
Increasing the Taxonomic Resolution of Low Cost Dolphin Click Detectors

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Acknowledgements

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St Andrews

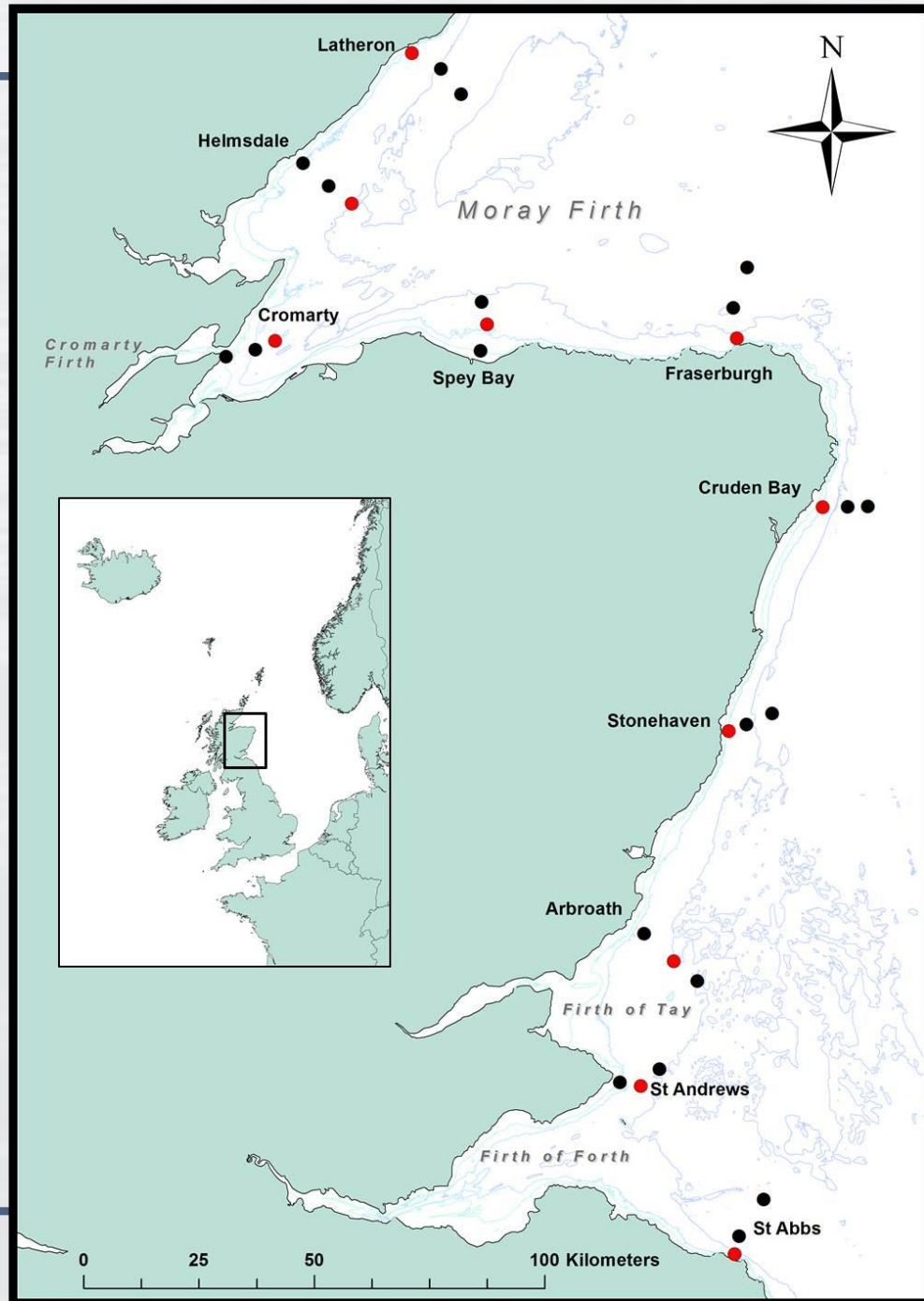
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Species Classification in a Large-Scale and Long-Term Study



Latheron

Helmsdale

Cromarty

Spey Bay

Fraserburgh

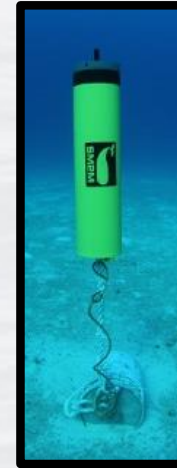
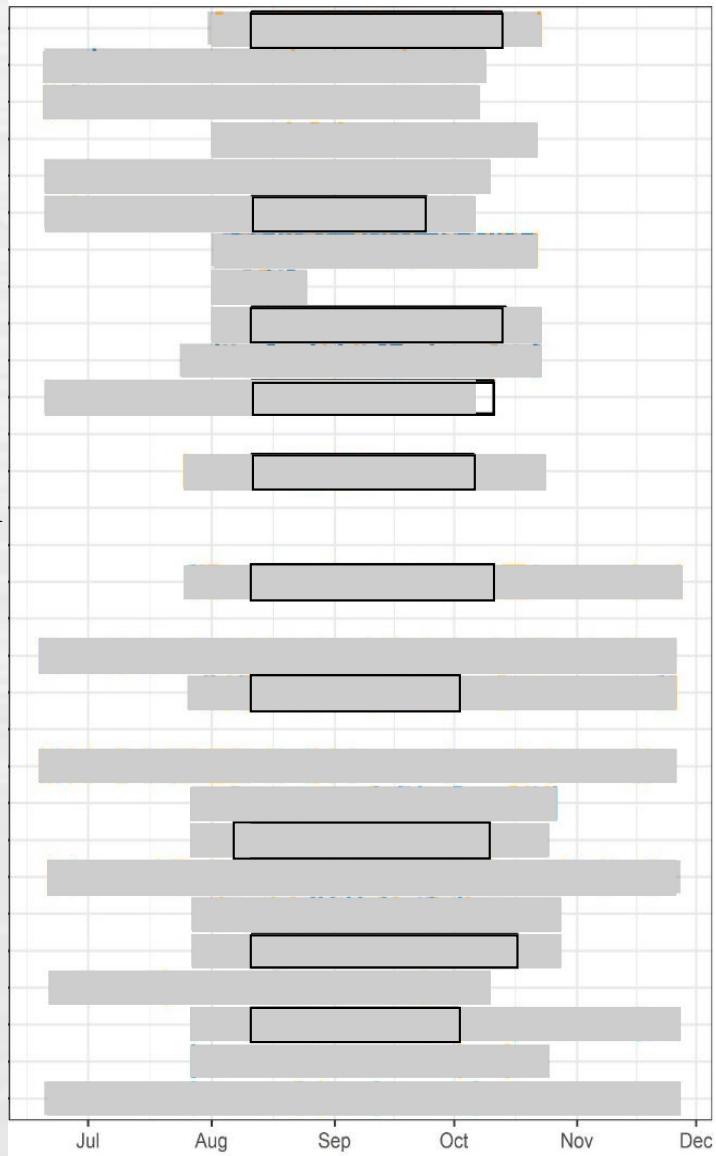
Cruden Bay

Stonehaven

Arbroath

St Andrews

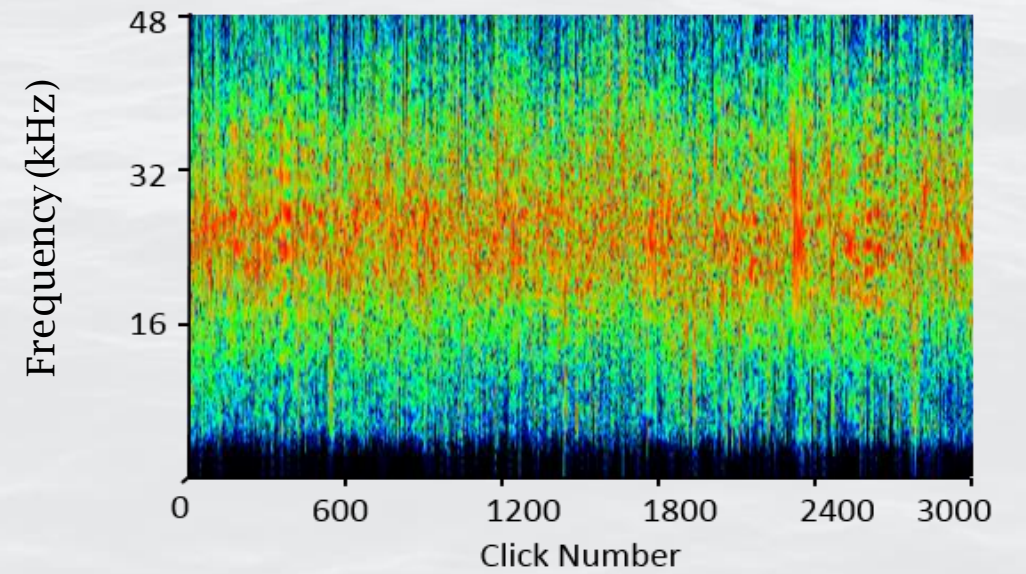
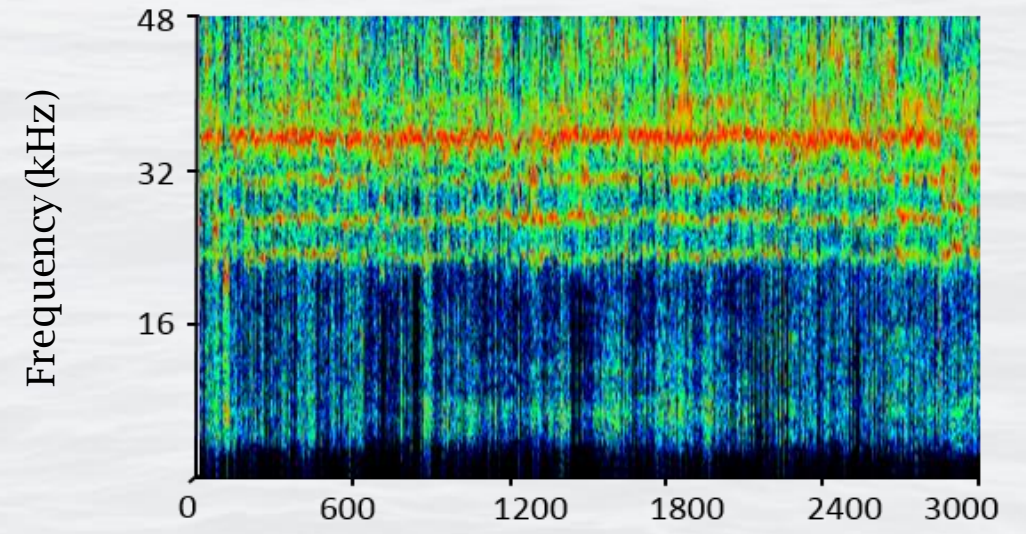
St Abbs



SM2Ms



C-PODs

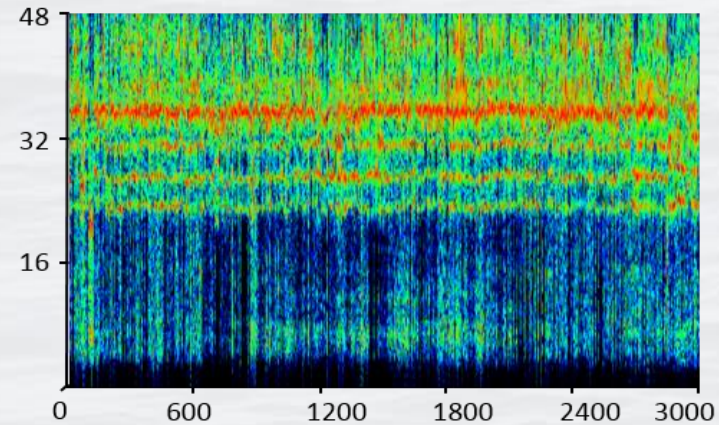


C-POD Features

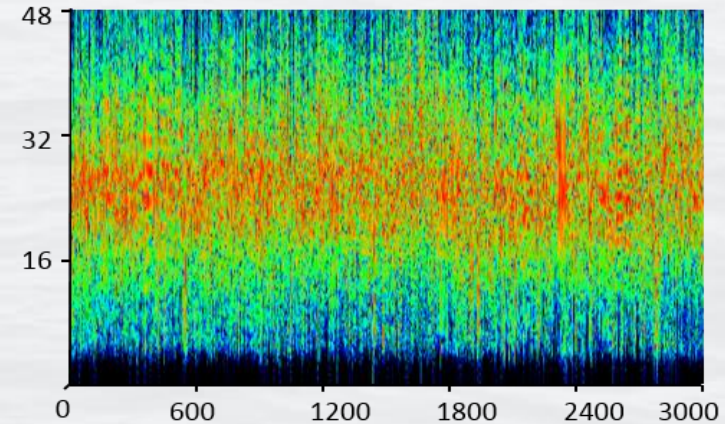


- Click Frequency*
- Bandwidth*
- Inter-click-interval*
- Duration*

Continuous Recordings

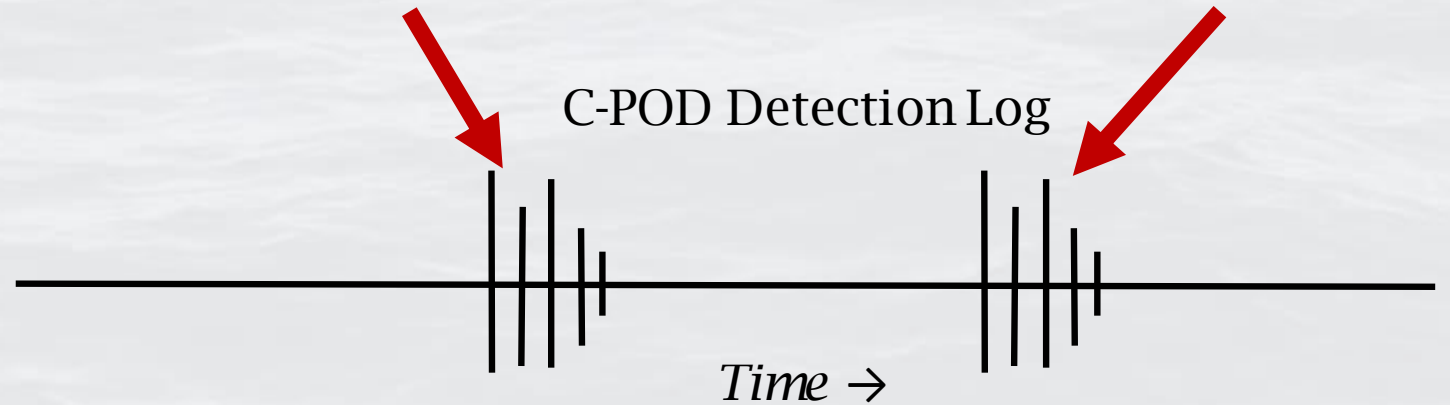


Frequency Banded



Broadband

C-POD Detection Log



GAM to Separate Features

Species α Click train features

Response Species (from SM2Ms):

If Broadband click train – 1

If Frequency Banded click train – 0

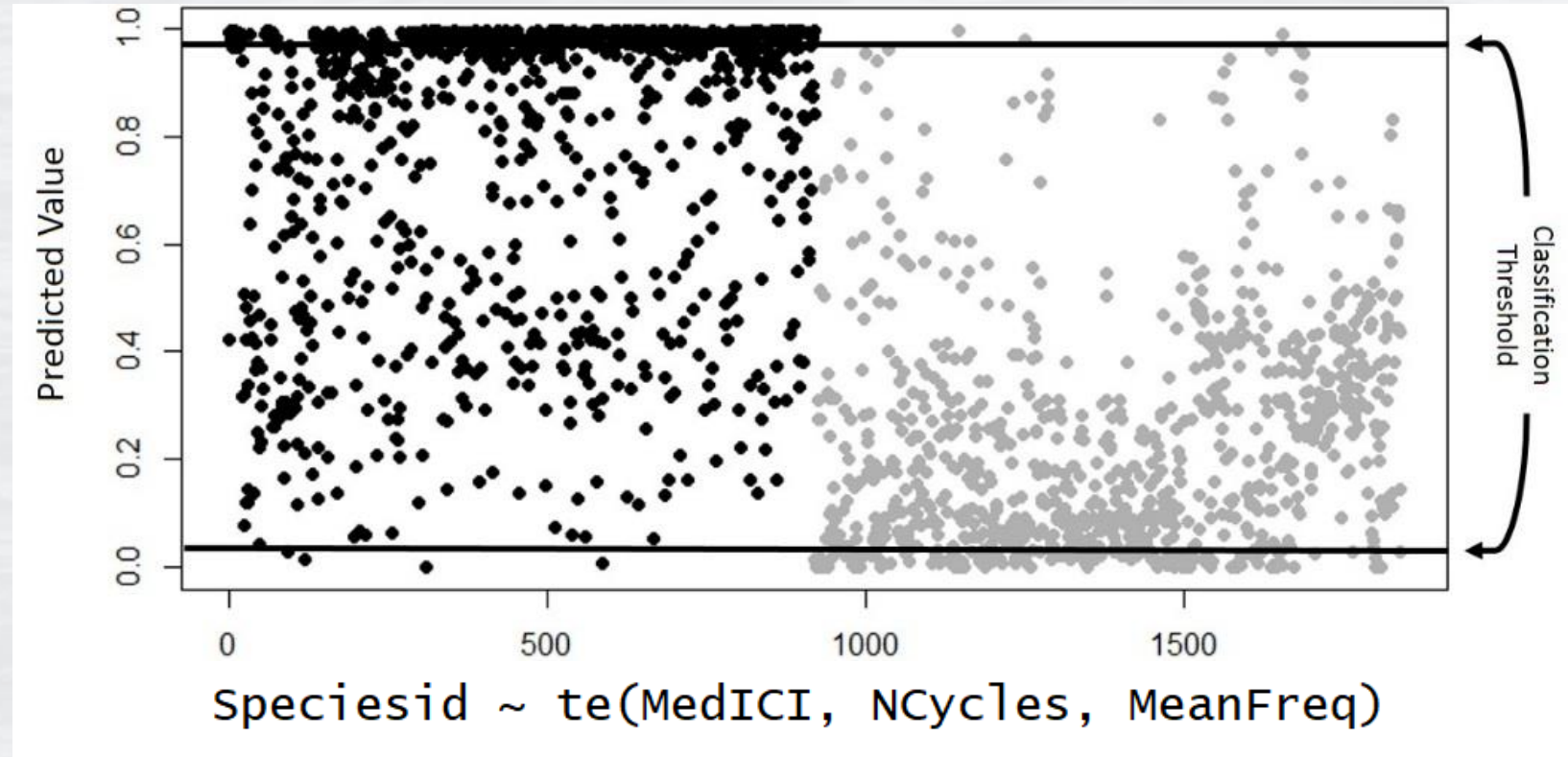
Prediction Variables:

Inter-click interval*

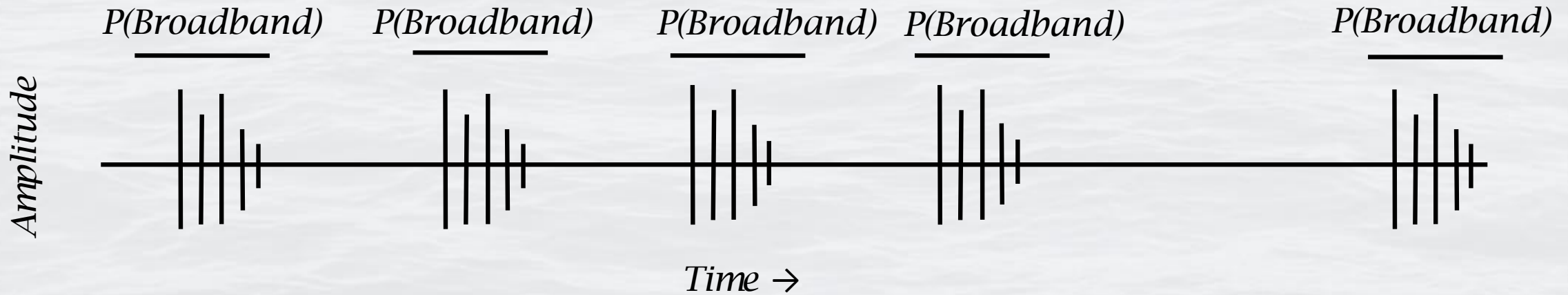
Duration*

Bandwidth*

Binomial Classification Model



Click Trains to Acoustic Encounters



$$\text{Likelihood Ratio} = \frac{\prod_{i=1}^n P_i}{\prod_{i=1}^n (1 - P_i)}$$

Trends in Acoustic Occupancy

Latheron

Helmsdale

Cromarty

Spey Bay

Fraserburgh

Cruden Bay

Stonehaven

Arbroath


St Andrews

St Abbs

Dolphin
Encounter

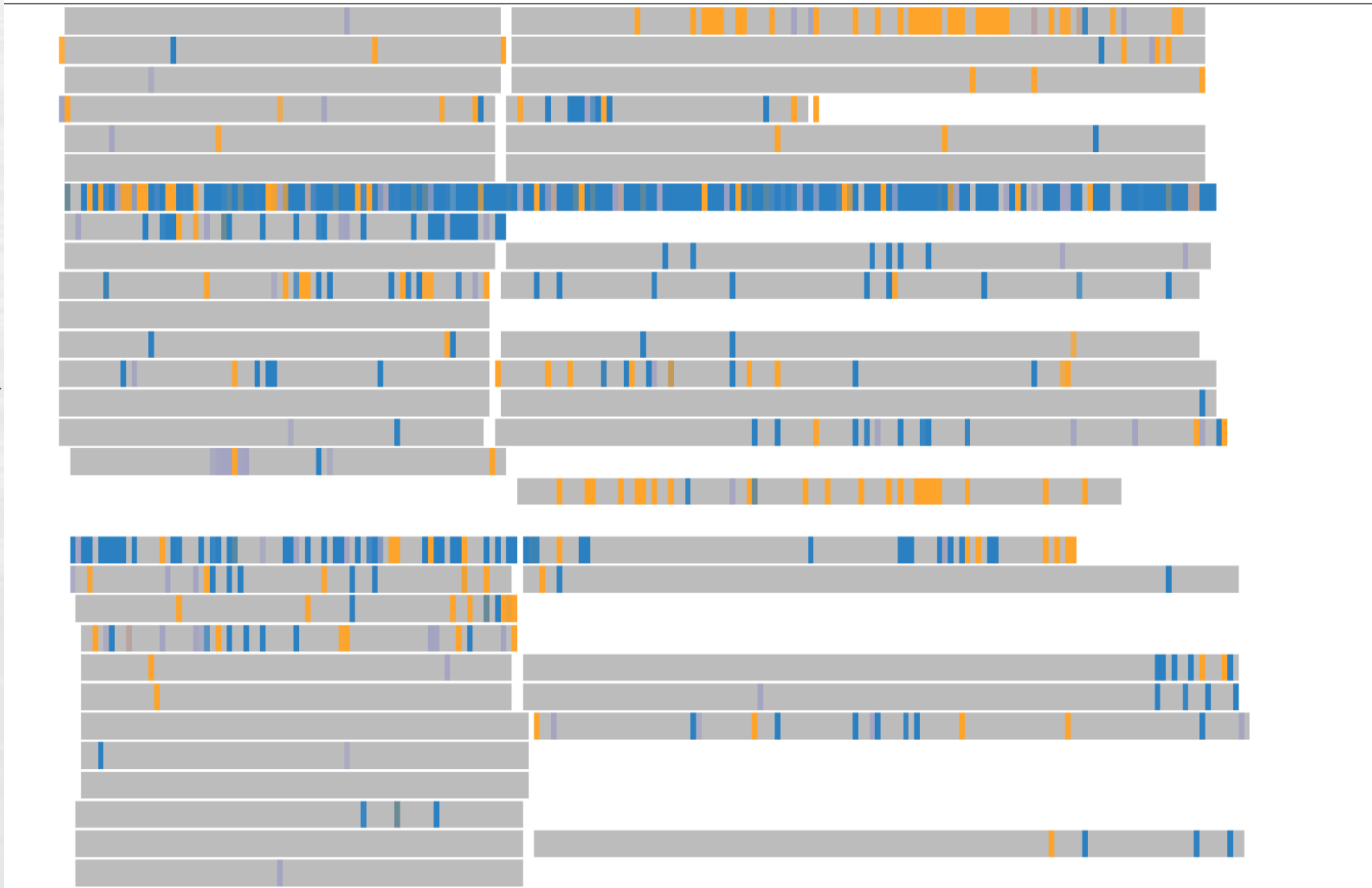
 Broadband

 Unknown

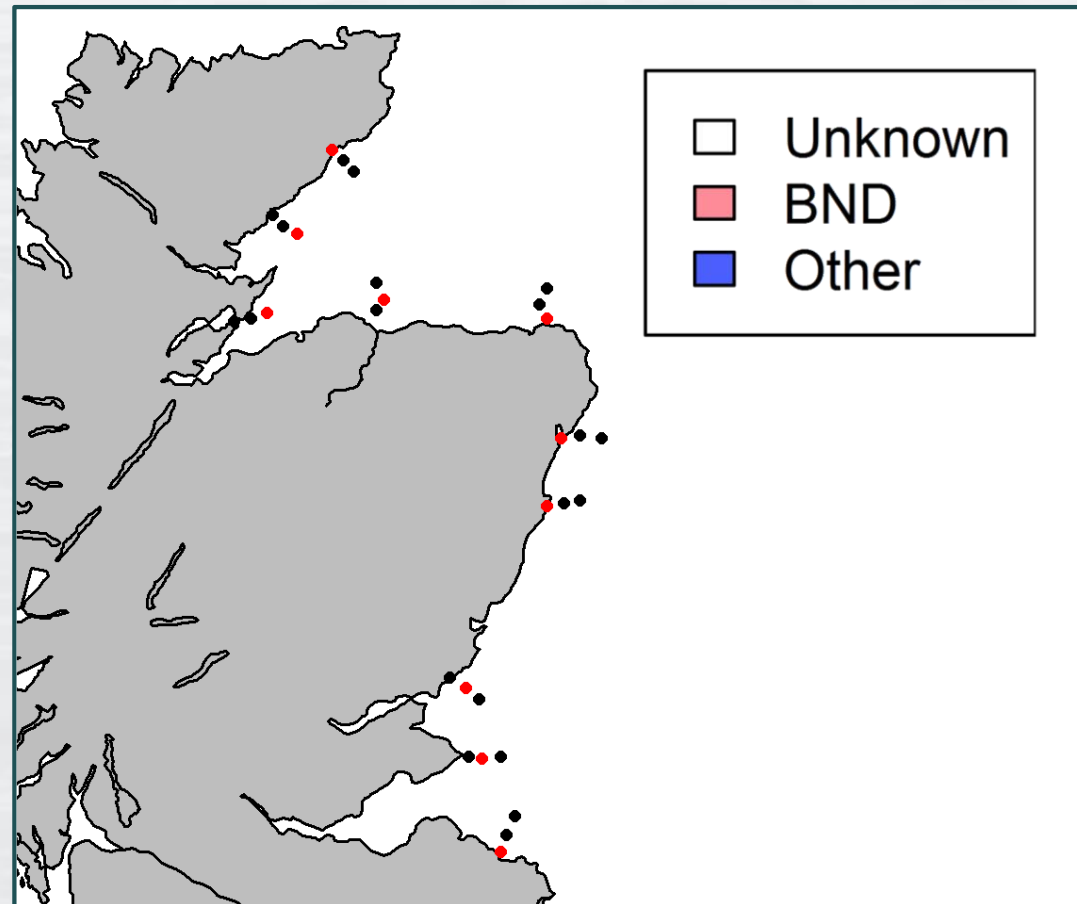
 Frequency Banded

July

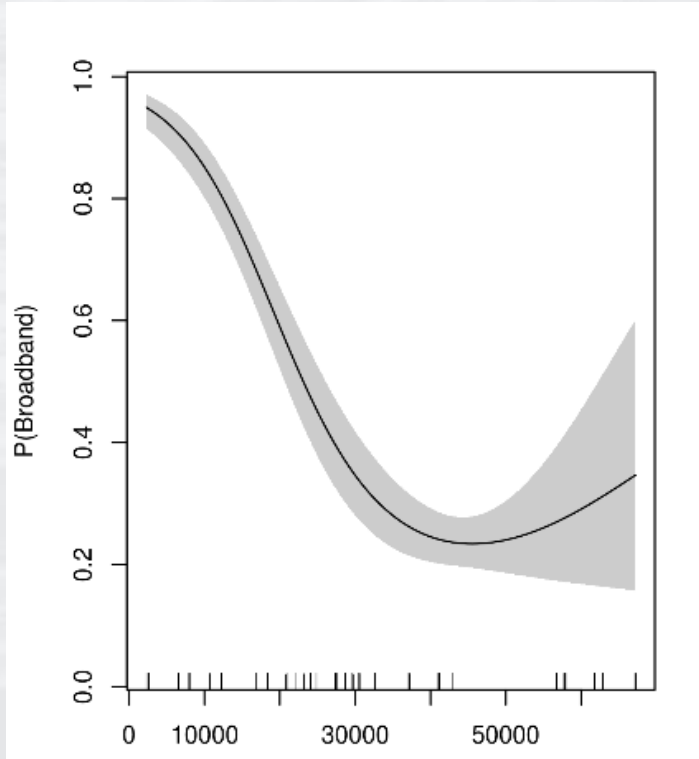
October



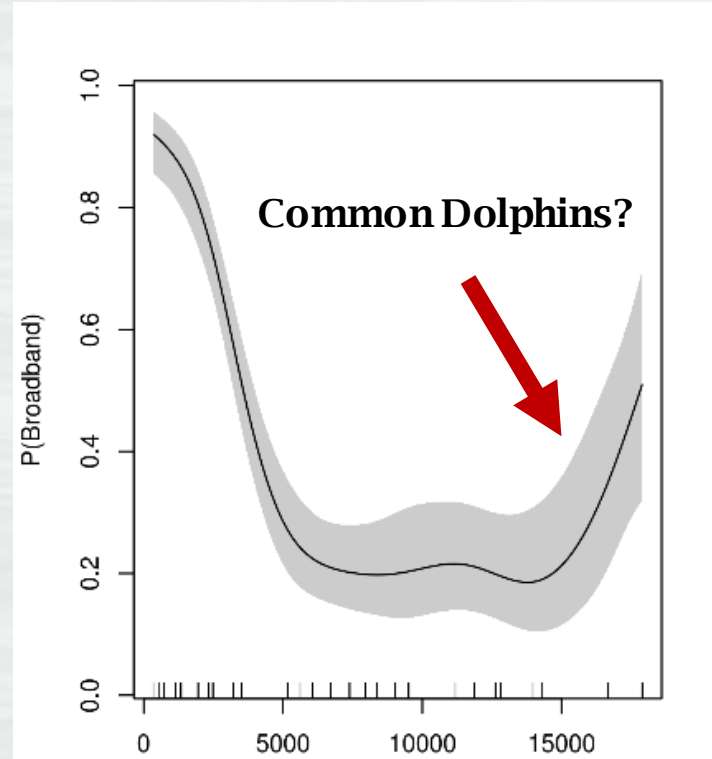
Trends in Acoustic Occupancy



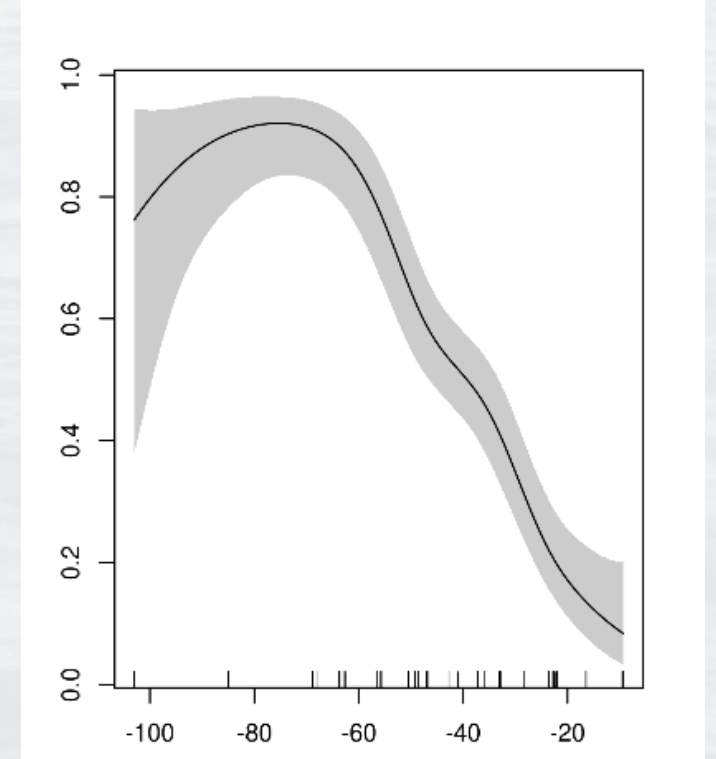
Trends in Broadband Occupancy (GEEGAM)



Distance To Point of Aggregation
(e.g. Chanory Point) (m)



Distance To Shore (m)

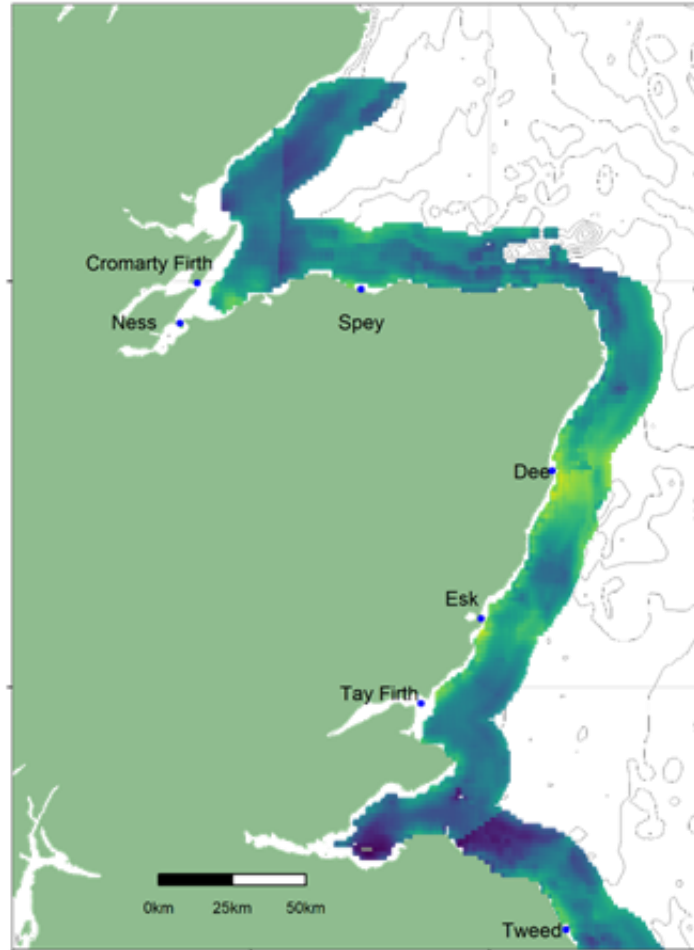


Depth

Trends in Broadband Occupancy

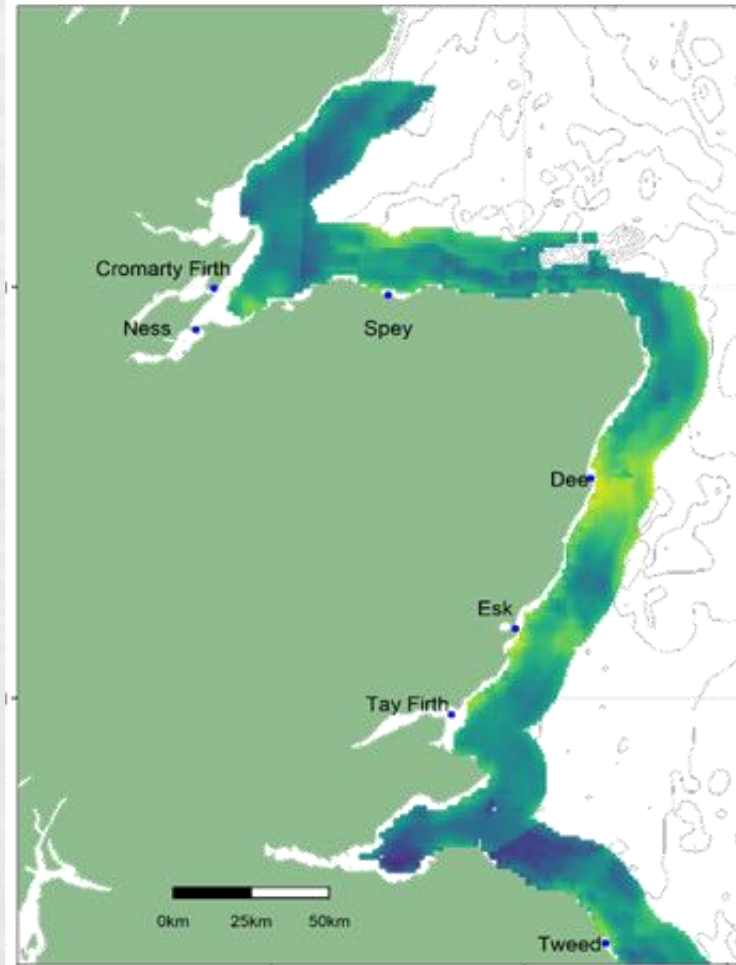
Summer Acoustic Occupancy Model Predictions

Lower 95% Model Confidence Interval



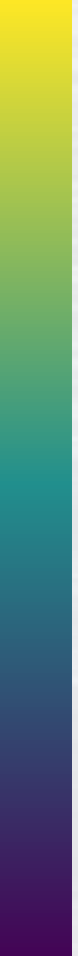
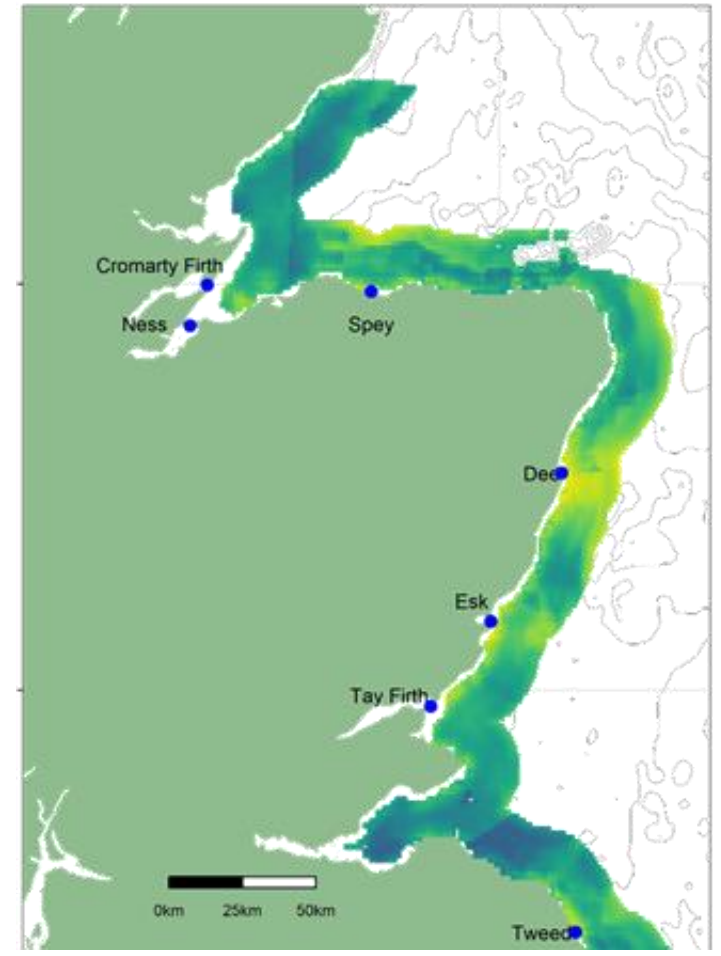
Summer Acoustic Occupancy Model Predictions

Model Average



Summer Acoustic Occupancy Model Predictions

Upper 95% Model Confidence Interval



Probability of Detecting a Broadband Click Train

Acknowledgements

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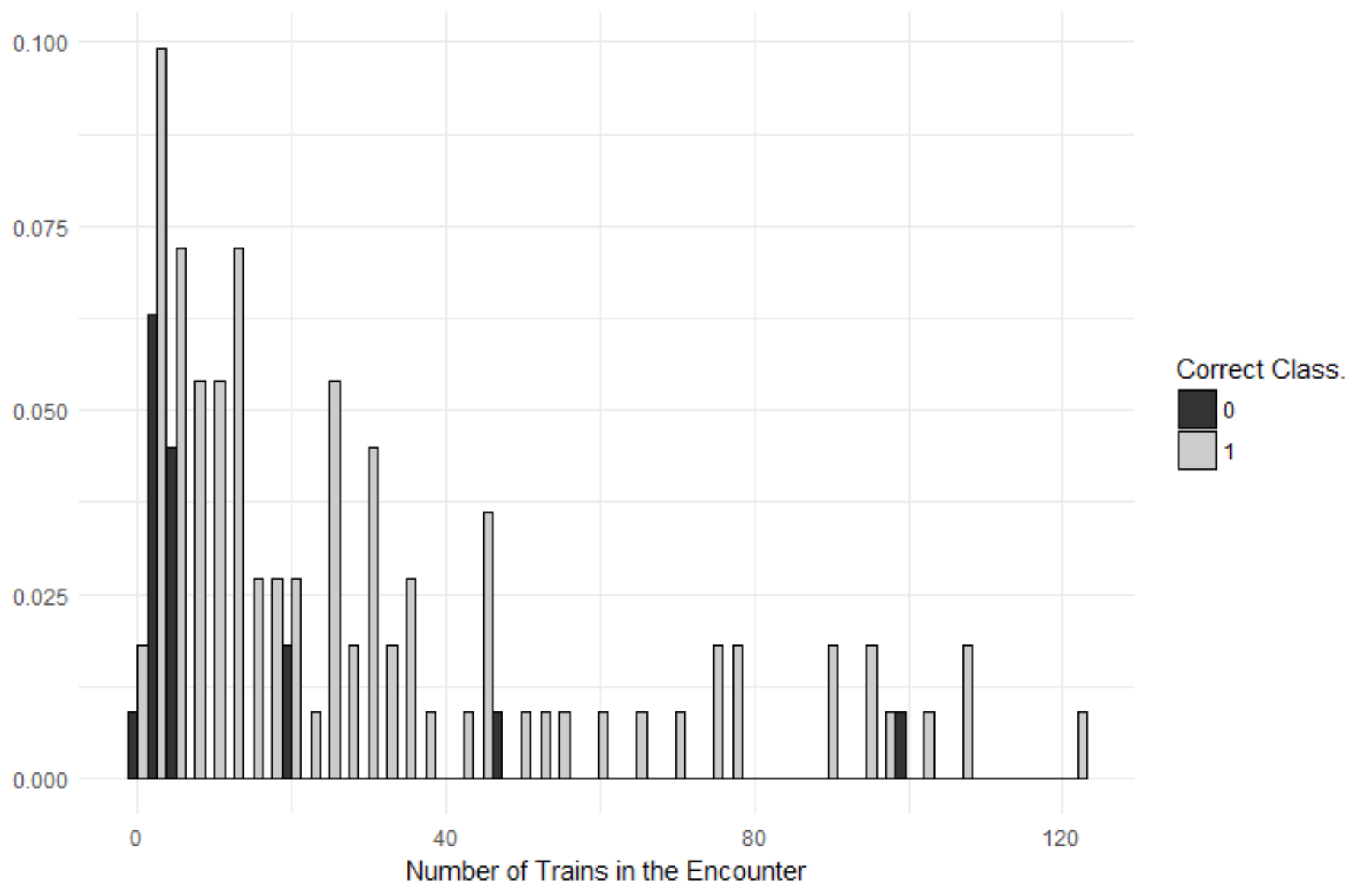


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How Well Does the Classification System Work?

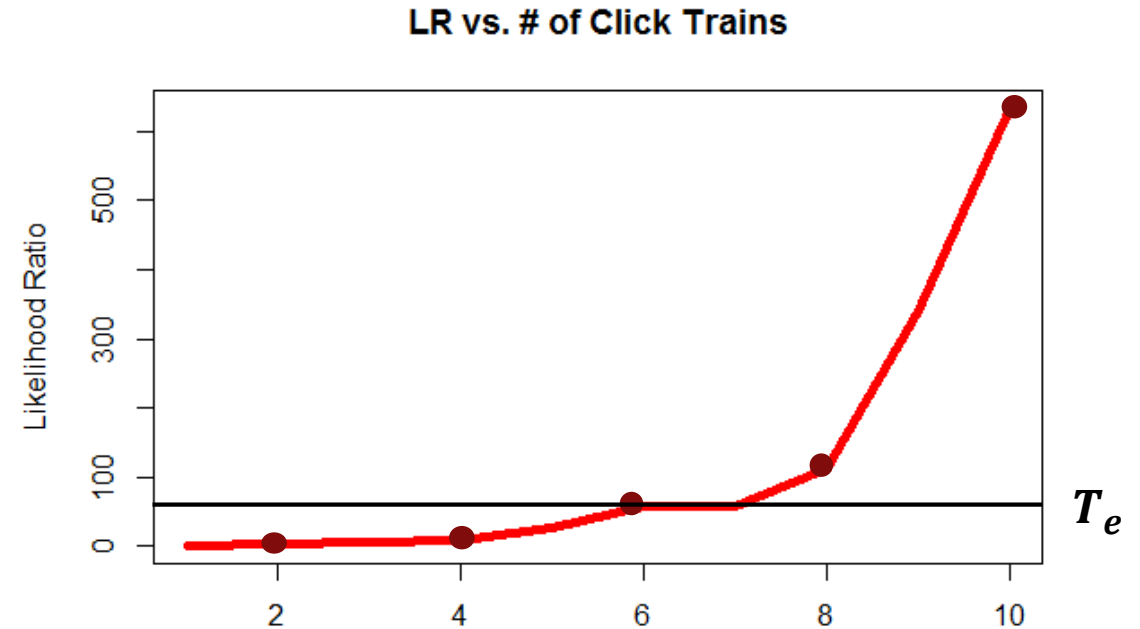
		Predicted Category	
		Broadband	Frequency Banded
Verified Category	Broadband	66	17
	Frequency Banded	2	23
P(Broadband Classification)		0.79	0.08
P(Frequency Banded Classification)		0.21	0.82

Performance Across Encounters



Likelihood Ratio

$$LR = \frac{\prod_{i=1}^n P_i}{\prod_{i=1}^n (1 - P_i)}$$



$$\text{Encounter Class} = \begin{cases} \text{Broadband,} & LR \geq T_e \\ \text{Frequency Banded,} & LR \leq 1/T_e \\ \text{Unclassified,} & 1/T_e < LR < T_e \end{cases}$$