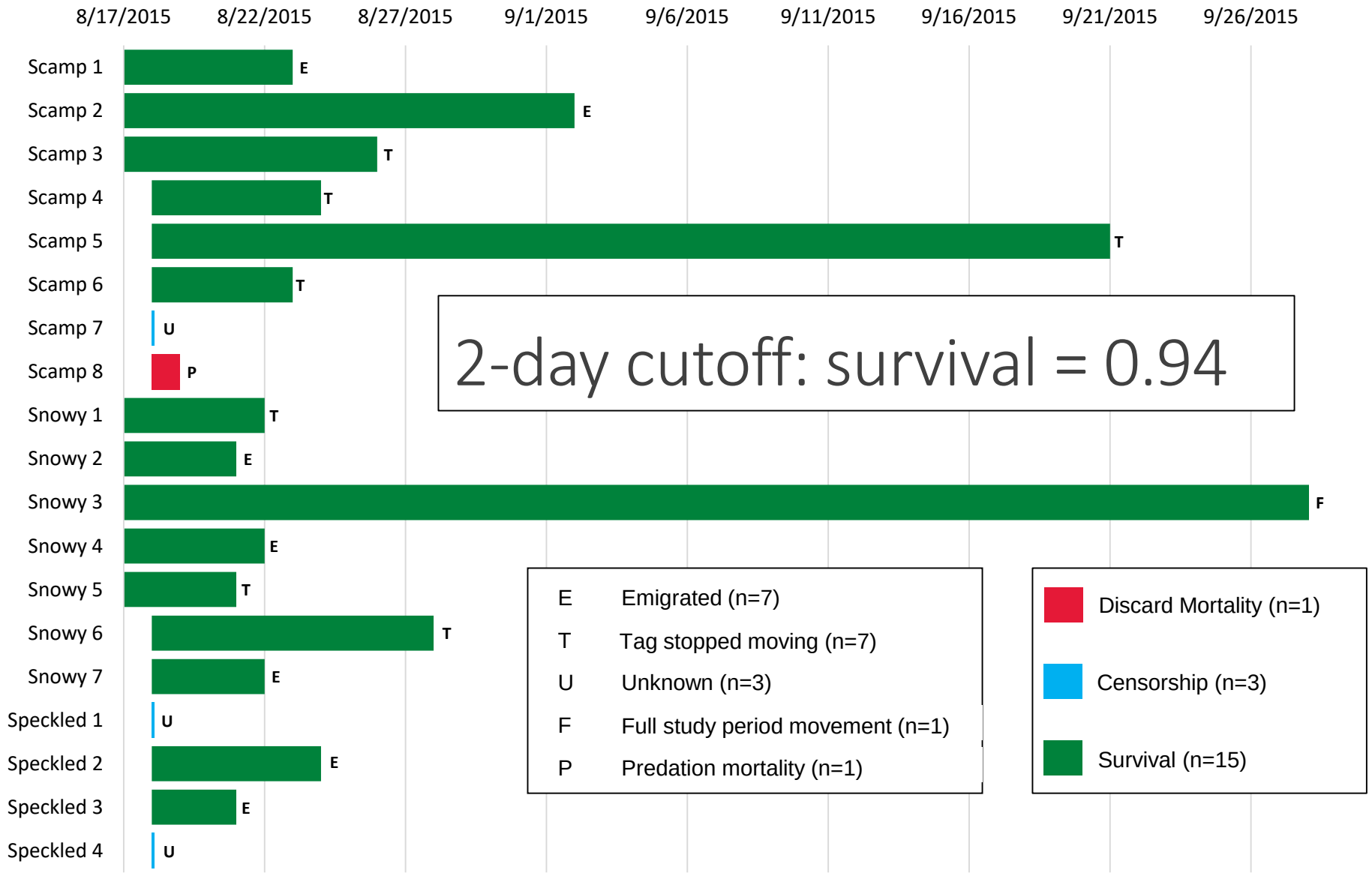
E Emigrated (n=7)
T Tag stopped moving (n=7)
U Unknown (n=3)
F Full study period movement (n=1)
P Predation mortality (n=1)


8/17/2015
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9/11/2015
9/16/2015
9/21/2015
9/26/2015
Scamp 1
Scamp 2
Scamp 3
Scamp 4
Scamp 5
Scamp 6
Scamp 7
Scamp 8
Snowy 1
Snowy 2
Snowy 3
Snowy 4
Snowy 5
Snowy 6
Snowy 7
Speckled 1
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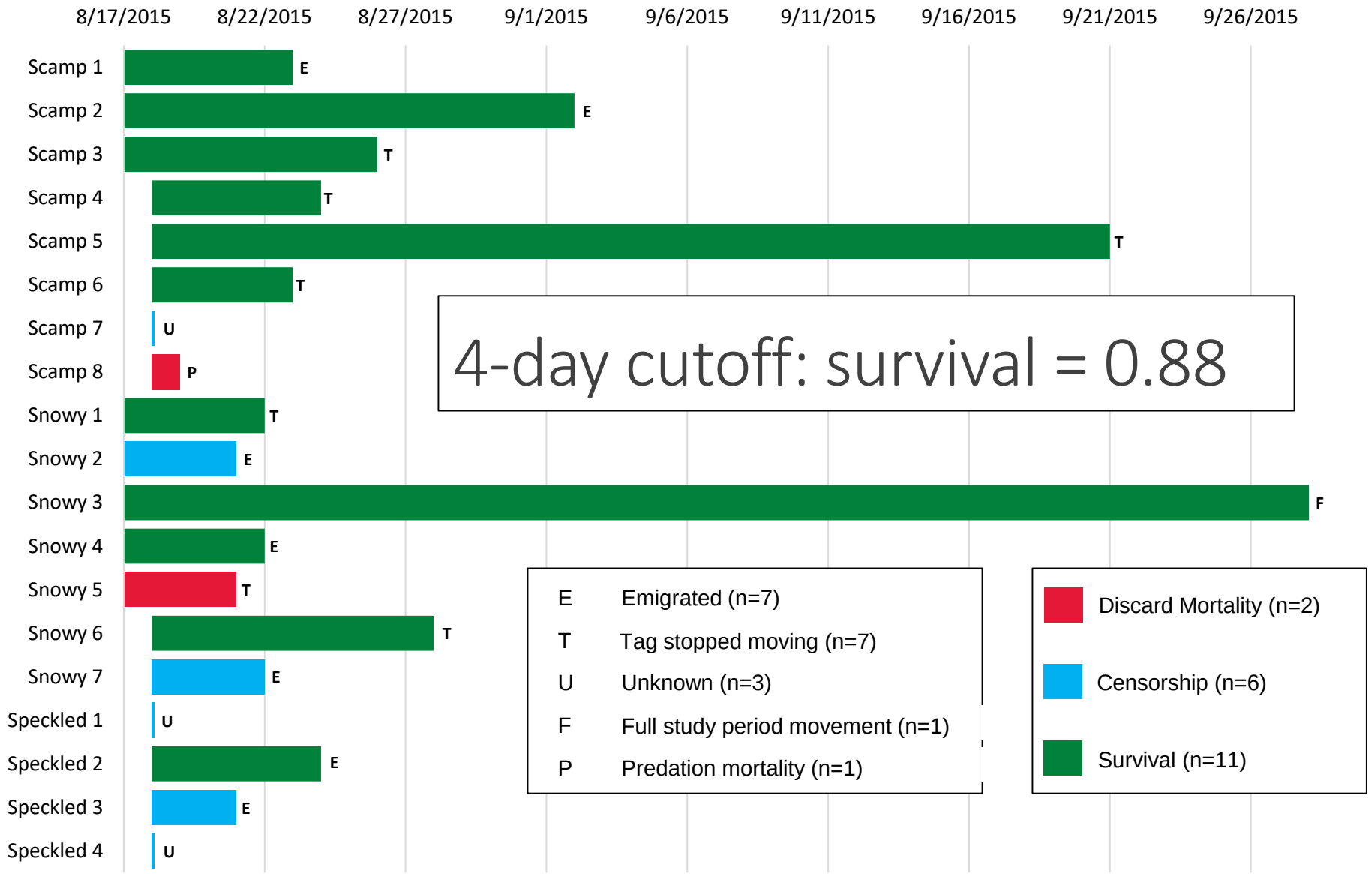
2-day cutoff: survival = 0.94
E Emigrated (n=7)
T Tag stopped moving (n=7)
U Unknown (n=3)
F Full study period movement (n=1)
P Predation mortality (n=1)
Discard Mortality (n=1)
Censorship (n=3)
Survival (n=15)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9/26/2015
Scamp 1
Scamp 2
Scamp 3
Scamp 4
Scamp 5
Scamp 6
Scamp 7
Scamp 8
Snowy 1
Snowy 2
Snowy 3
Snowy 4
Snowy 5
Snowy 6
Snowy 7
Speckled 1
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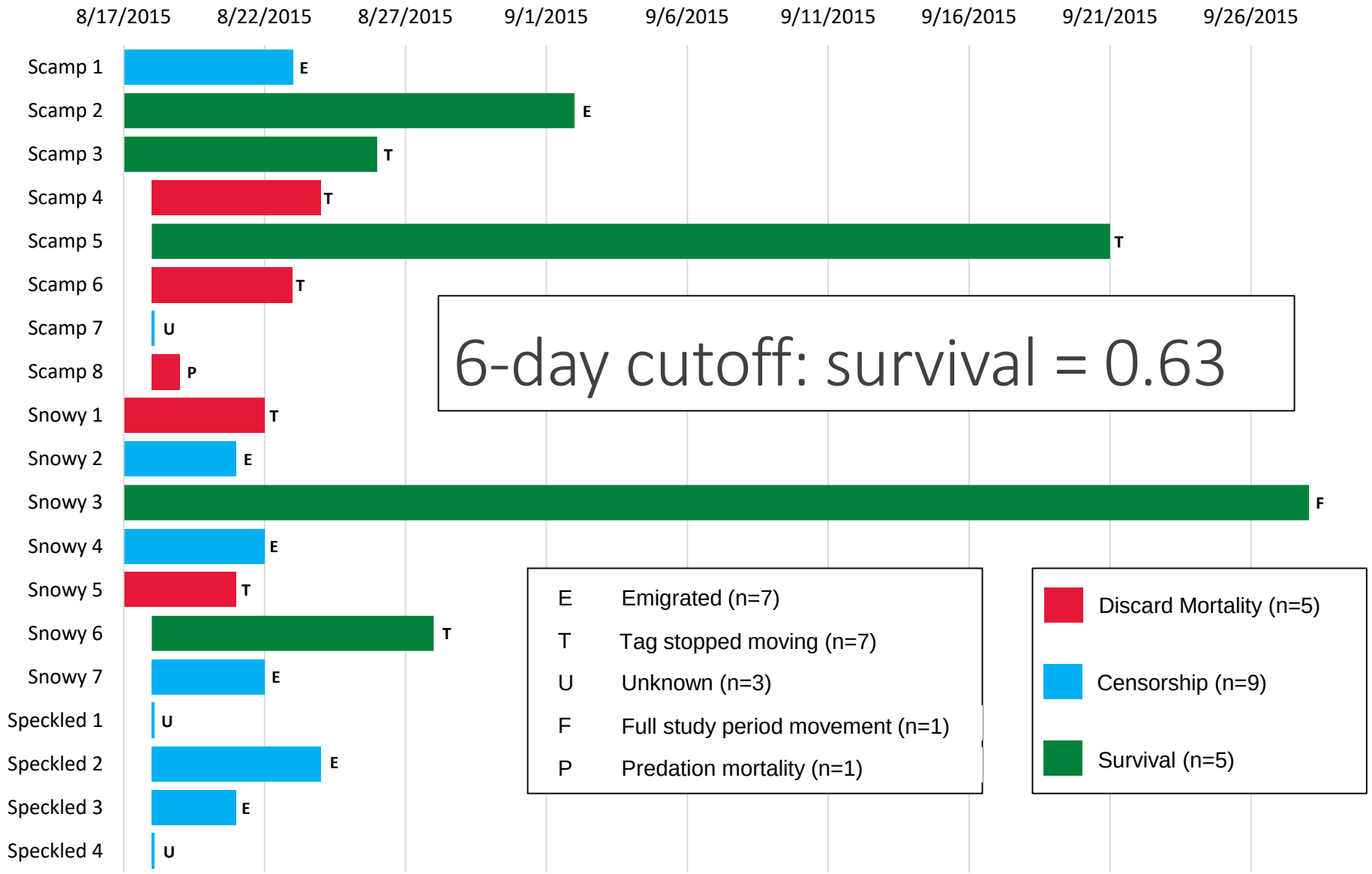
4-day cutoff: survival = 0.88
E Emigrated (n=7)
T Tag stopped moving (n=7)
U Unknown (n=3)
F Full study period movement (n=1)
P Predation mortality (n=1)
Discard Mortality (n=2)
Censorship (n=6)
Survival (n=11)


8/17/2015
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9/16/2015
9/21/2015
9/26/2015
Scamp 1
Scamp 2
Scamp 3
Scamp 4
Scamp 5
Scamp 6
Scamp 7
Scamp 8
Snowy 1
Snowy 2
Snowy 3
Snowy 4
Snowy 5
Snowy 6
Snowy 7
Speckled 1
Speckled 2
Speckled 3
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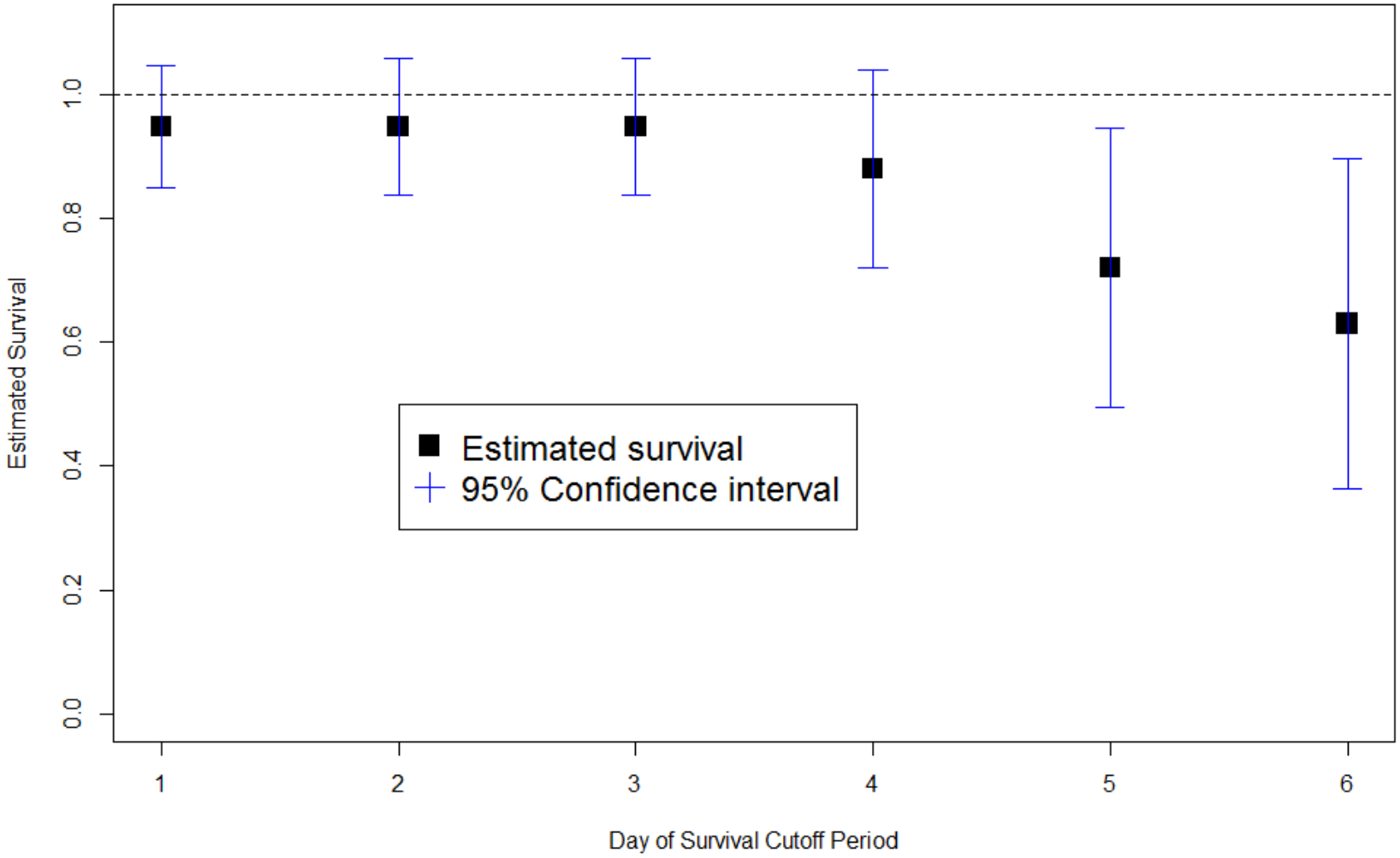
6-day cutoff: survival = 0.63
E Emigrated (n=7)
T Tag stopped moving (n=7)
U Unknown (n=3)
F Full study period movement (n=1)
P Predation mortality (n=1)
Discard Mortality (n=5)
Censorship (n=9)
Survival (n=5)

Kaplan-Meier survival changes with time



Conclusions

- Recompression appears to promote survival

- Management implications
  - Gear requirements in regulations not unprecedented
    - Circle hooks, dehooking tools, venting

- Future work
  - Grant proposal to repeat study with control group
  - More transmitters, more receivers – try to detect fish for longer periods (fewer emigrations)