

Sampling snow leopards

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**SNOW
LEOPARD
NETWORK**



Spot the Cat



~~Spot~~ Count the cat



Count the cat now?





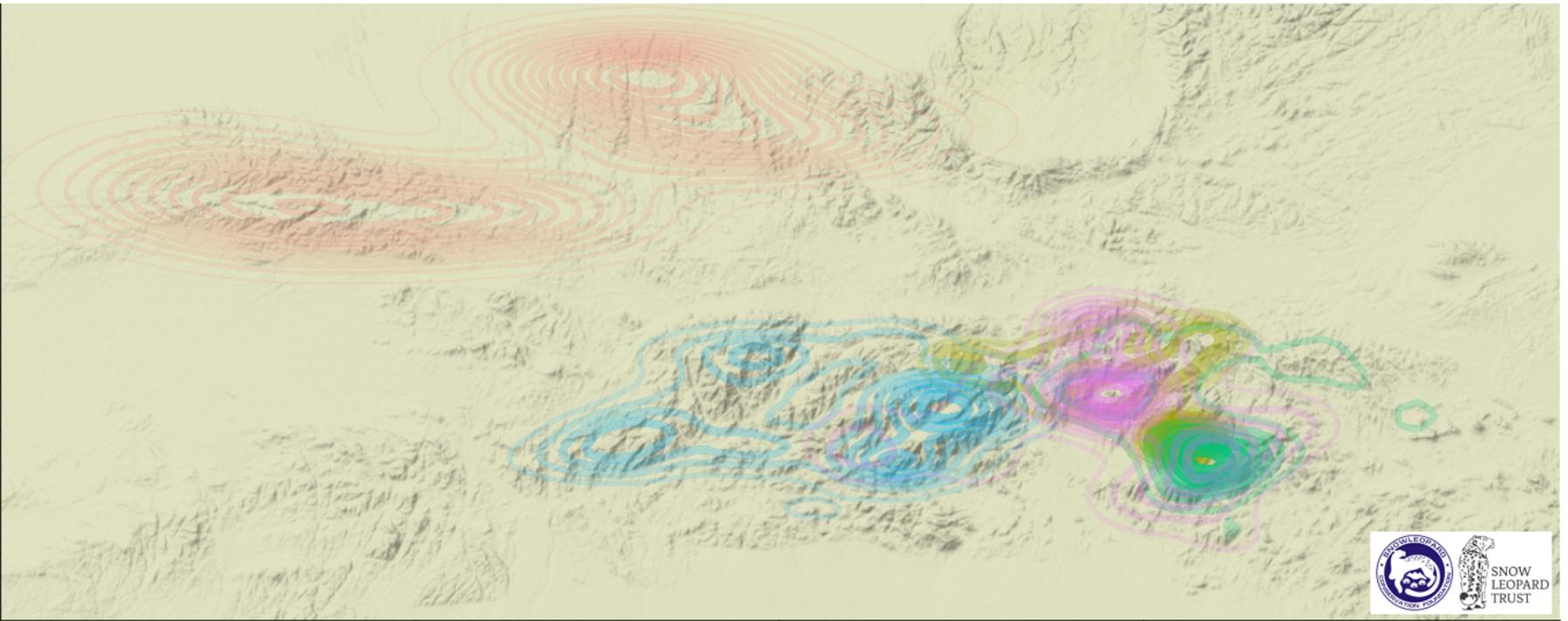
Camera traps rock!



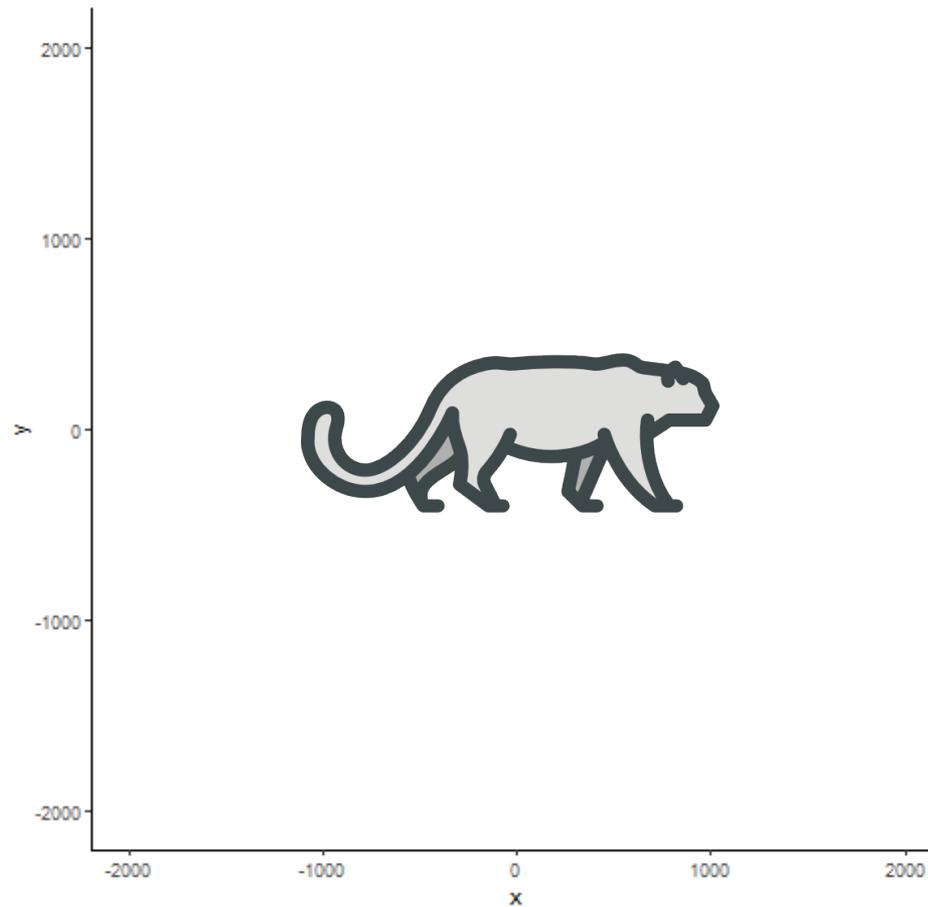
Following Anu The Queen of Tost



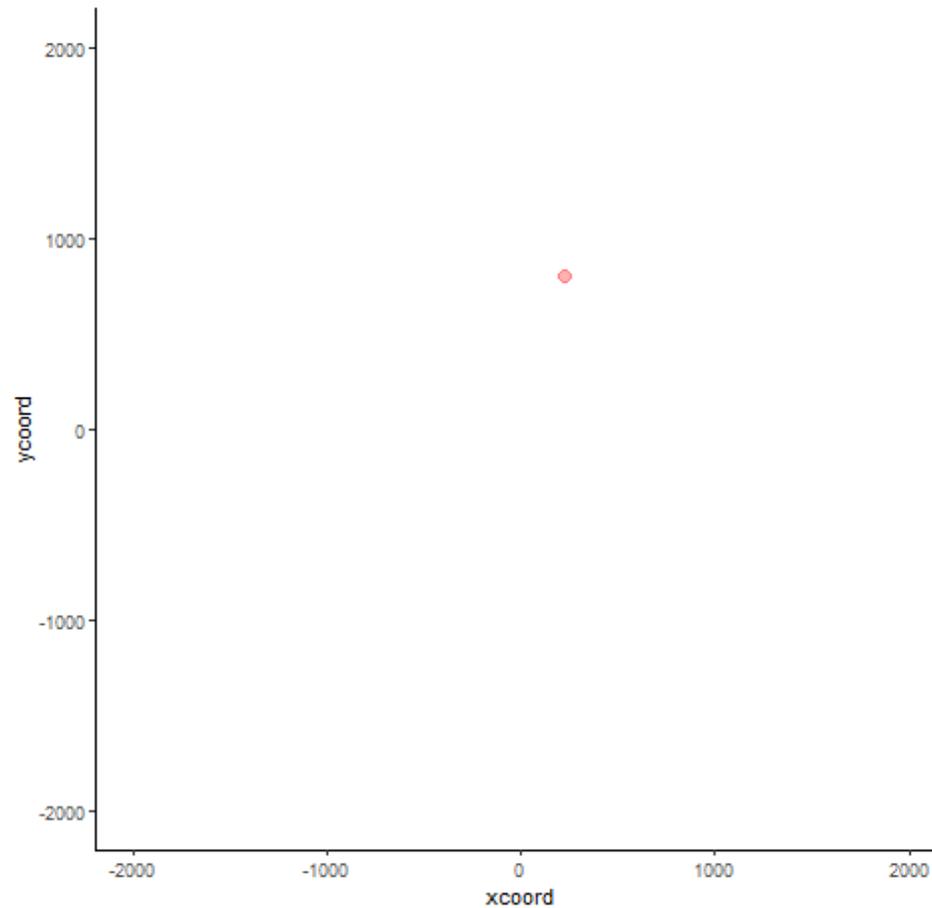
All animals have home ranges



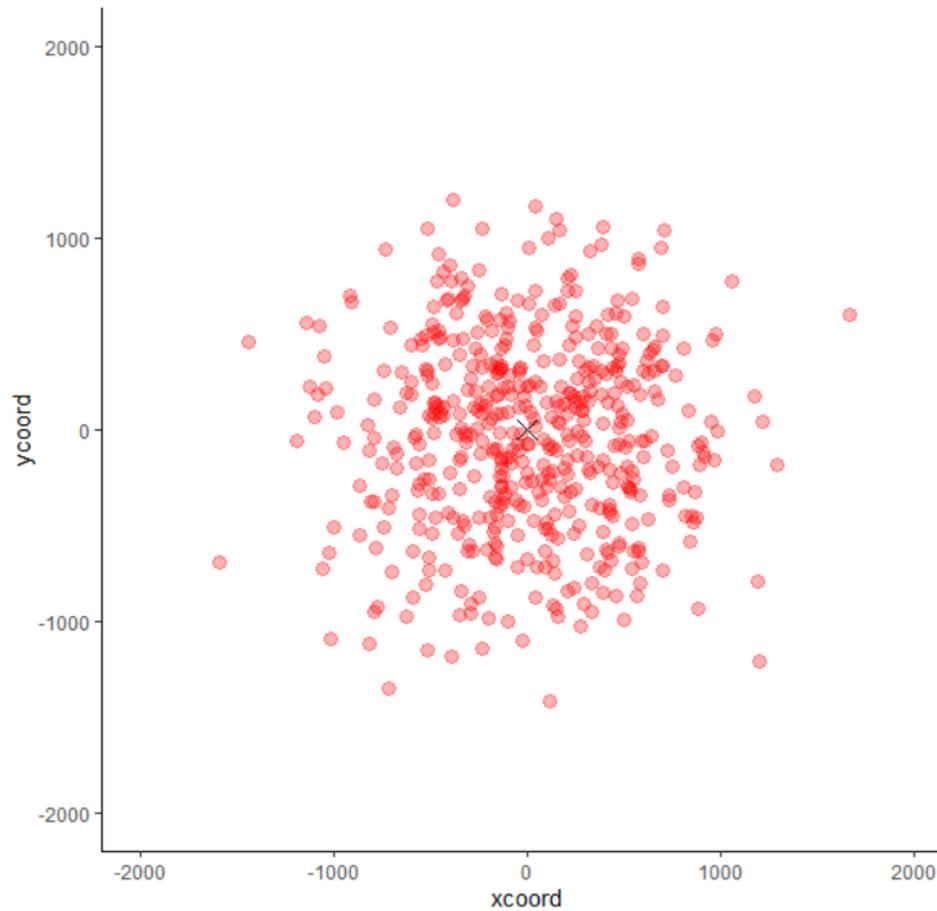
Our first virtual snow leopard



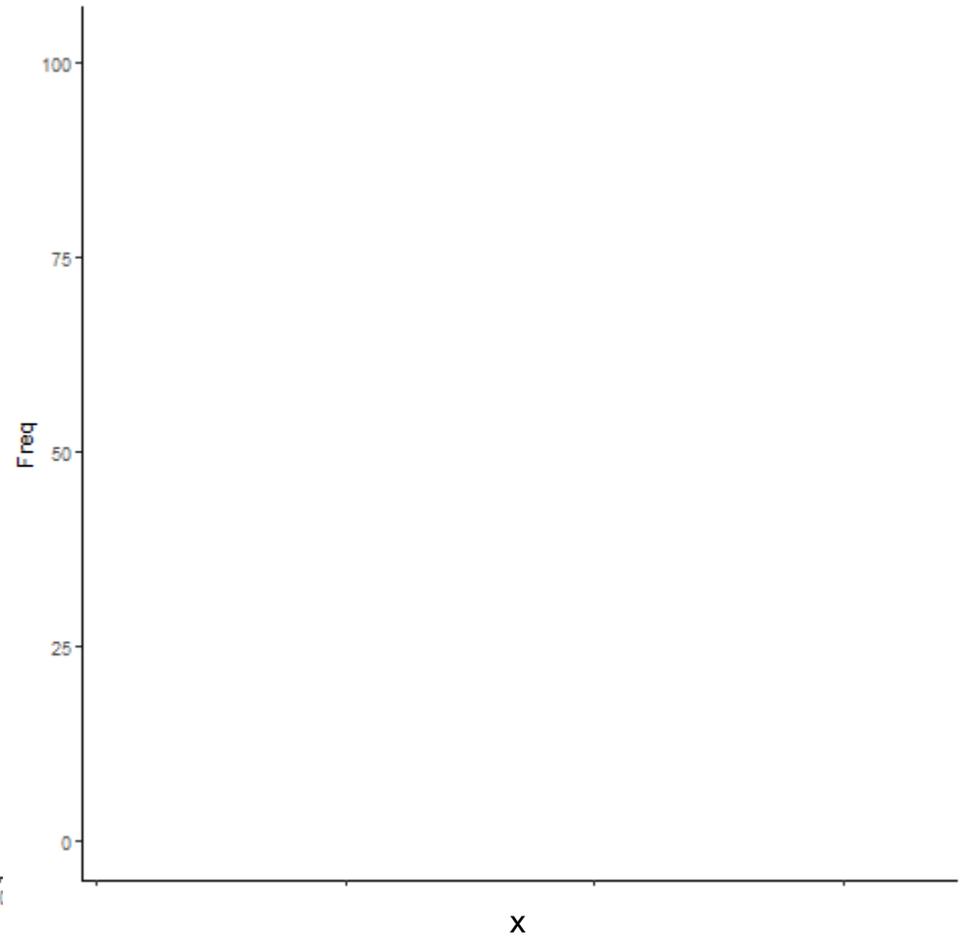
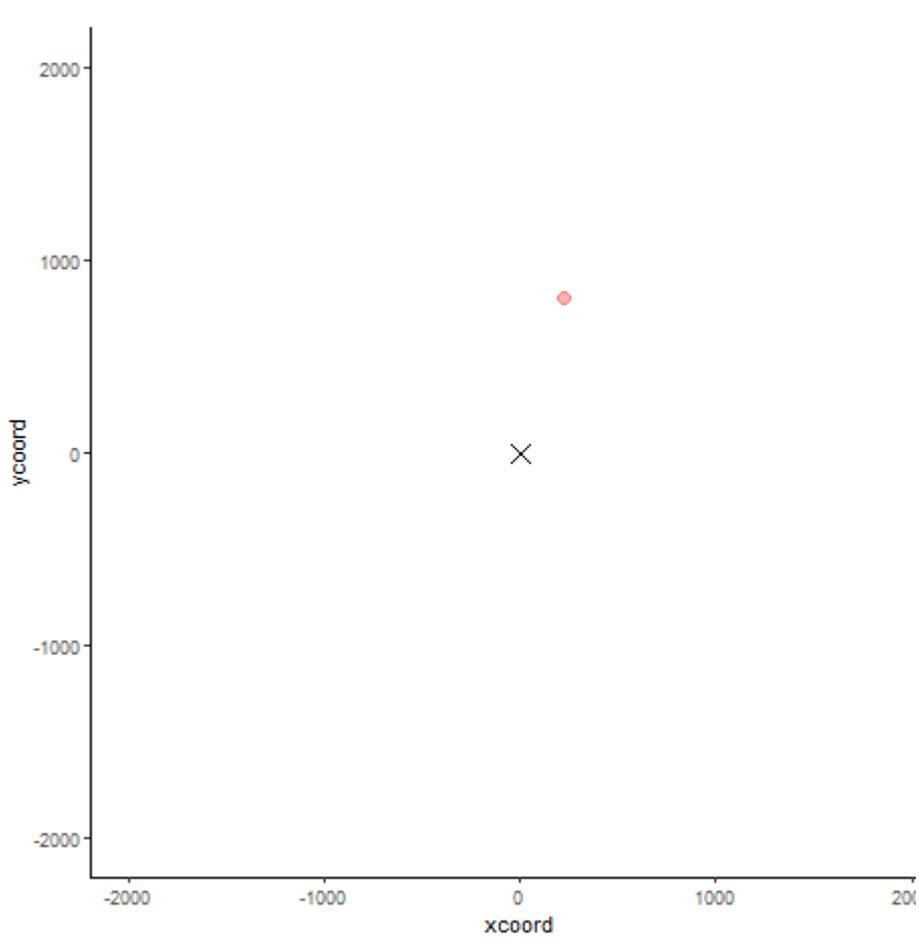
Our first virtual snow leopard



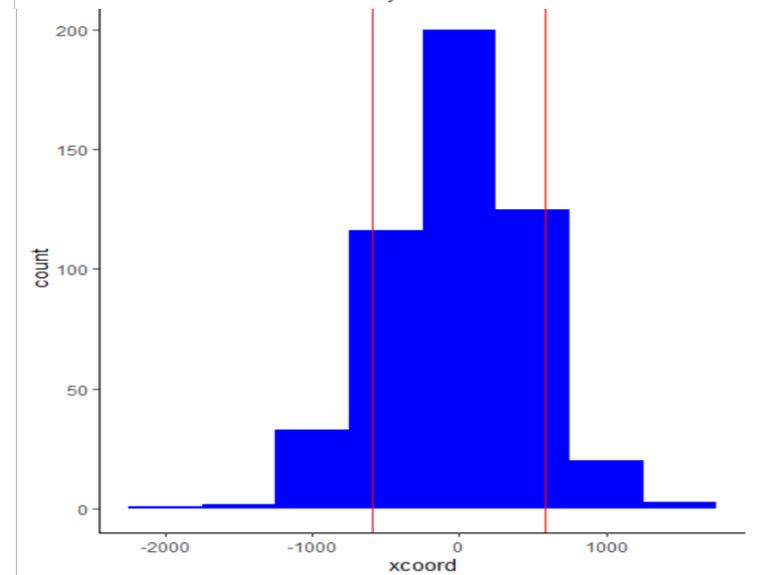
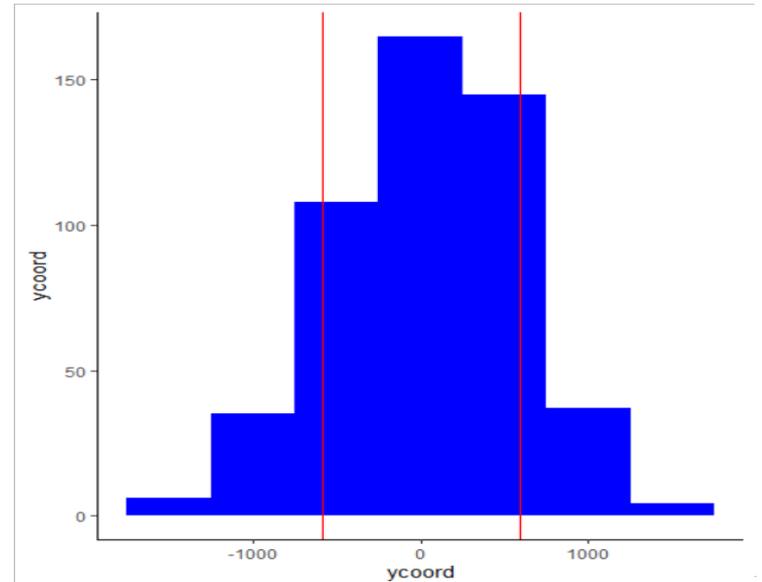
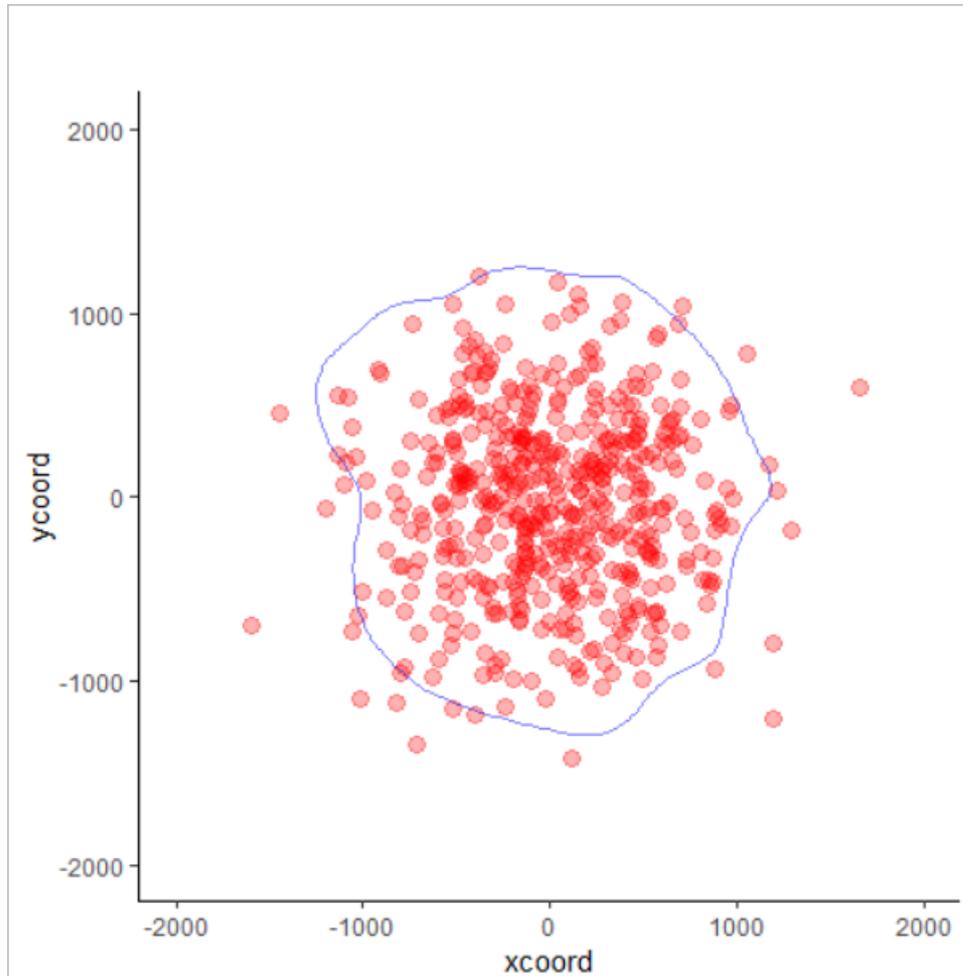
Activity Center



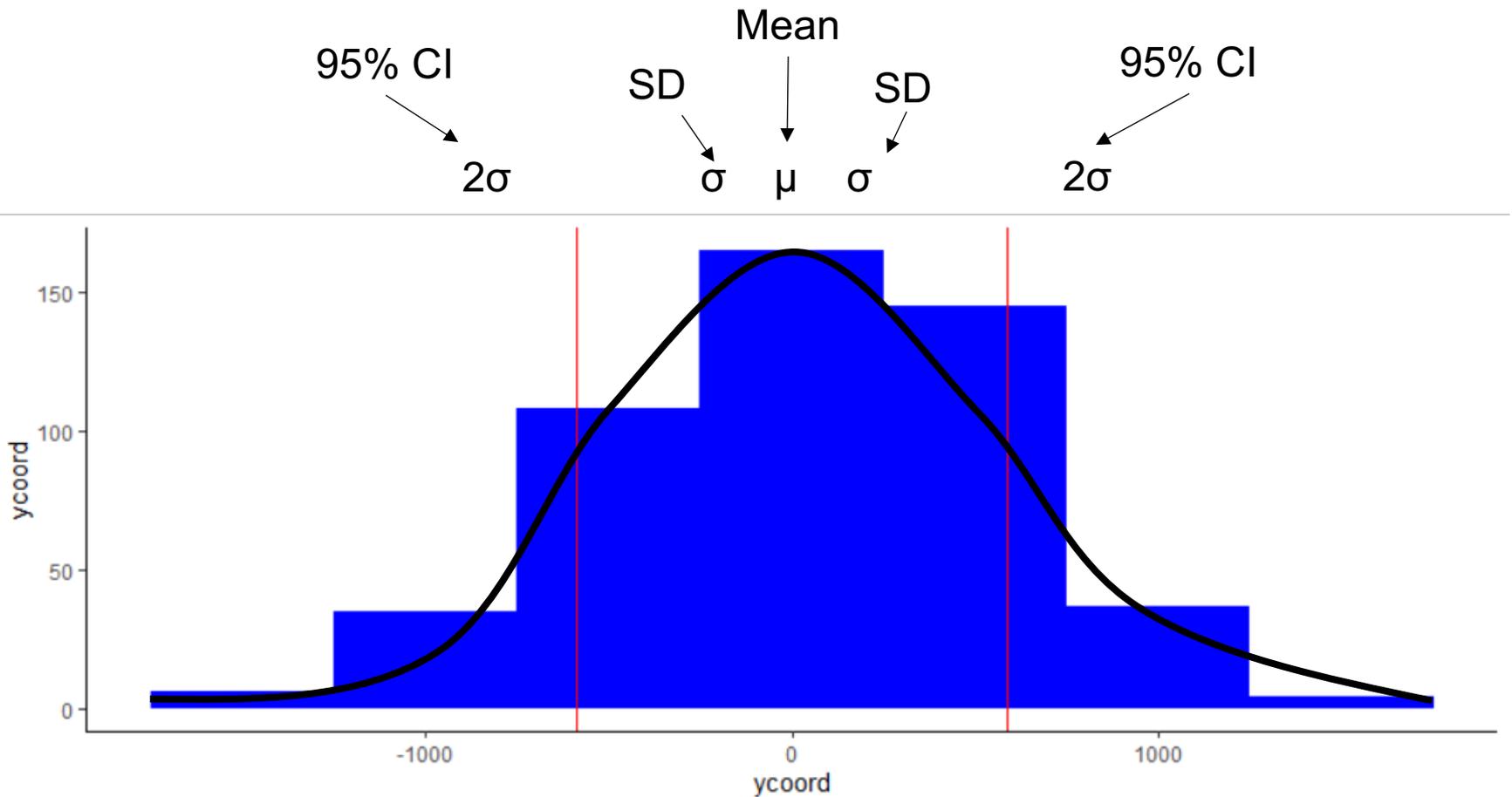
Activity Center



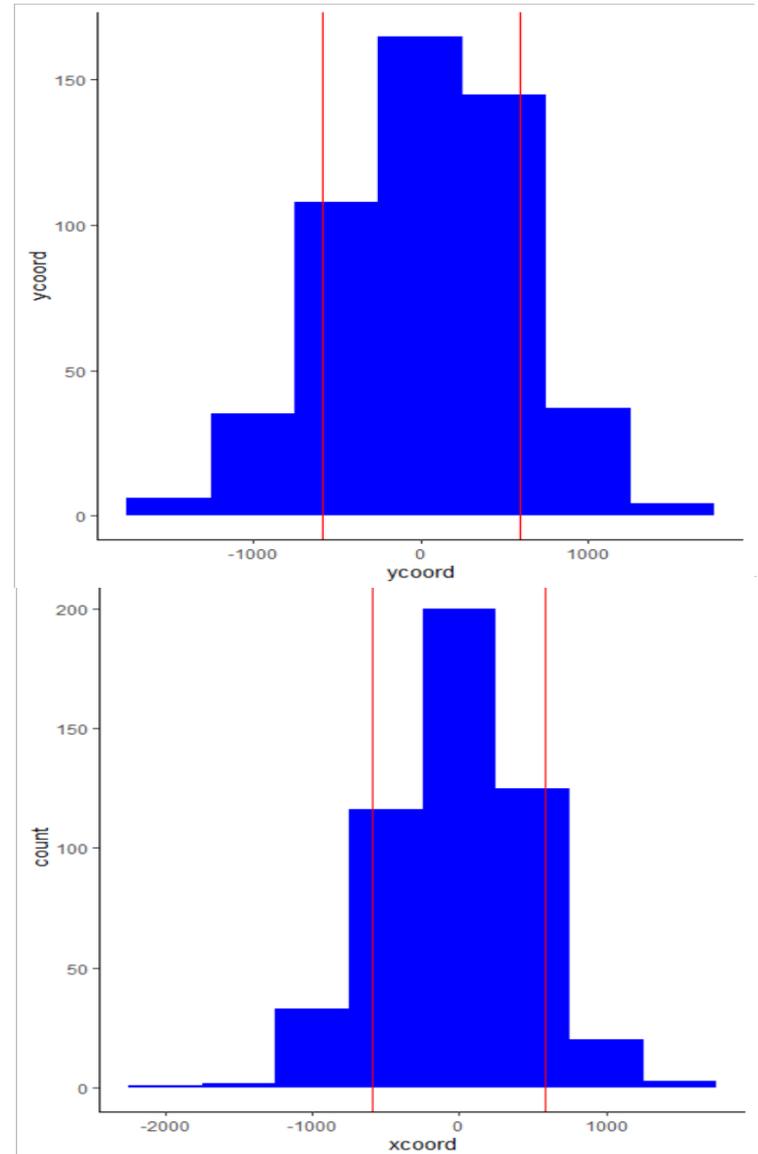
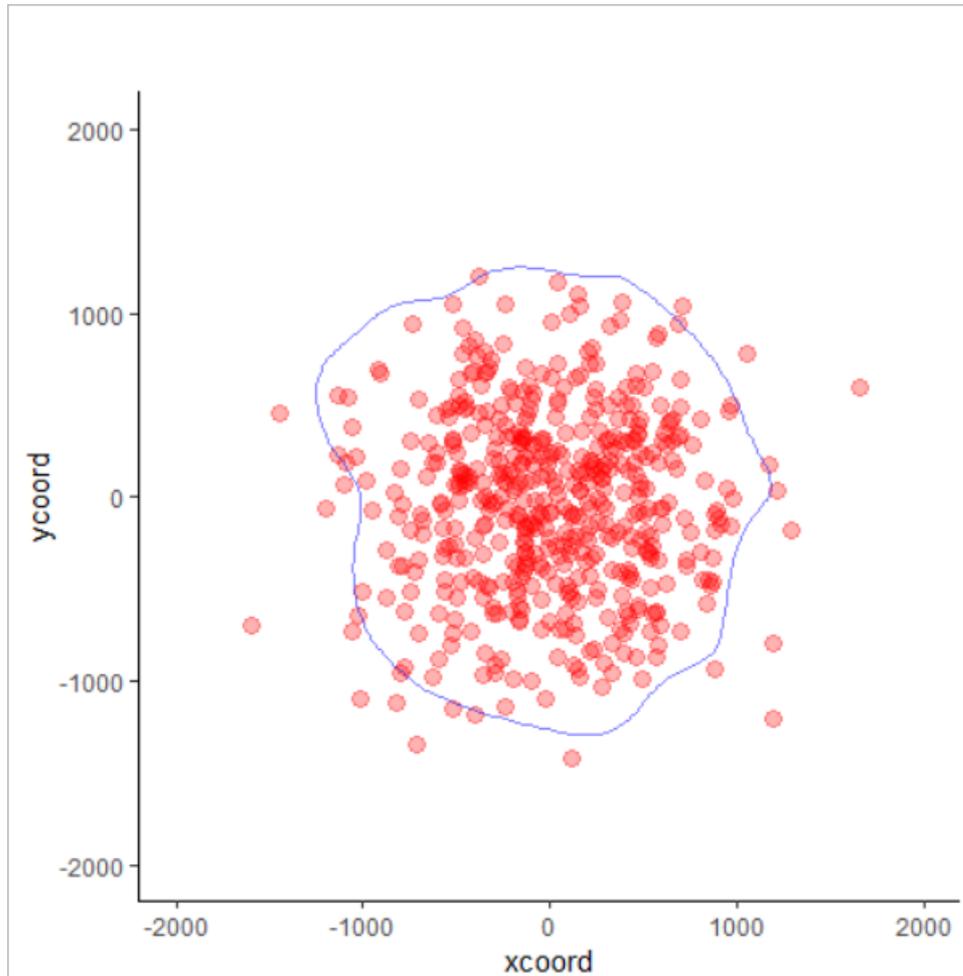
95% Activity Range



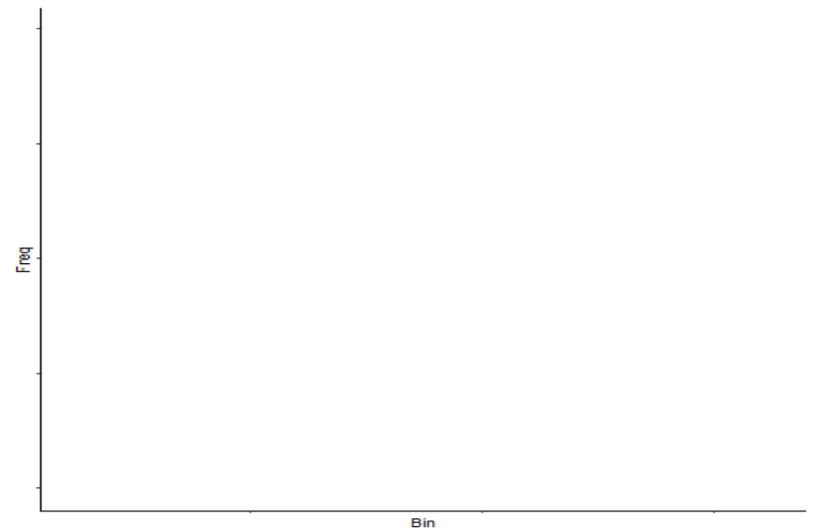
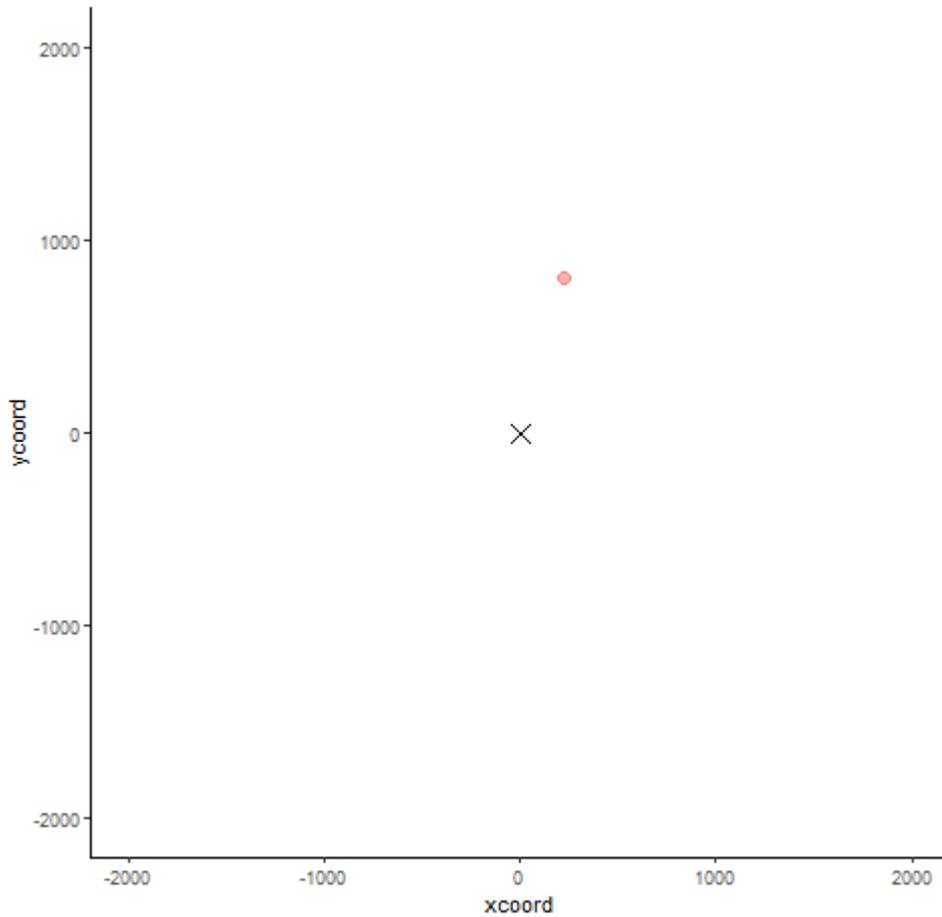
Variance & Standard Deviations



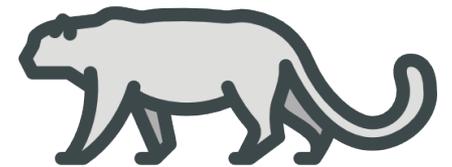
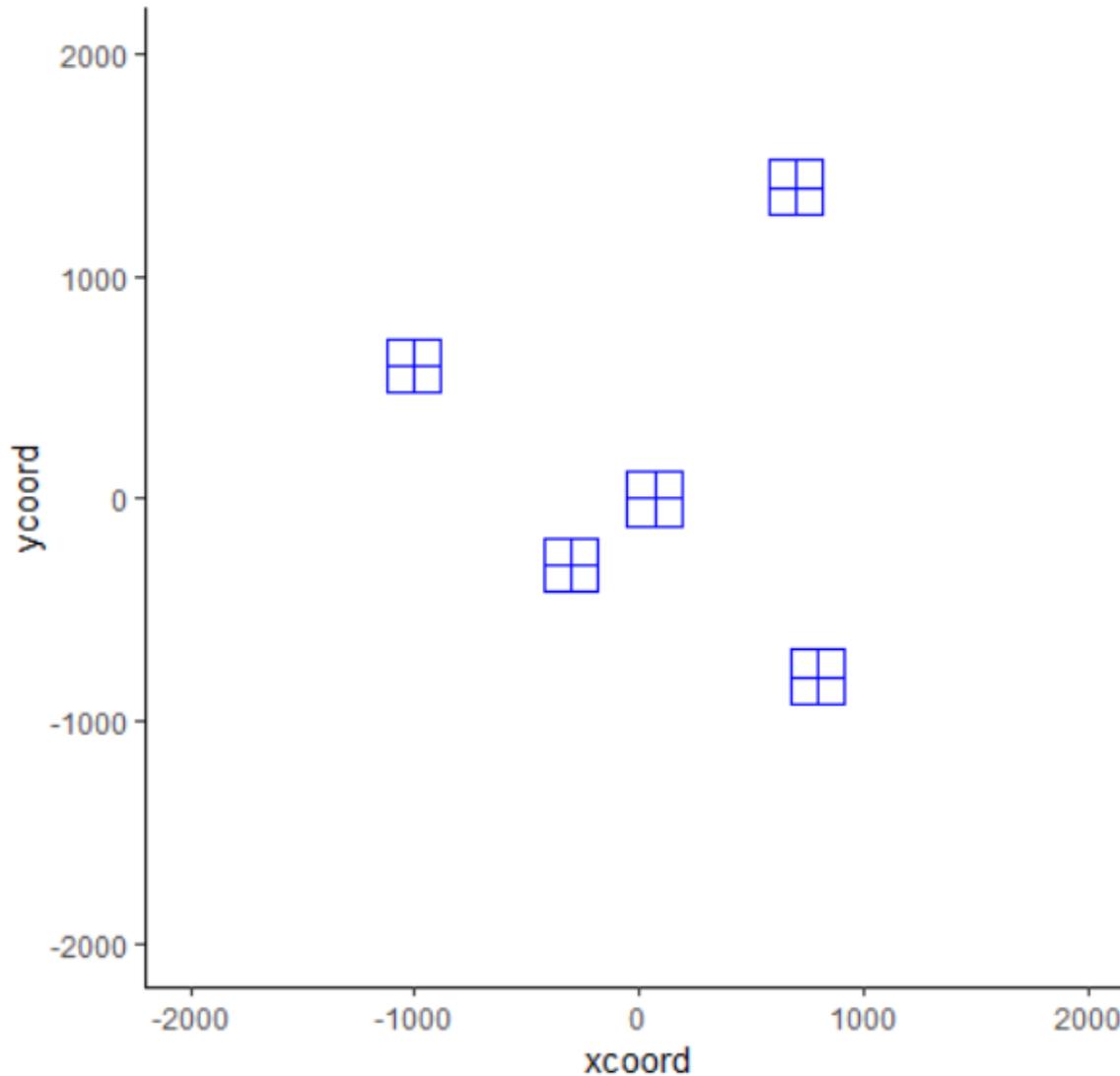
$2\sigma \approx 95\%$ activity range



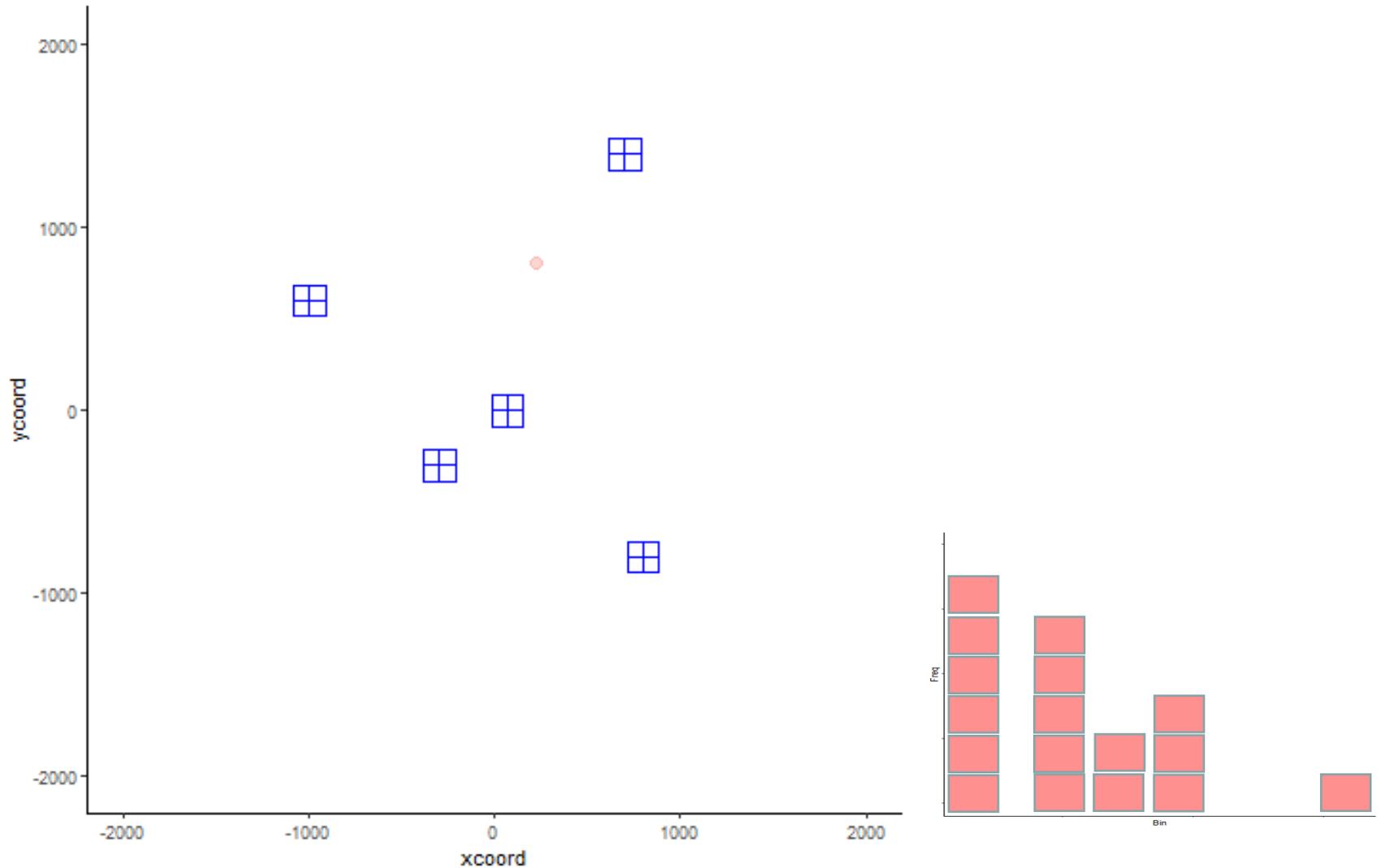
Activity Center



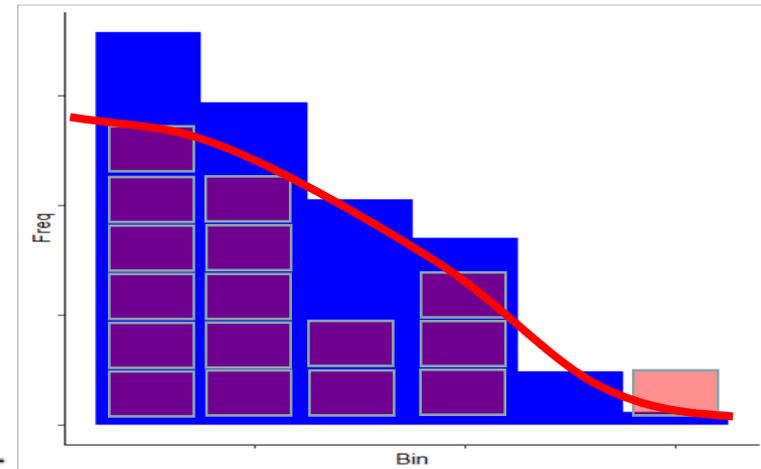
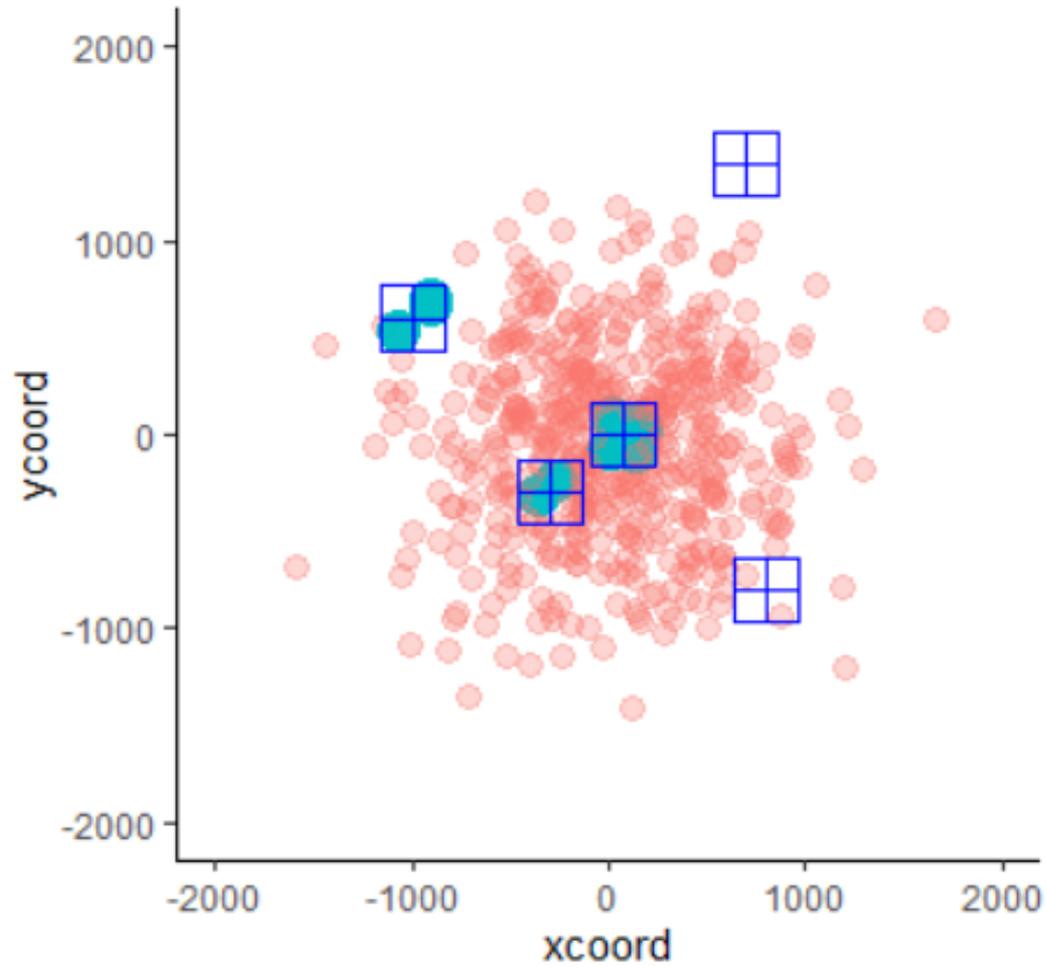
Camera traps & a snow leopard



Trapping a snow leopard

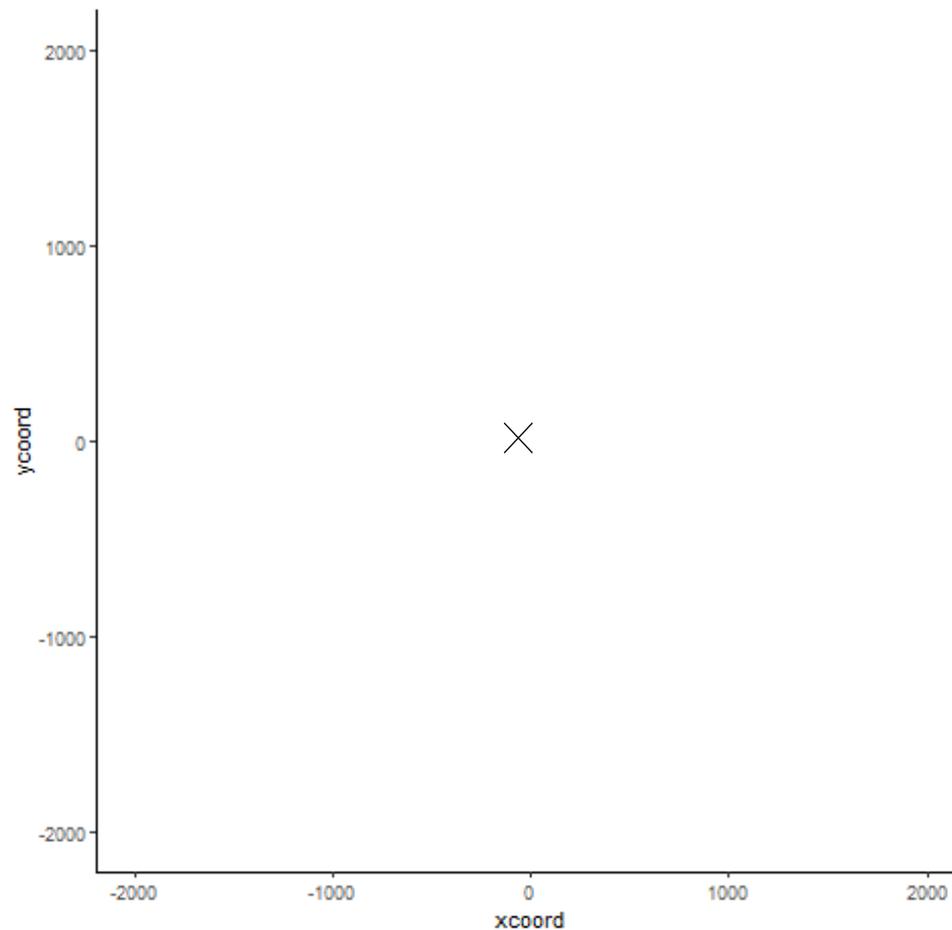


Do we see a shape?



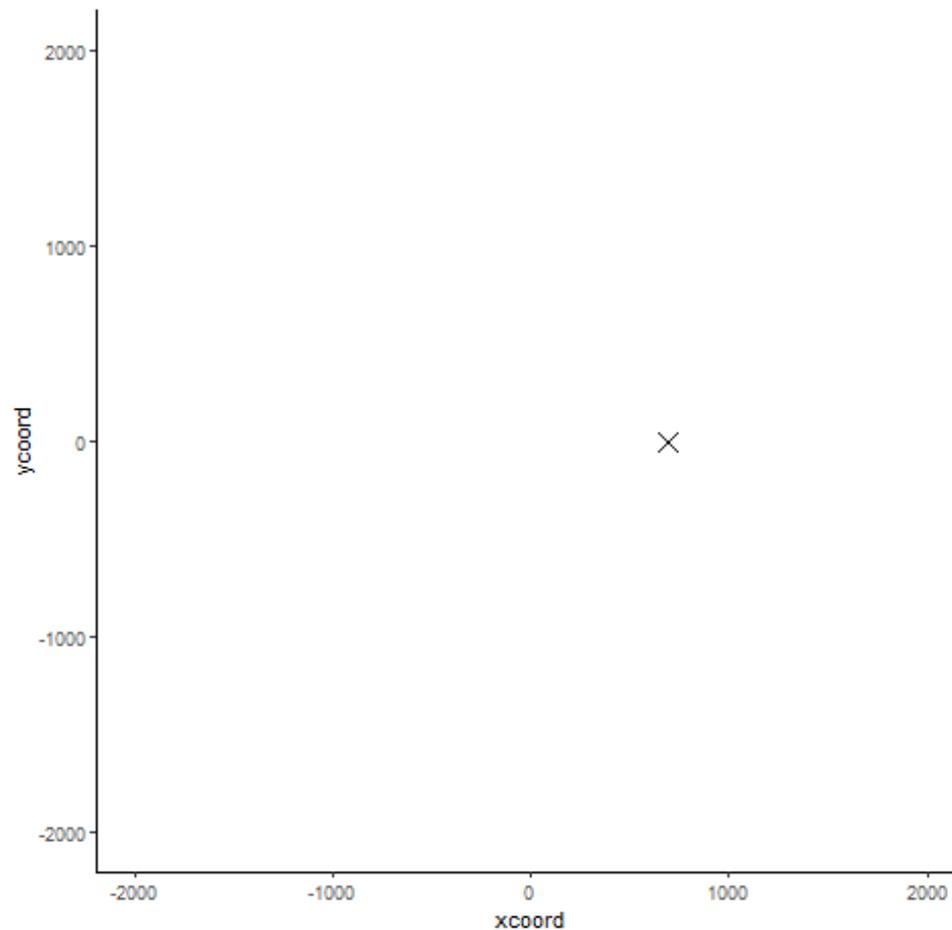
But we don't know the center

- Activity Center (D)



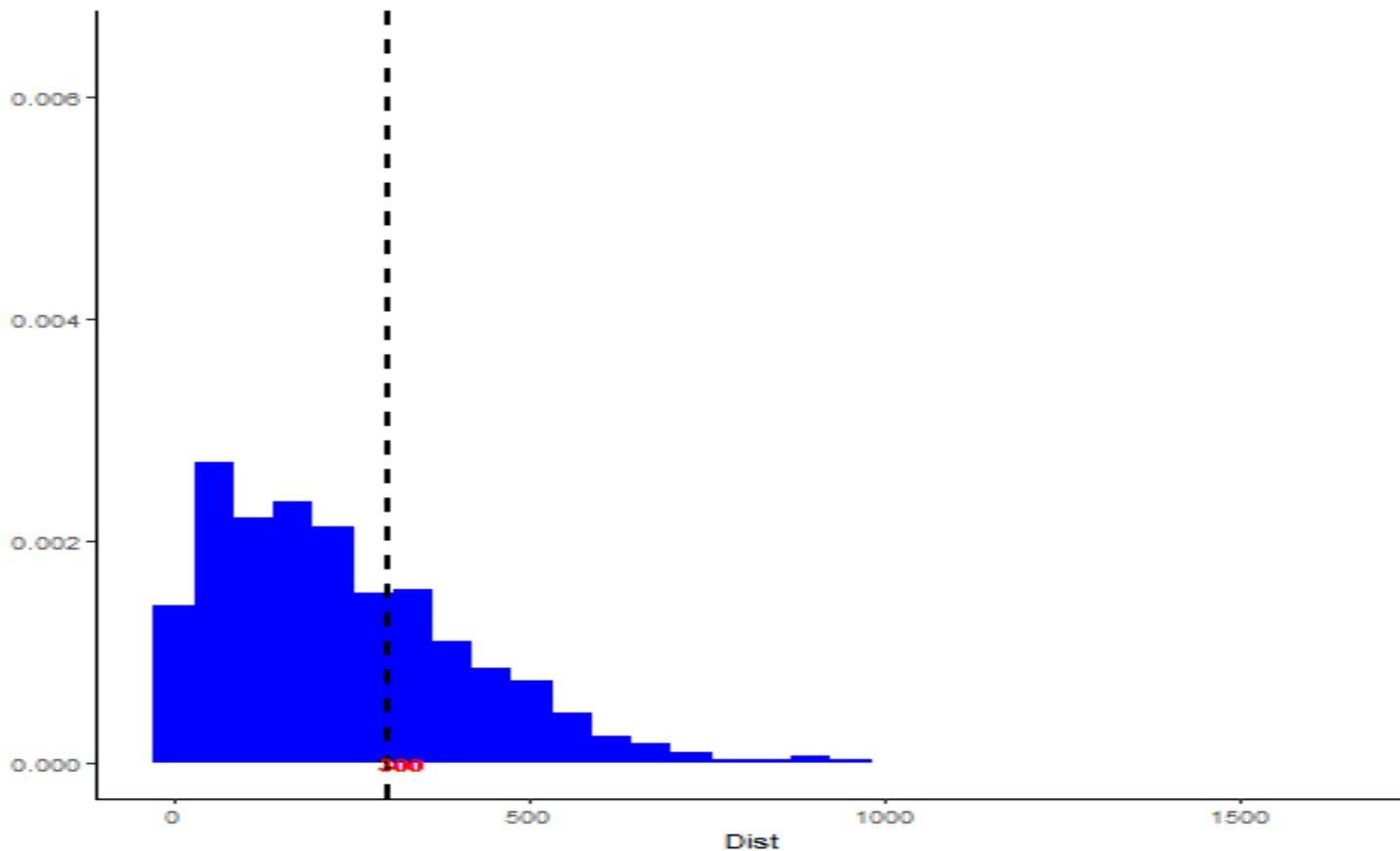
But we don't know the center

- Activity Center (D)



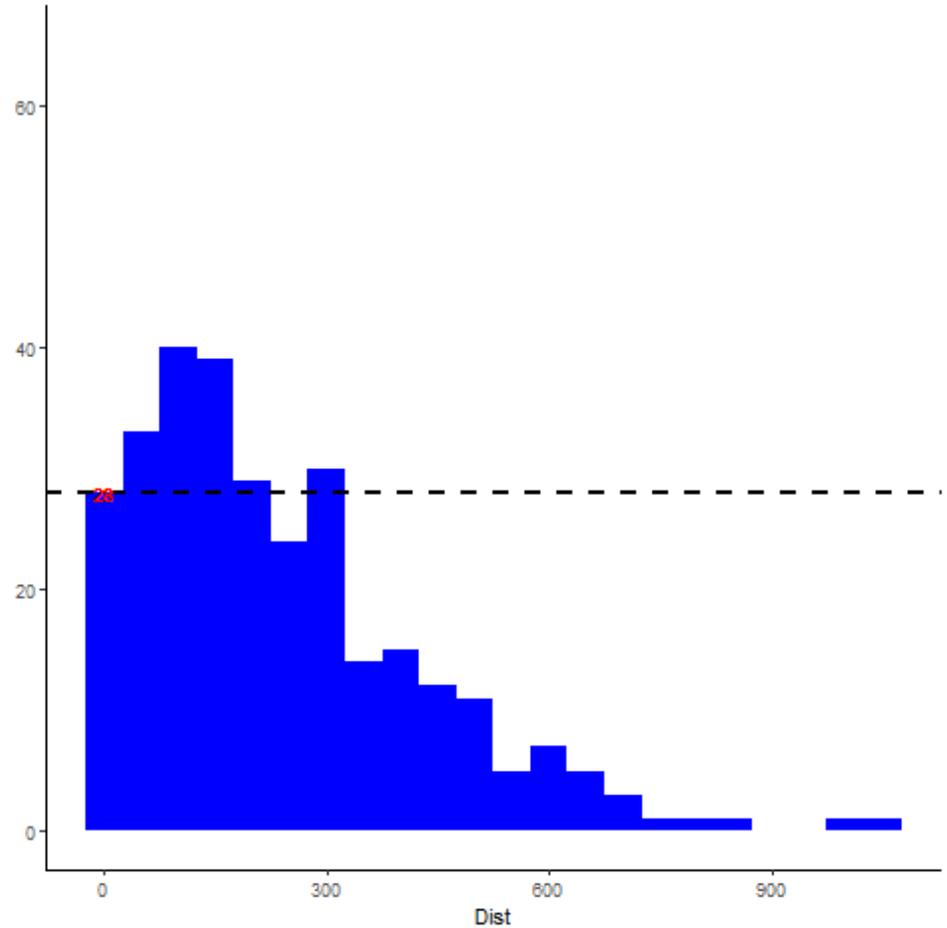
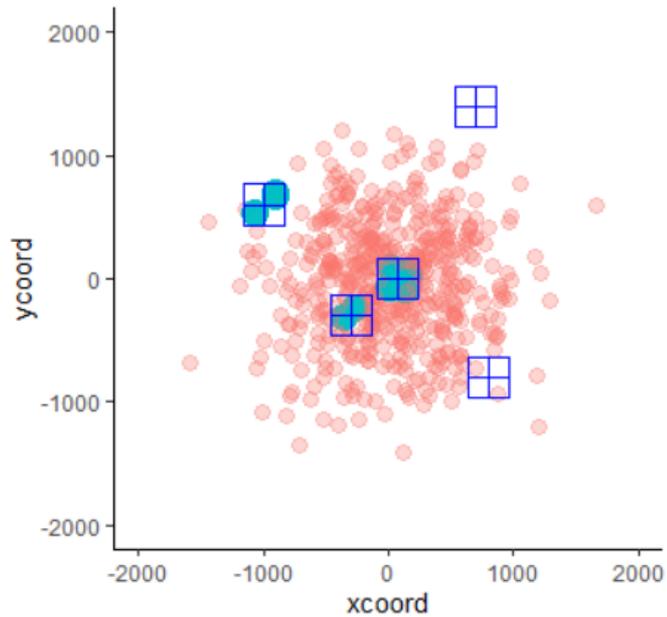
We also don't know the range

- Sigma (σ)

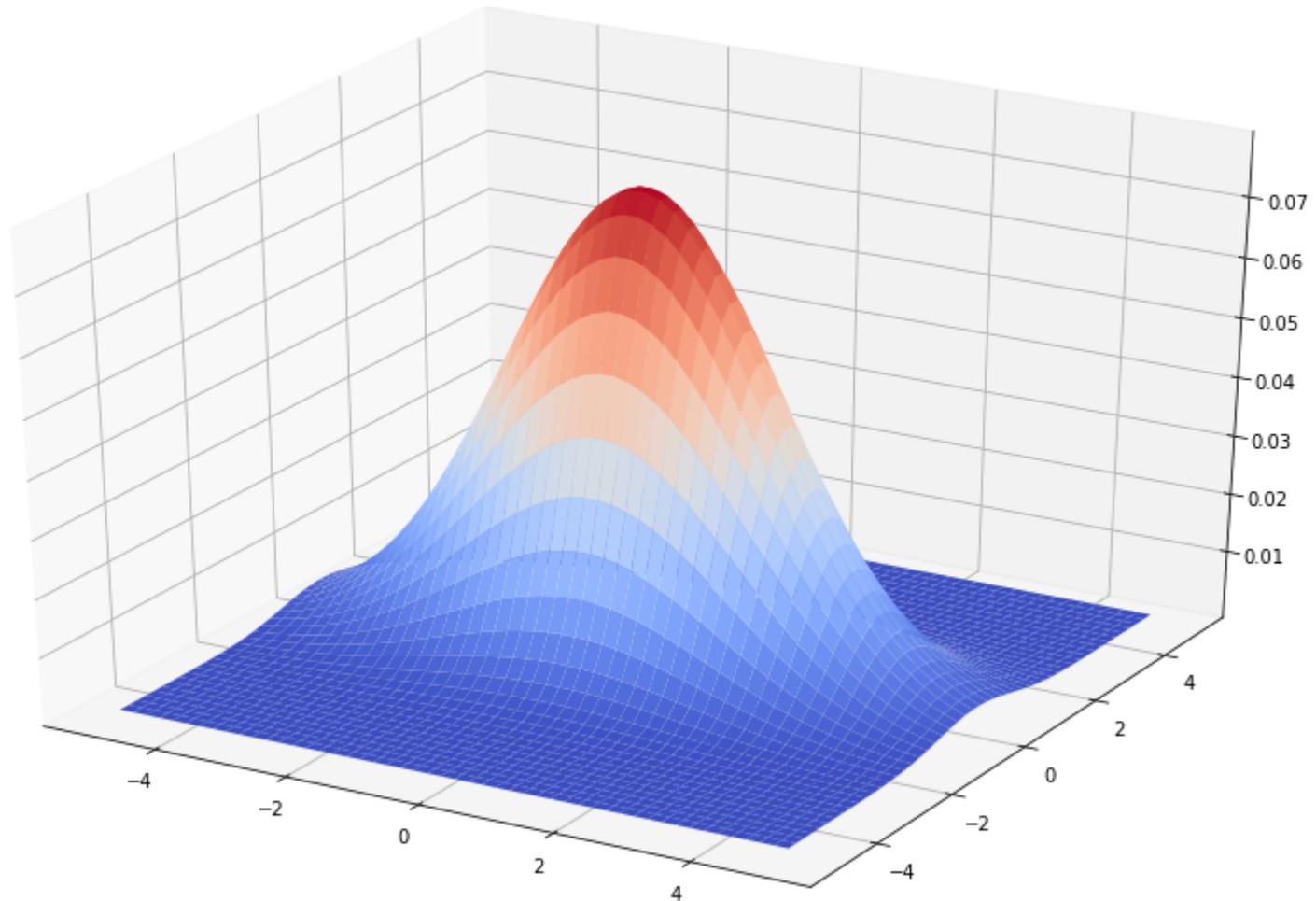


Nor the Encounter Rate

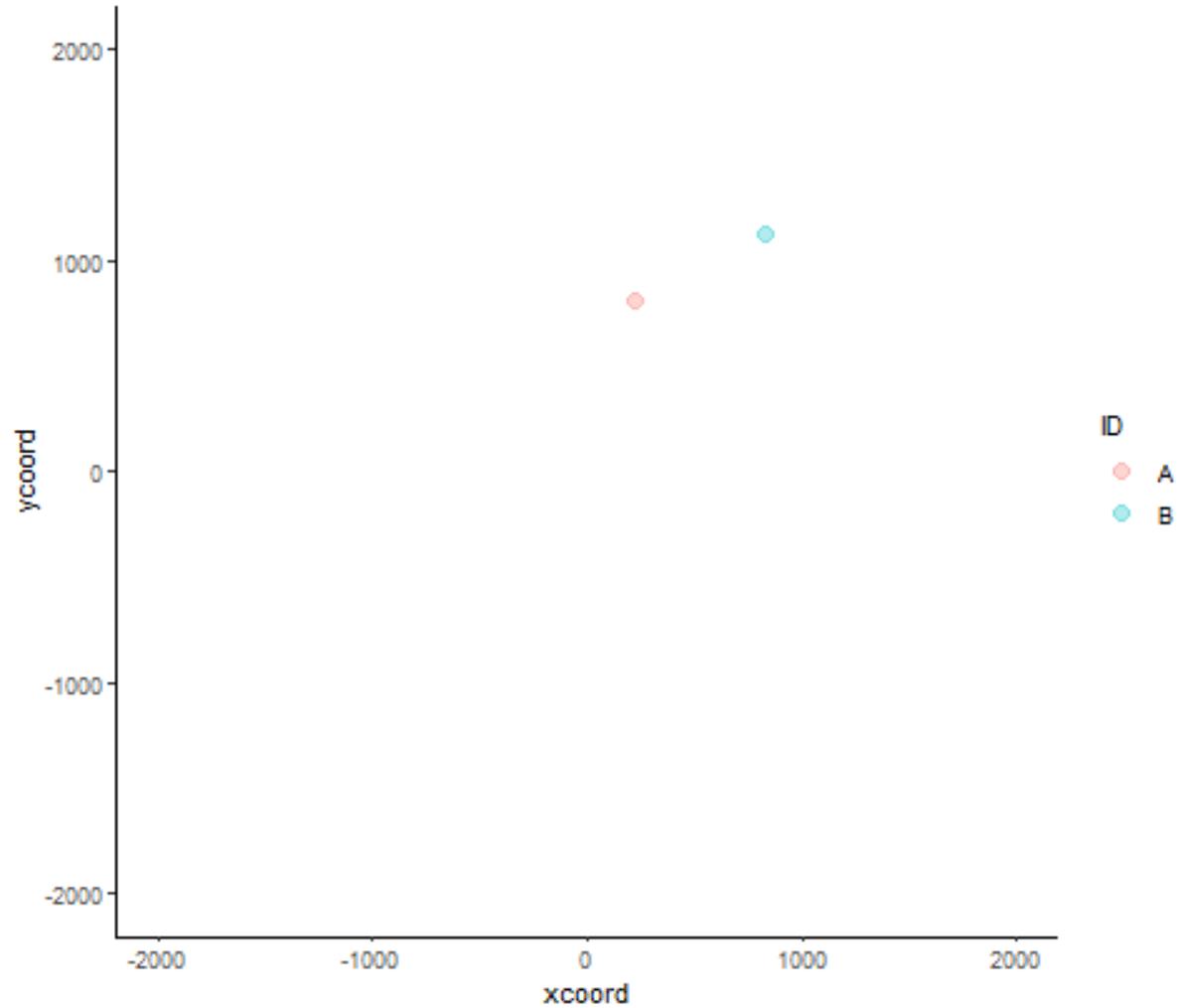
- Lambda0 (λ_0)



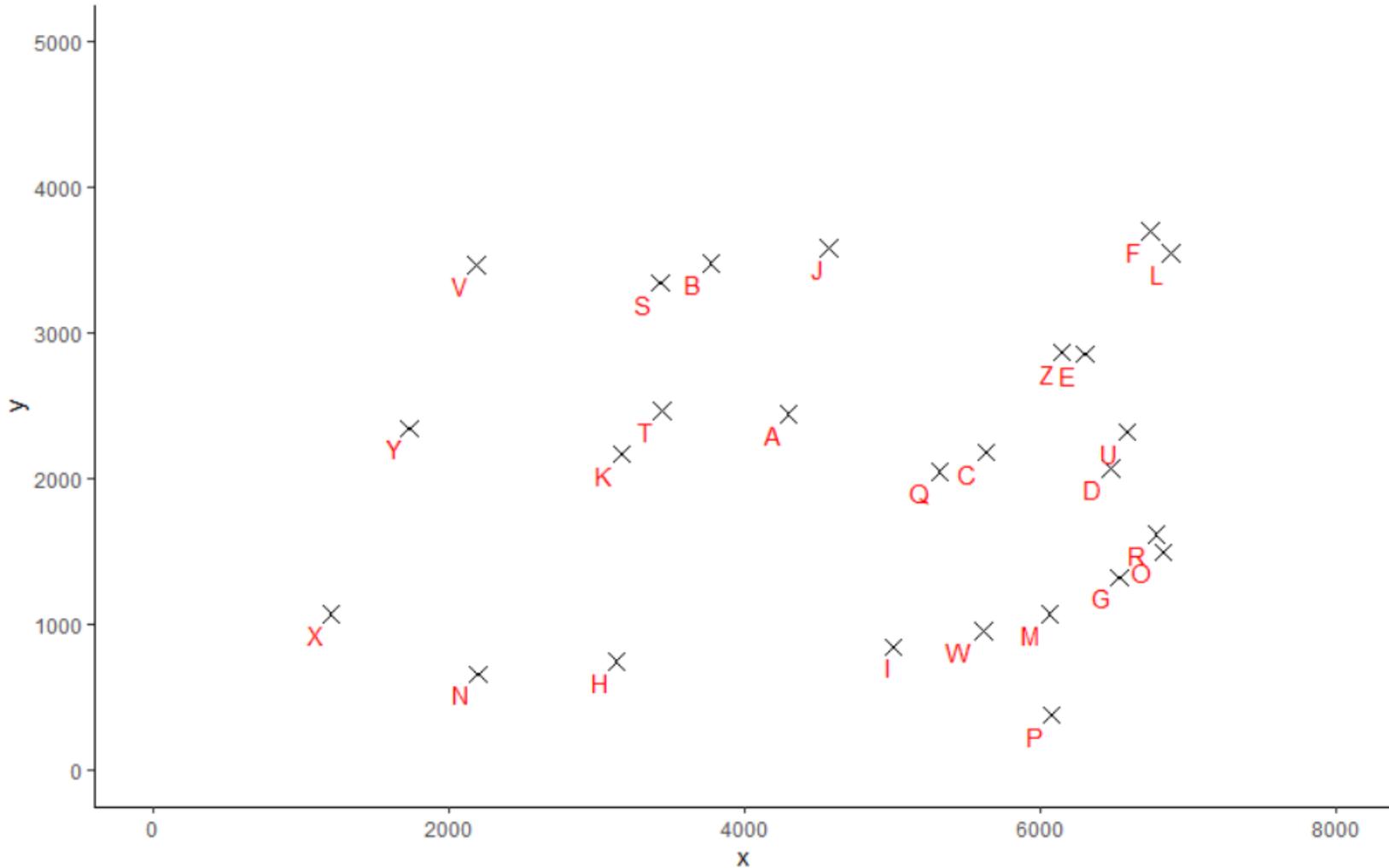
Maximum Likelihood



For two snow leopards



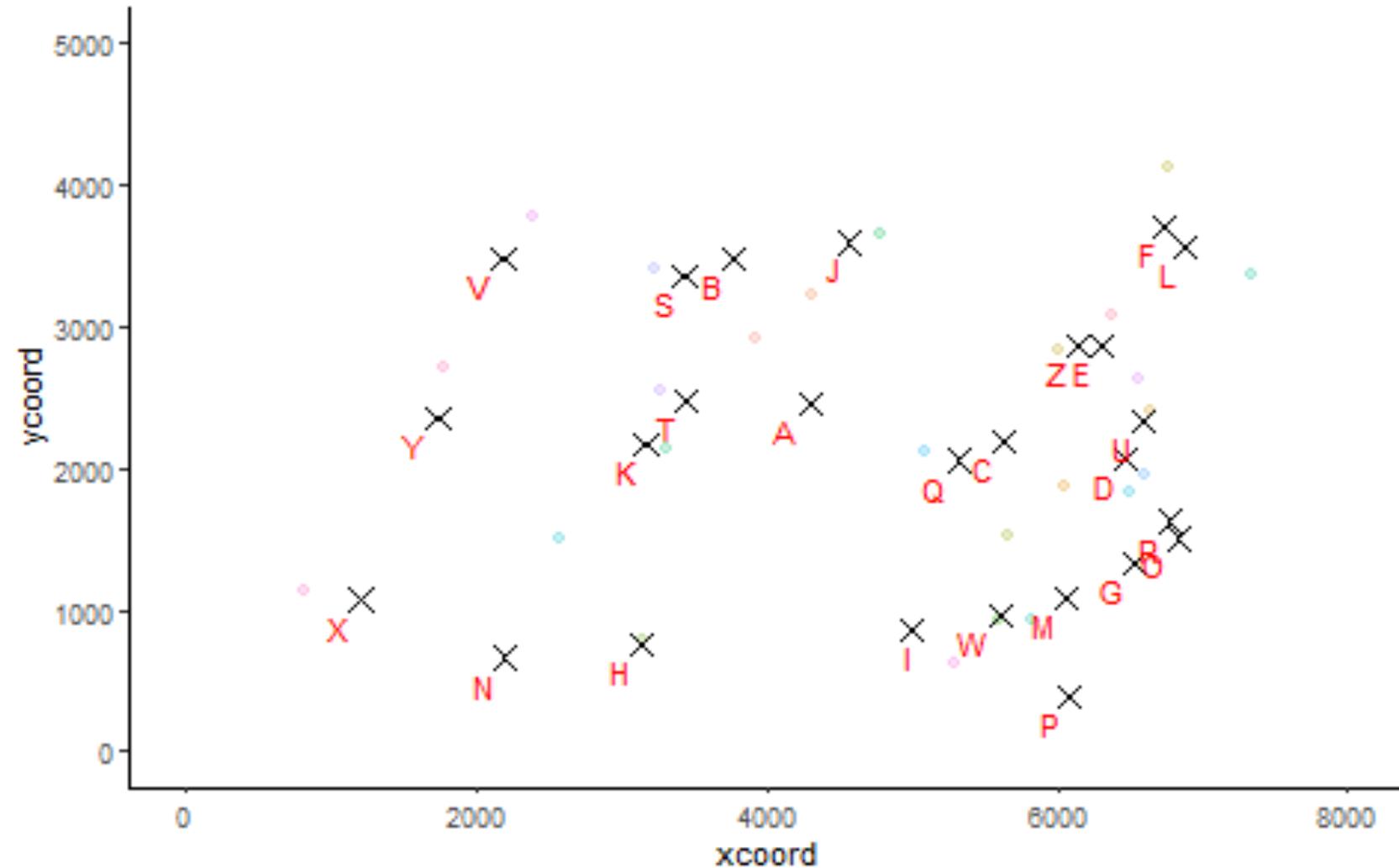
What if there are many snow leopards?



The fun way!



This is how 26 animals may move



And we have 50 cameras

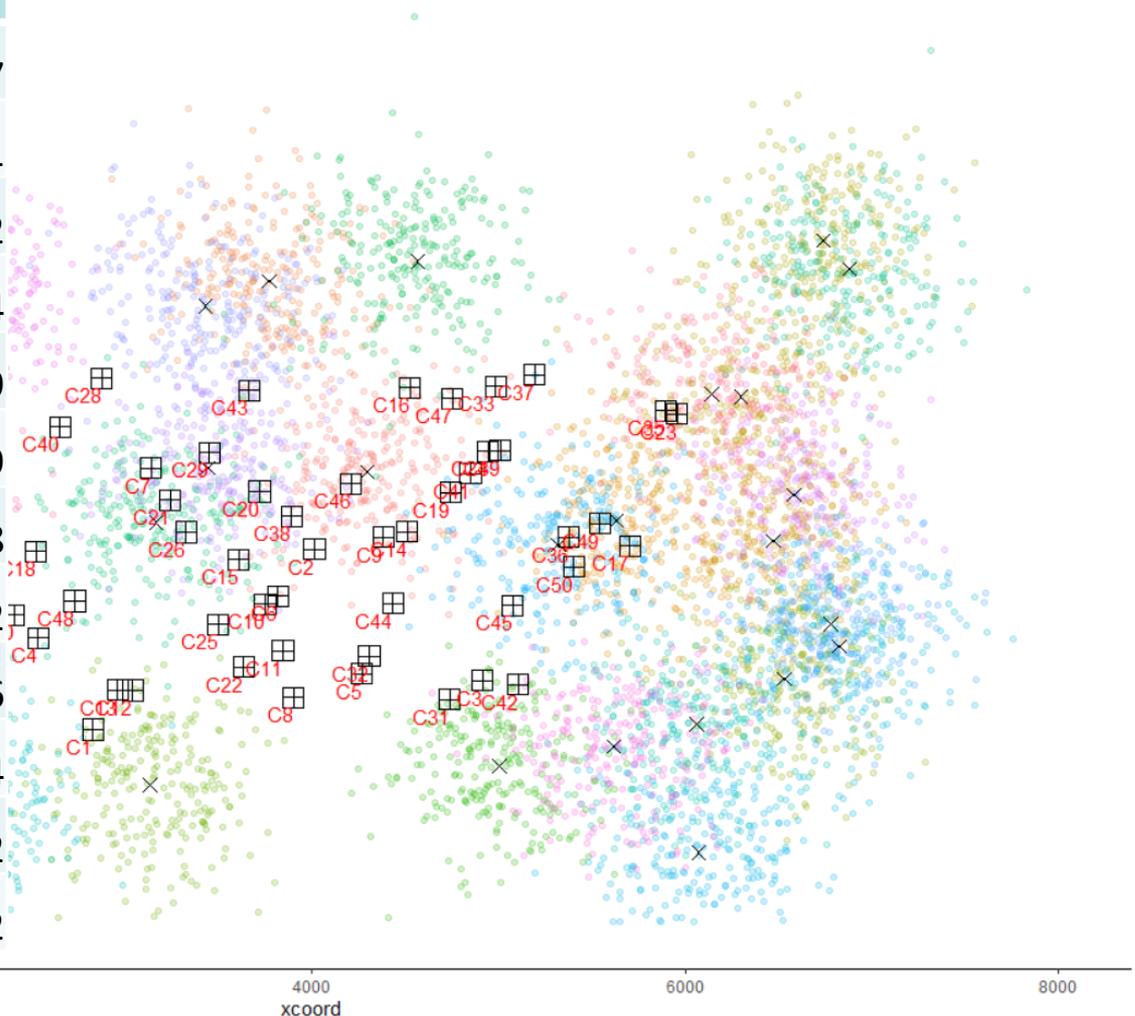


Datasets: trap location



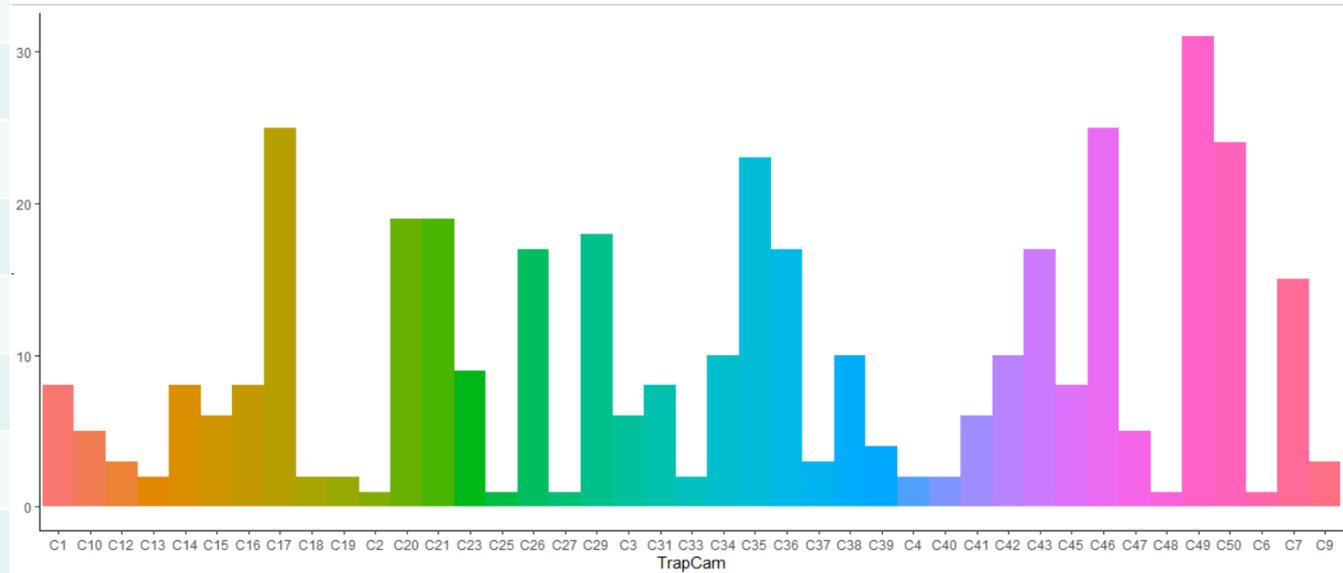
Datasets: trap location

CamID	Cam.x	Cam.y
C1	2827.098	1049.697
C2	4014.244	2027.311
C3	4913.956	1317.102
C4	2533.664	1547.154
C5	4269.348	1352.759
C6	3818.762	1775.219
C7	3139.492	2469.068
C8	3902.355	1224.402
C9	4383.877	2095.166
C10	3750.077	1729.414
C11	3845.153	1476.772
C12	3038.622	1261.692



Datasets: capture data

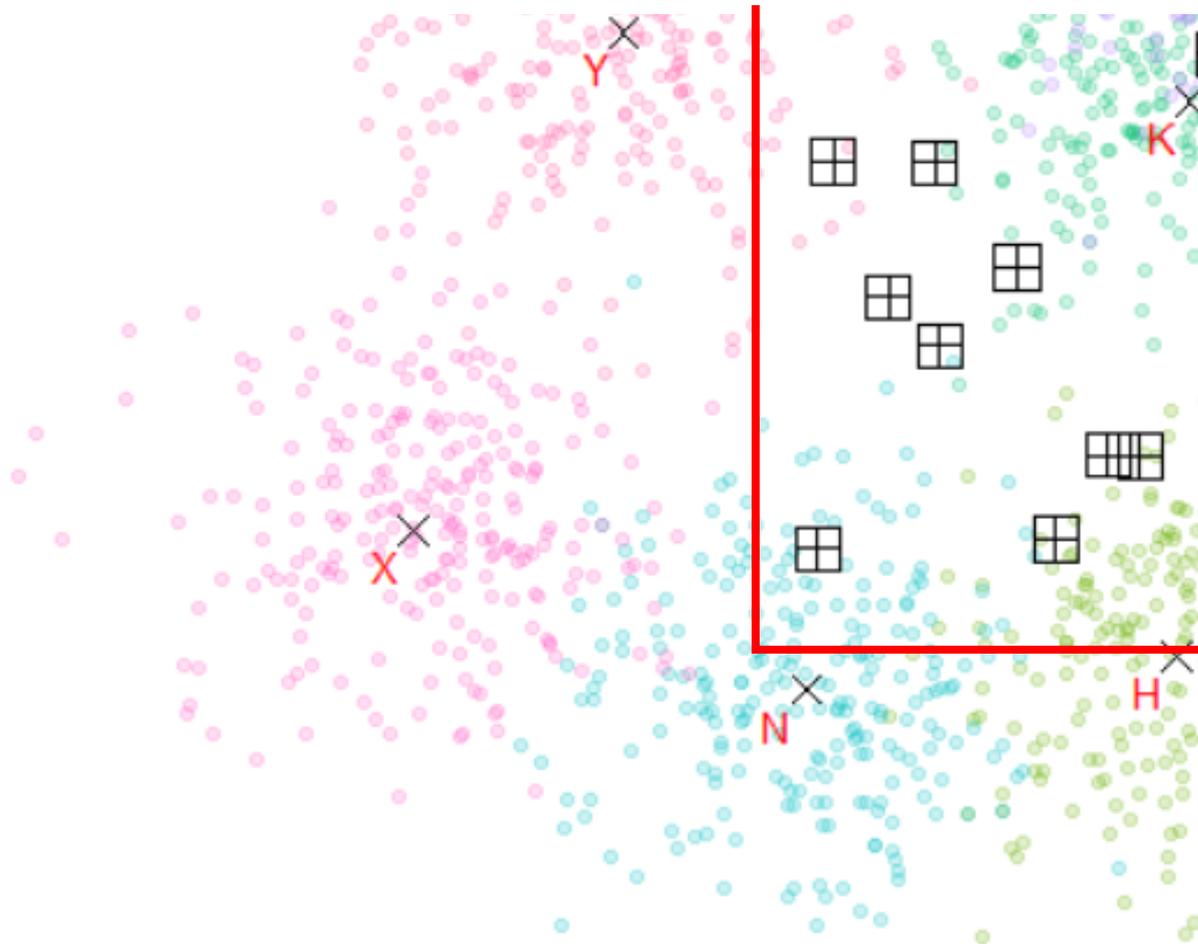
#session	ID	occasion	trapID
1A			1C16
1A			1C46
1A			1C39
1A			1C16
1A			1C14
1A			1C47
1A			1C14
1A			1C46



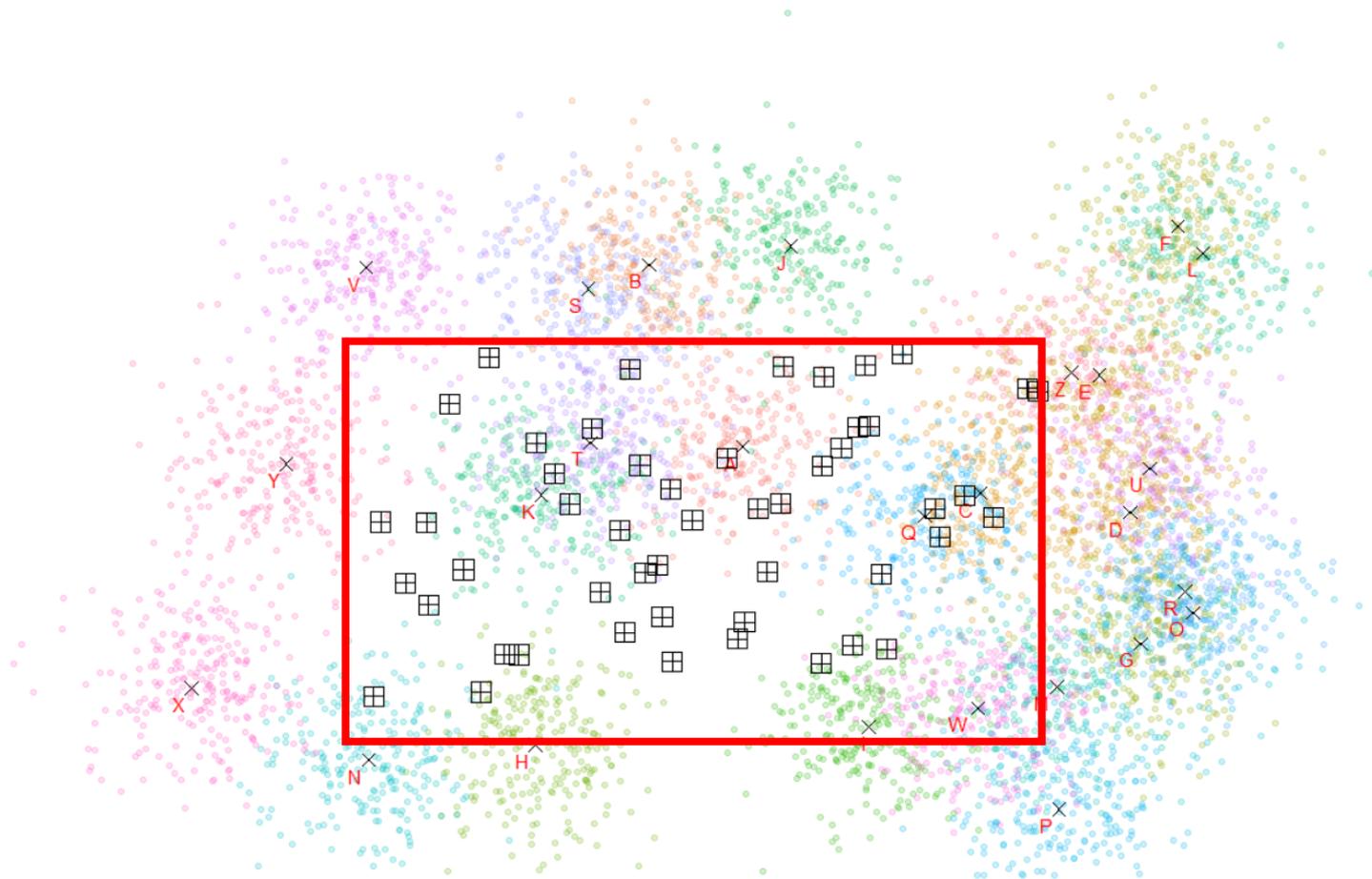
What is our study area?



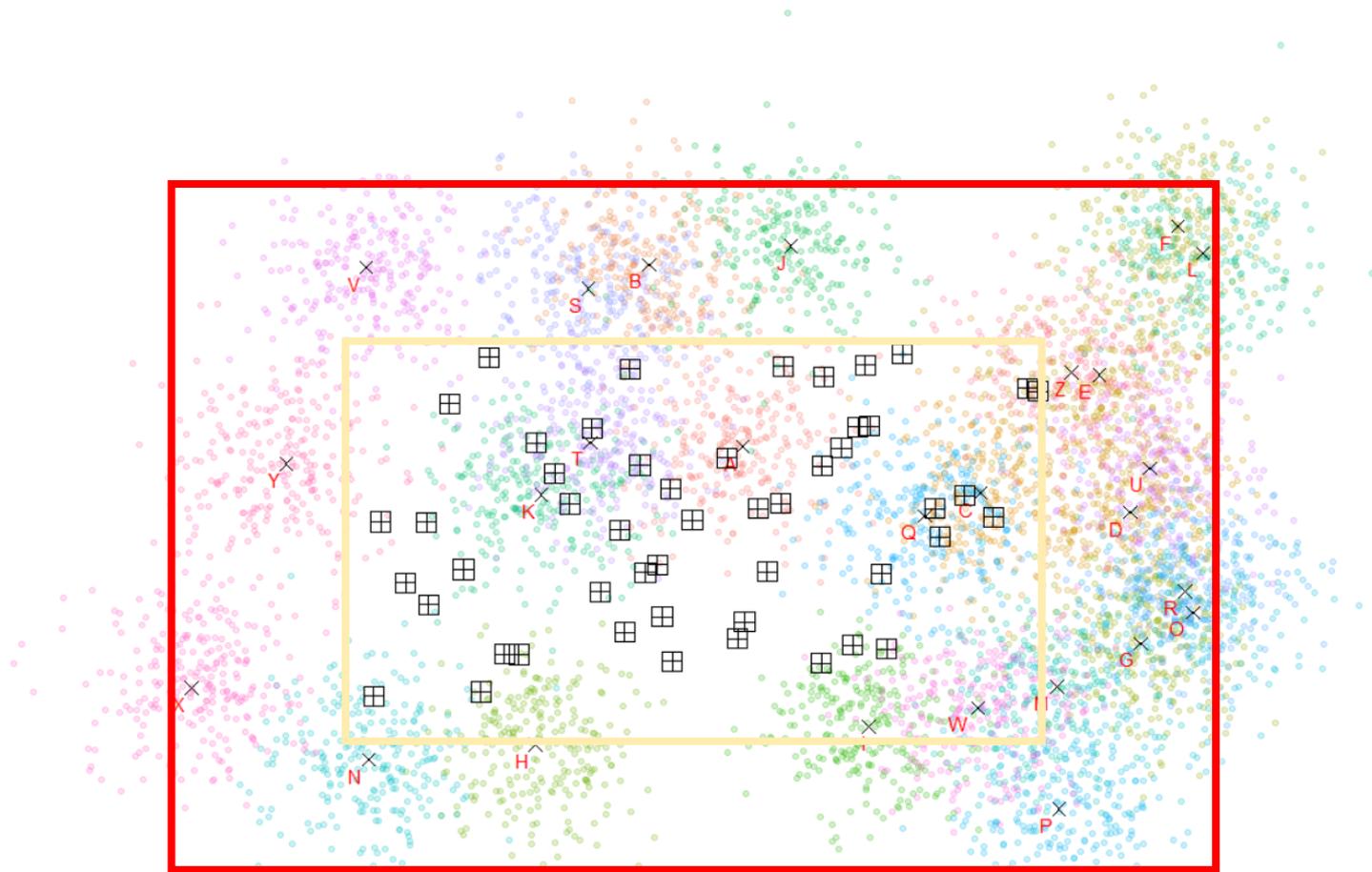
X and N are from outside!



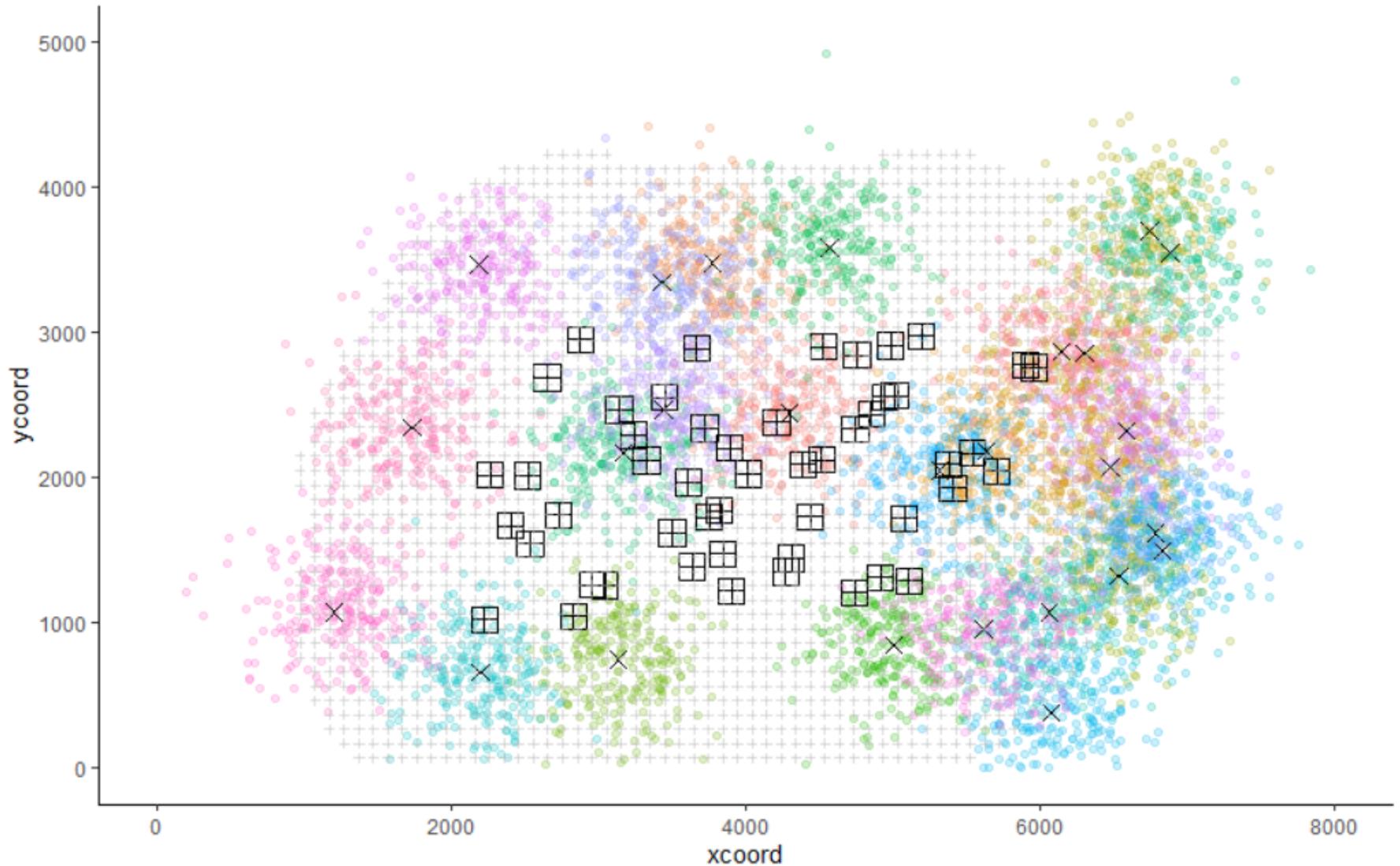
What is our study area?



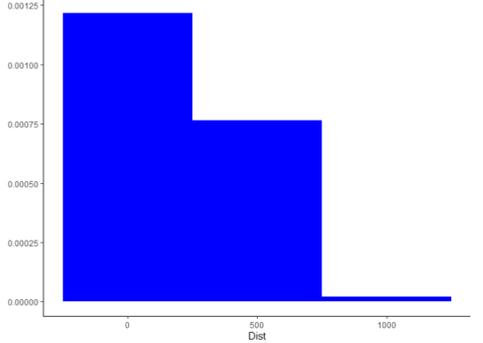
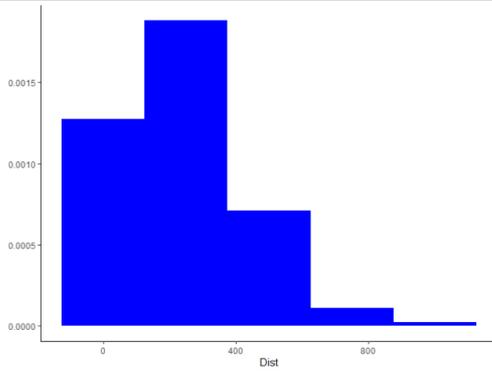
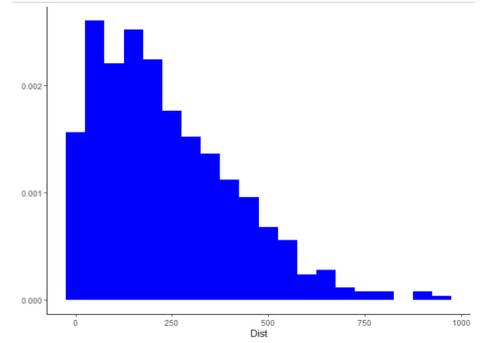
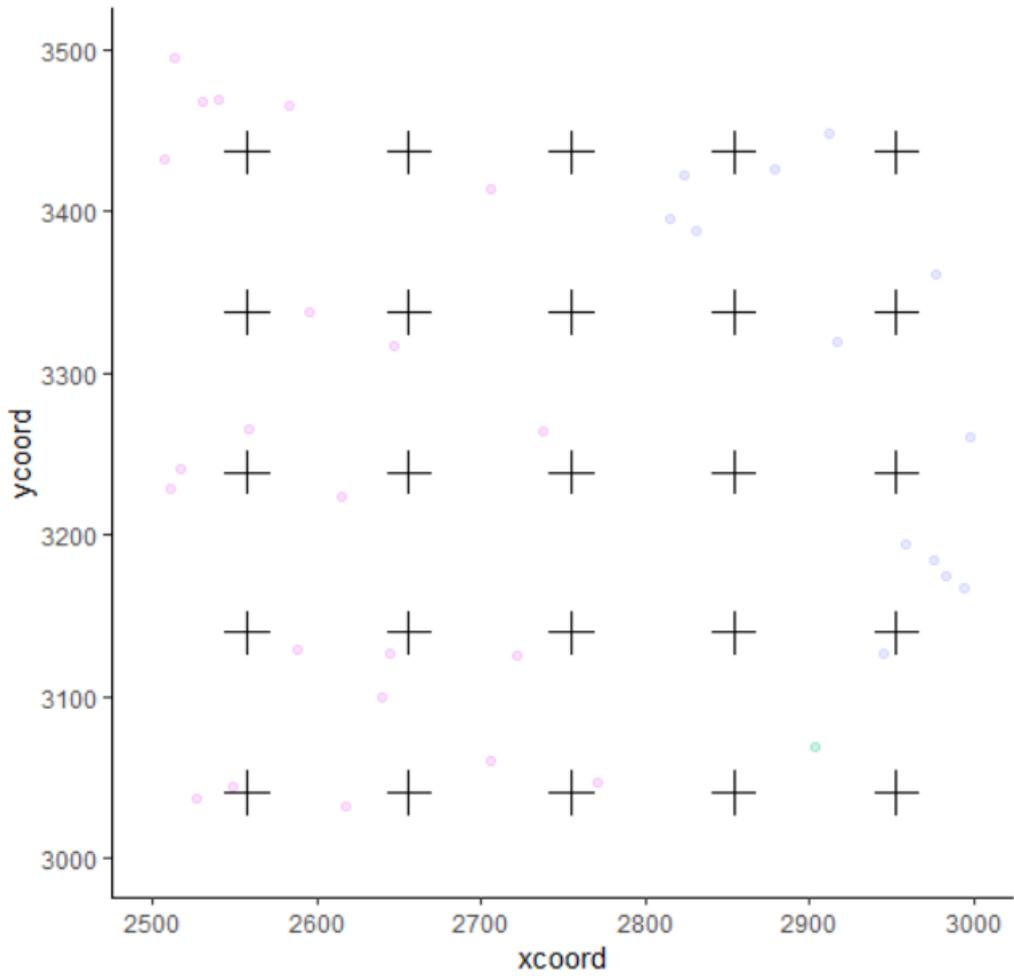
What is our study area?



What is an integration space?



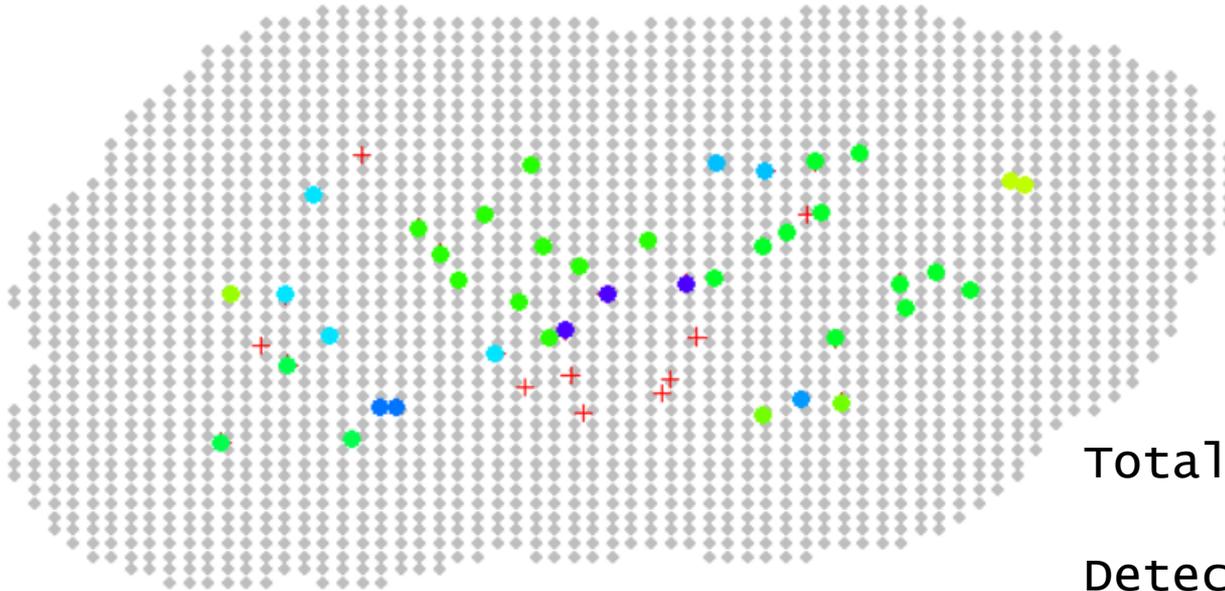
What resolution to choose?



Data summary

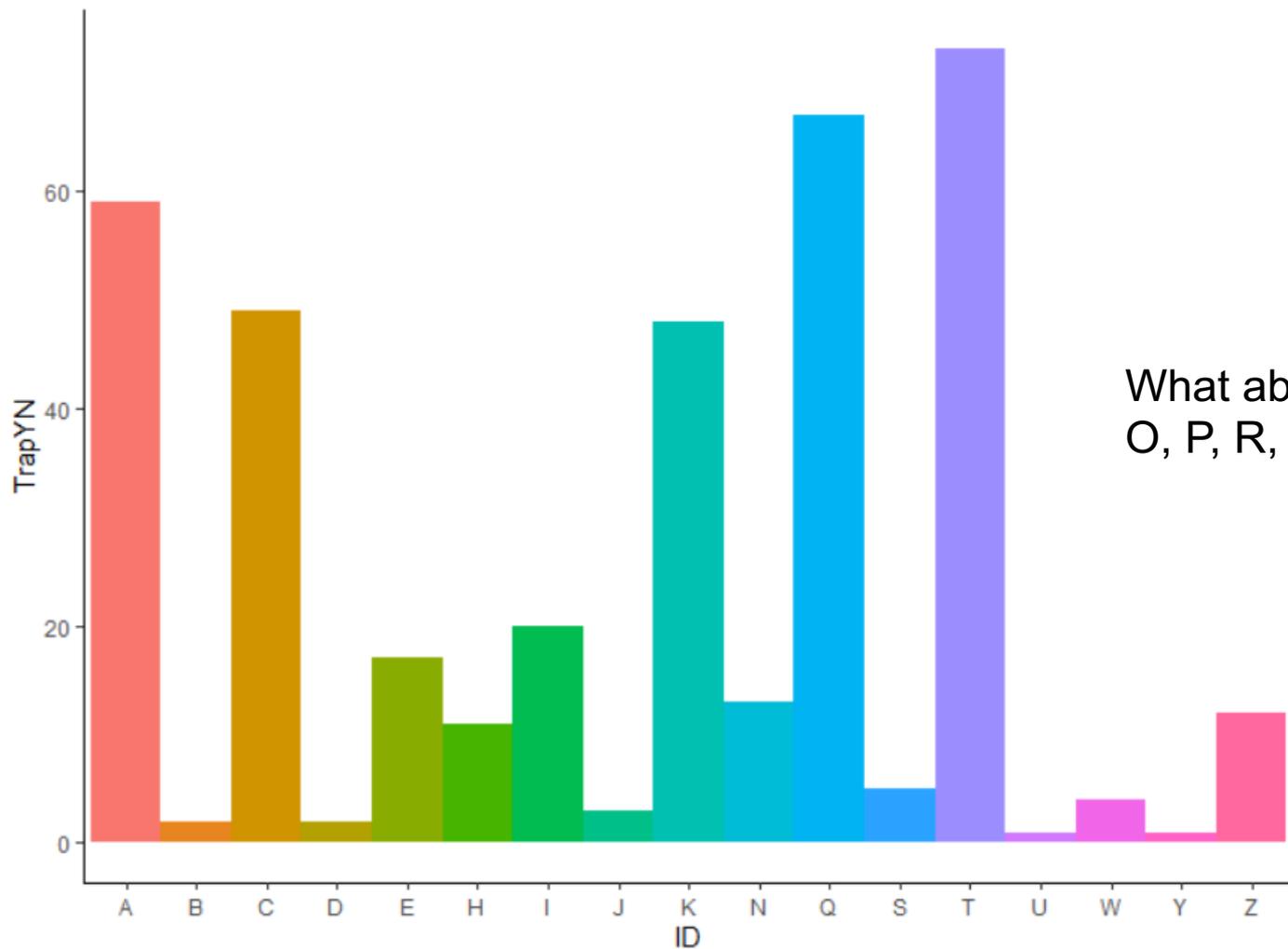
1

1 occasion, 387 detections, 17 animals



Total count:	17
Detections	387
Detectors visited:	41
Detectors used:	50

Cats never captured?



What about cat F, G, L, M,
O, P, R, V, X

Detection Probability (p)

- Unknown number of animals NOT seen
- An unknown proportion of total animals SEEN

$$D = \frac{N}{A} = \frac{\hat{C}}{pA}$$

Count

Detection Probability



Running the analysis

```
gummy.hhn<-secr.fit(all.data.gummy,  
                    model = list(D~1, lambda0~1, sigma~1),  
                    detectfn="HHN", mask=Mask.gummy)
```

```
coefficients(gummy.hhn)
```

```
predict(gummy.hhn)
```

```
region.N(gummy.hhn)
```

Our estimates

	beta	SE	lcl	ucl	
D	-4.53	0.24	-5.00	-4.05	
lambda0	2.75	0.08	2.59	2.90	
sigma	5.73	0.03	5.67	5.79	
	link	Estimate	SE	Lcl	ucl
D	log	0.01	0.0026	6.71e-03	0.018
lambda0	Log	15.57	1.22	1.34E+01	18.14
sigma	Log	308.69	9.41	2.91E+02	327.69
	estimate	SE.estimate	lcl	ucl	n
Abundance	25.39	3.75	20.63	36.346	17

SCR assumptions