

# Beaver burrowing activity along the River Isla in Scotland

Survey methods and burrowing patterns



**NatureScot**  
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Scotland's Nature Agency  
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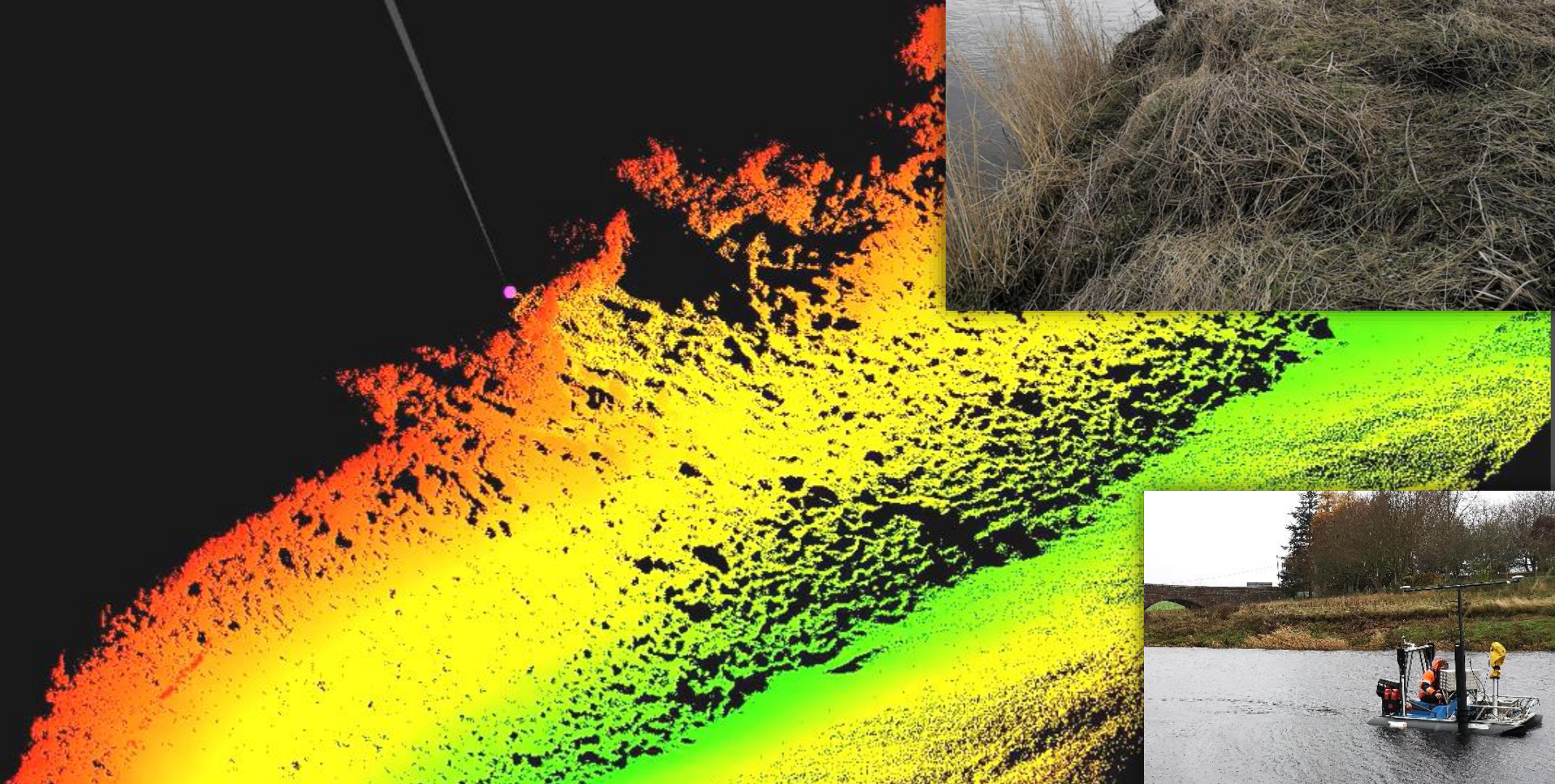
Roo Campbell

Mammal Advisor

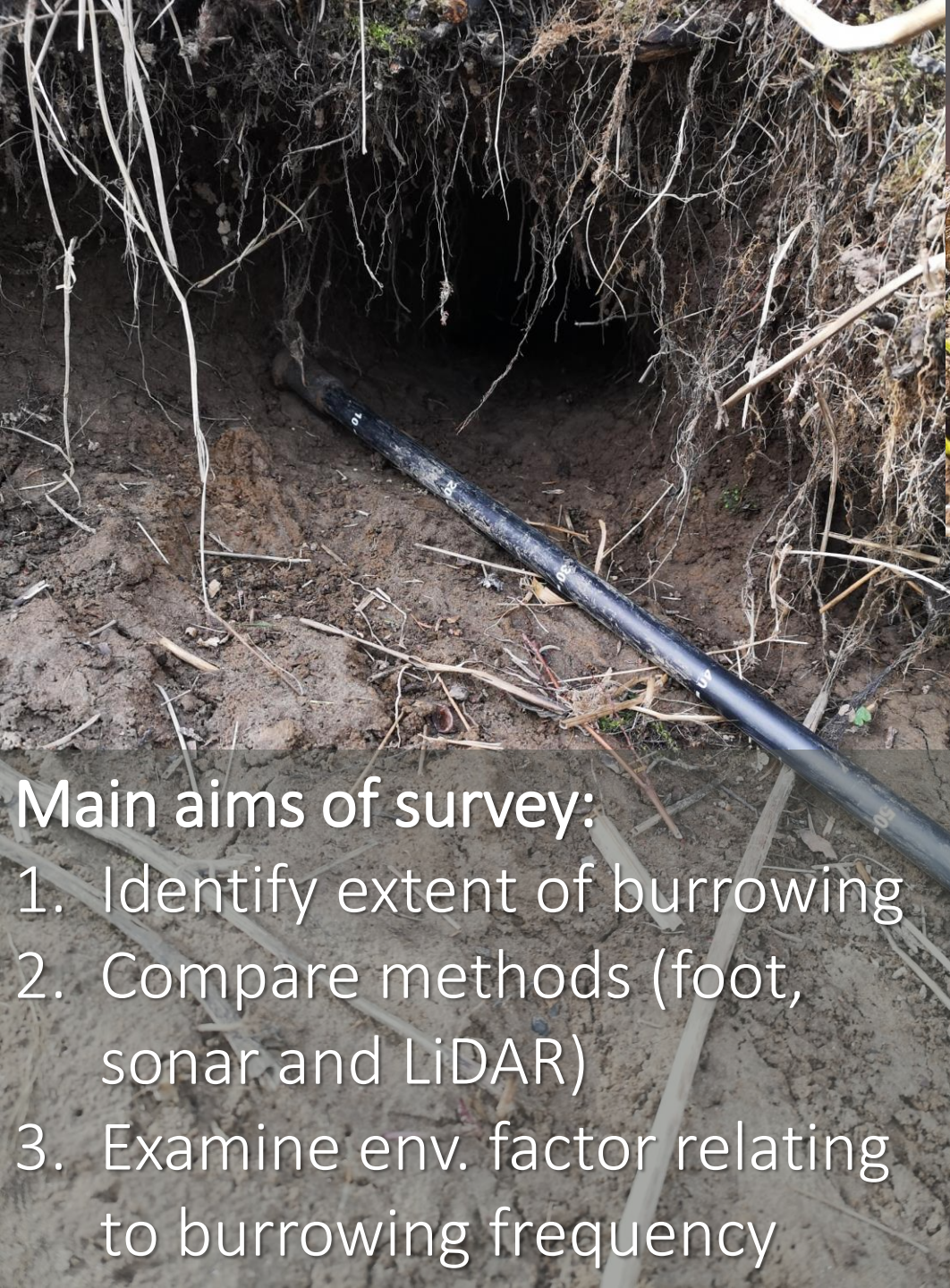
# CivTech<sup>®</sup>

Scalar field = 326.60

X	4.67	Xg	321304.67	R	255
Y	-20.48	Yg	740579.52	G	121
Z	30.19	Zg	30.19	B	0



## Surveyed 22km riverbank in Isla river



### Main aims of survey:

1. Identify extent of burrowing
2. Compare methods (foot, sonar and LiDAR)
3. Examine env. factor relating to burrowing frequency

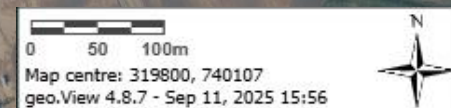


Sonar  
LiDAR  
Foot – intact  
Foot – collapsed  
Foot – possible  
Not surveyed on foot

# Results

Southwest half of survey area

*(note this part of the survey area contained the majority of burrows recorded)*



Burrows are not more common on outside of meanders

Collapsed burrows are highly aggregated

Foot: total 203 - burrows (177), possible burrows (17) and lodges (9), of which 173 (85%) had collapsed

Sonar: 46 burrows & LiDAR: 5 burrows

Total: 235 unique burrows and lodges  
= 10.6/km riverbank (1 per 94m)

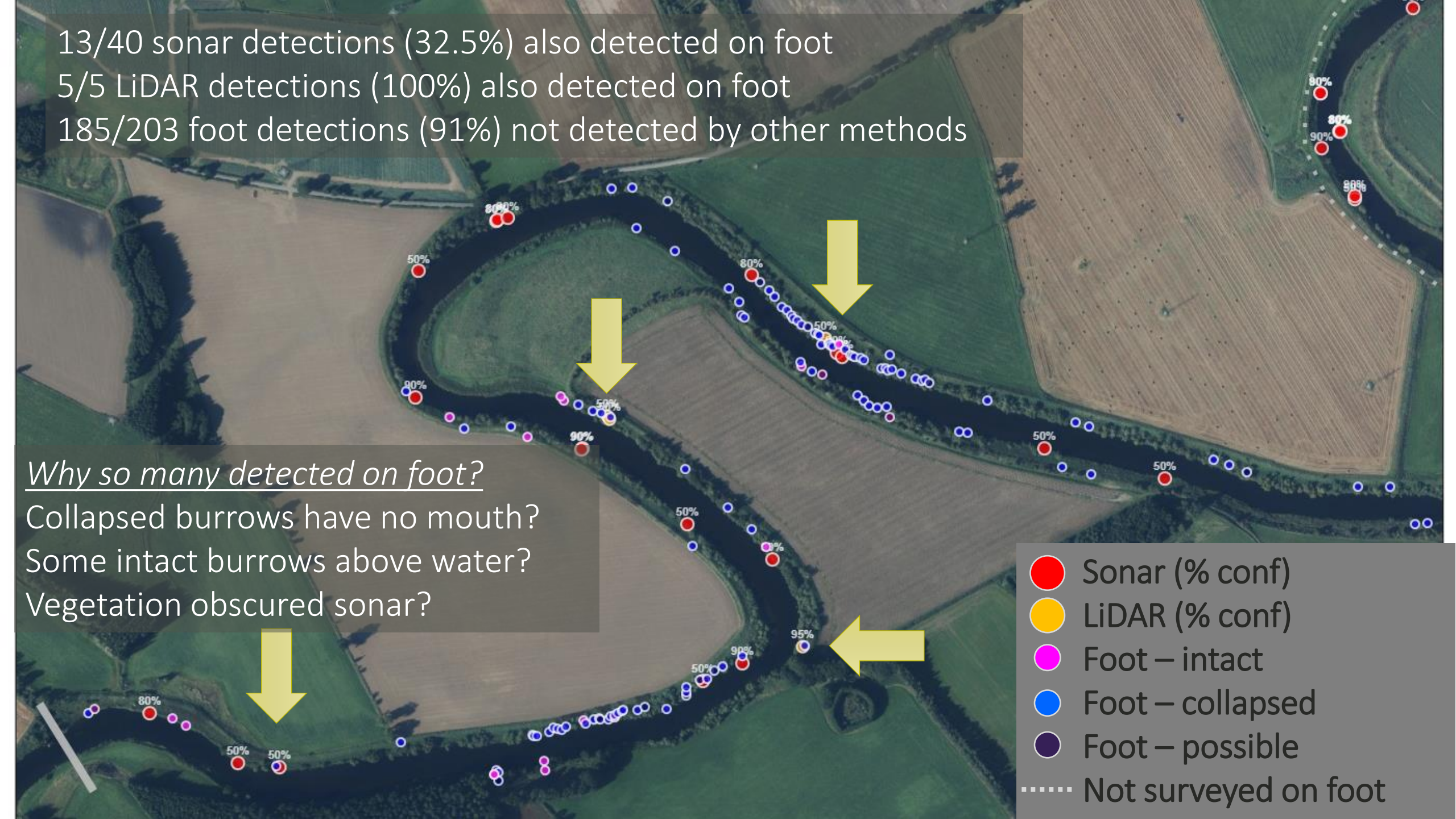
13/40 sonar detections (32.5%) also detected on foot  
5/5 LiDAR detections (100%) also detected on foot  
185/203 foot detections (91%) not detected by other methods

Why so many detected on foot?

Collapsed burrows have no mouth?

Some intact burrows above water?

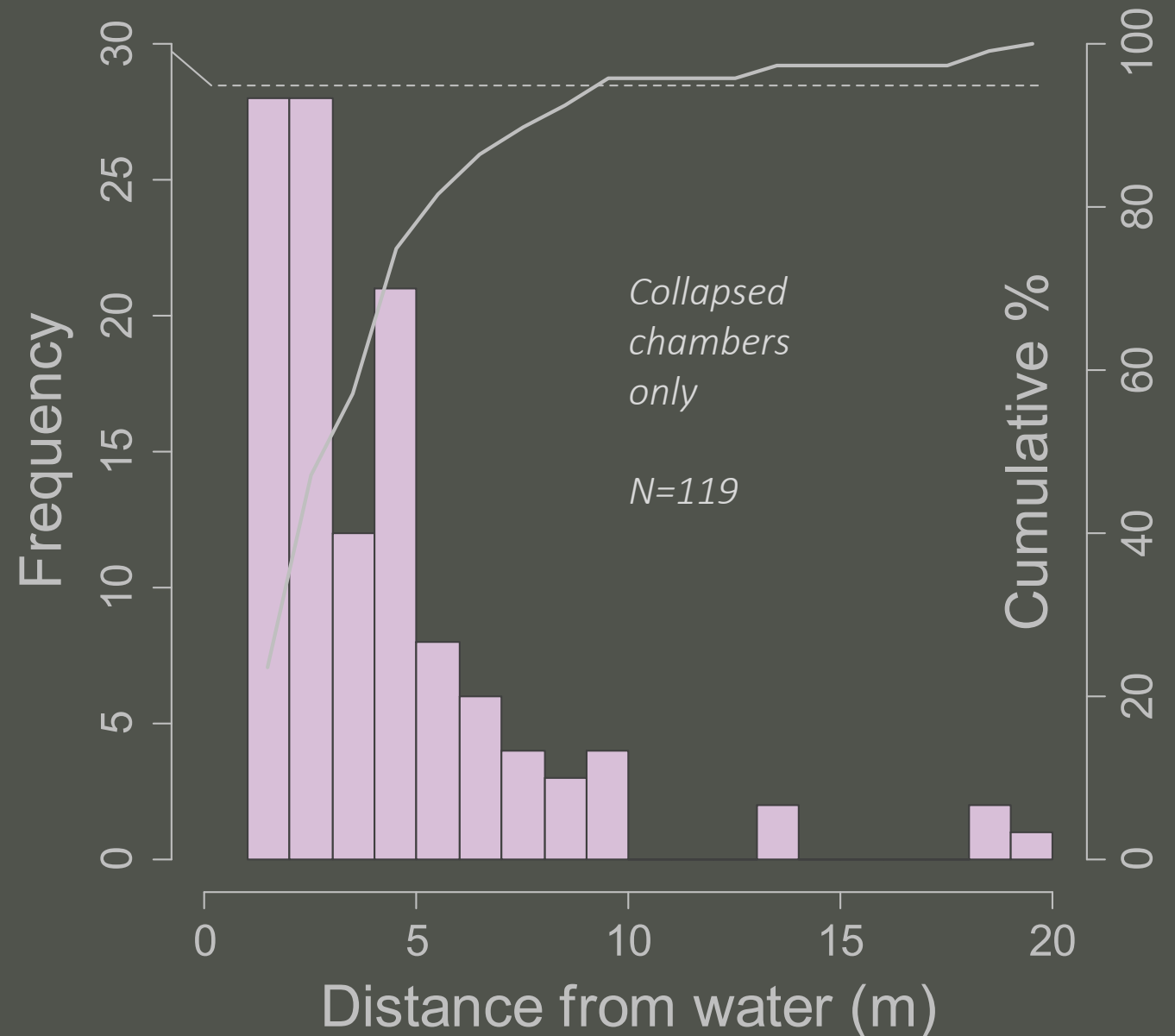
Vegetation obscured sonar?

- 
- Sonar (% conf)  
● LiDAR (% conf)  
● Foot – intact  
● Foot – collapsed  
● Foot – possible  
..... Not surveyed on foot

## Histogram of beaver burrow chamber with distance from water

>95% of chambers are <10m from water and none >20m

*But ~1 burrow per 2km river is >10m*



Binomial GLM

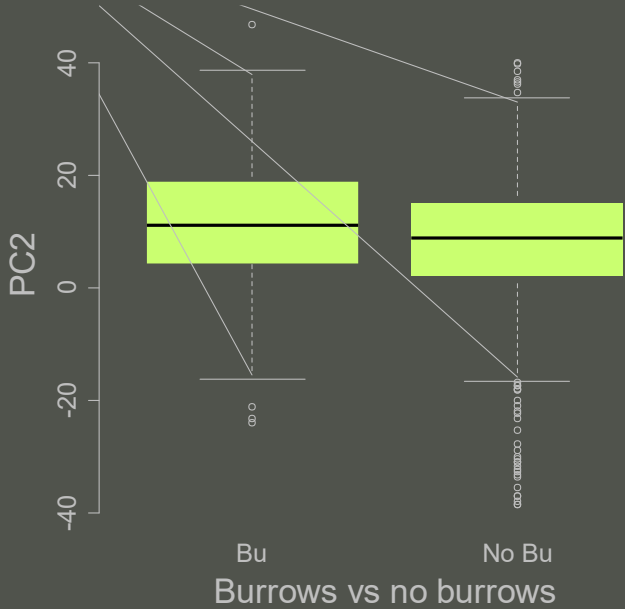
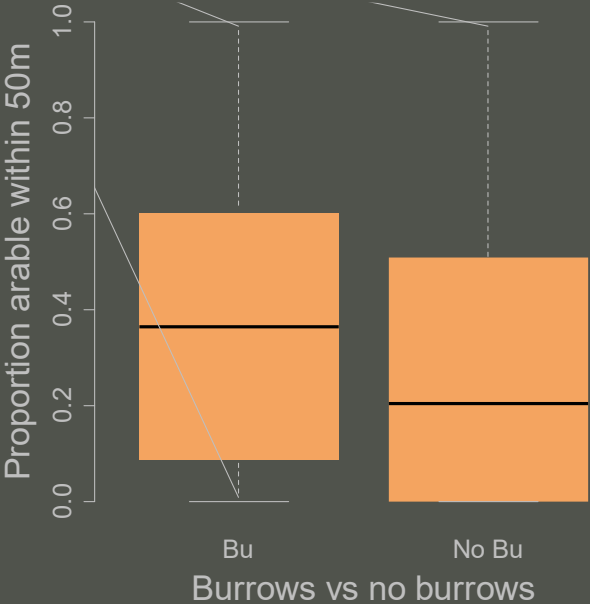
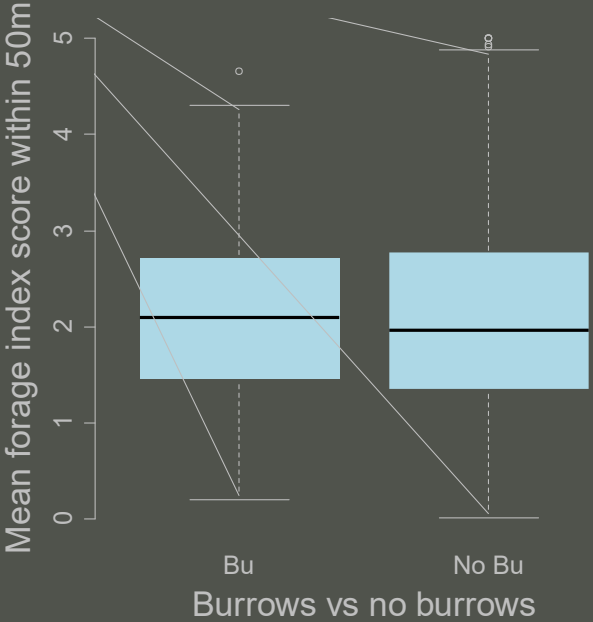
All data

Sonar data

Habitat

Bank profile

	Estimate	SE	z	P value	Estimate	SE	z	P value
(Intercept)	-4.182	0.375	-11.16	< 2e-16***	-5.697	0.760	-7.50	6.39E-14***
Mean forage index	0.259	0.096	2.69	0.007**	0.499	0.190	2.62	0.009**
√Proportion arable	1.241	0.264	4.69	2.70E-06***	1.218	0.552	2.21	0.027*
All mod. steep banks (PC1)	0.026	0.005	5.58	2.37E-08***	0.010	0.009	1.10	0.270
Steep offshore (PC2)	0.040	0.007	5.52	3.34E-08***	0.031	0.015	2.01	0.044*
Shallow edge w/ drop-off (PC3)	0.004	0.007	0.64	0.524	0.015	0.015	0.98	0.327
Shallow margins (PC4)	-0.027	0.008	-3.34	8.32E-04***	-0.025	0.017	-1.46	0.145
Flat w/floodbanks (PC5)	-0.011	0.006	-1.77	0.076.	-0.005	0.014	-0.33	0.739



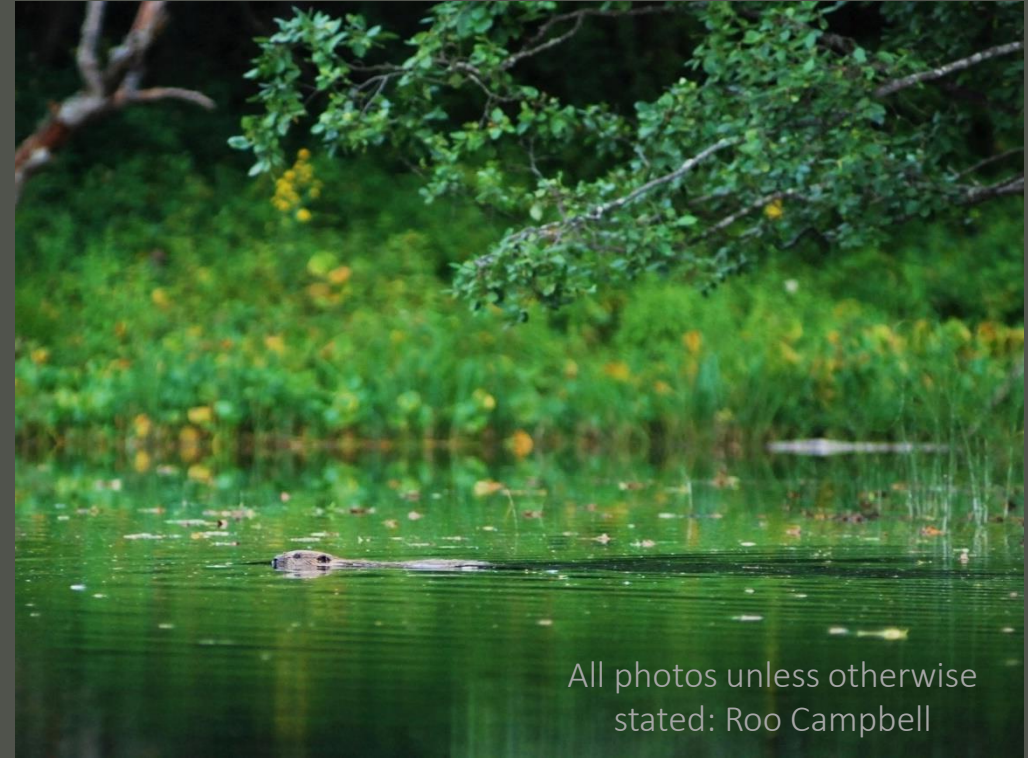
# Key discussion points

- 95% burrows extended <10m and all <20m
- High number of burrows reflects
  - Long history of occupancy
  - Collapses lead to new digging
  - Removal of beavers may lead to new burrowing?
- Burrows more common with more woody forage and agri land, and steeper banks (offshore at least)
- River meanders not related to burrow frequency
- LiDAR added little compared with foot and sonar (but may do in densely vegetated sites)
- Neither sonar nor foot survey methods detected everything
  - Foot obviously misses many intact burrows with underwater entrances
  - Sonar doesn't detect many collapsed burrows
  - Vegetation may obscure burrows from sonar



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All photos unless otherwise  
stated: Roo Campbell

## Acknowledgements

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Roo.Campbell@nature.scot