University of Zurich[UZH]

Estimating population size and demographic rates from count data:

Panacea or pipe dream?

Sam Cruickshank

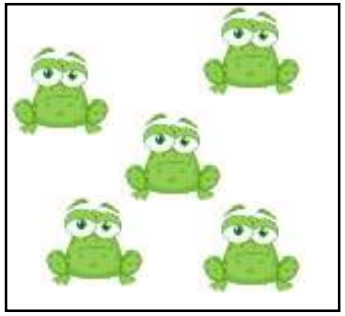
Department of Environmental Studies and Evolutionary Biology

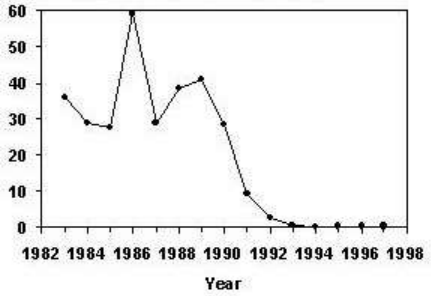
University of Zurich

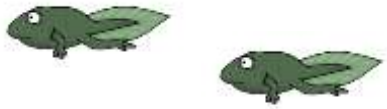





YES
NO




60
50
40
30
20
10
0
1982 1984 1986 1988 1990 1992 1994 1996 1998
Year



Questions

1. What difficulties are there in analysing count data in amphibian systems?
2. Can we accurately estimate population sizes?
3. Is it possible to estimate survival and recruitment rates from count data?

Examples:

1. Calling male counts
2. Egg masses

N-mixture Models

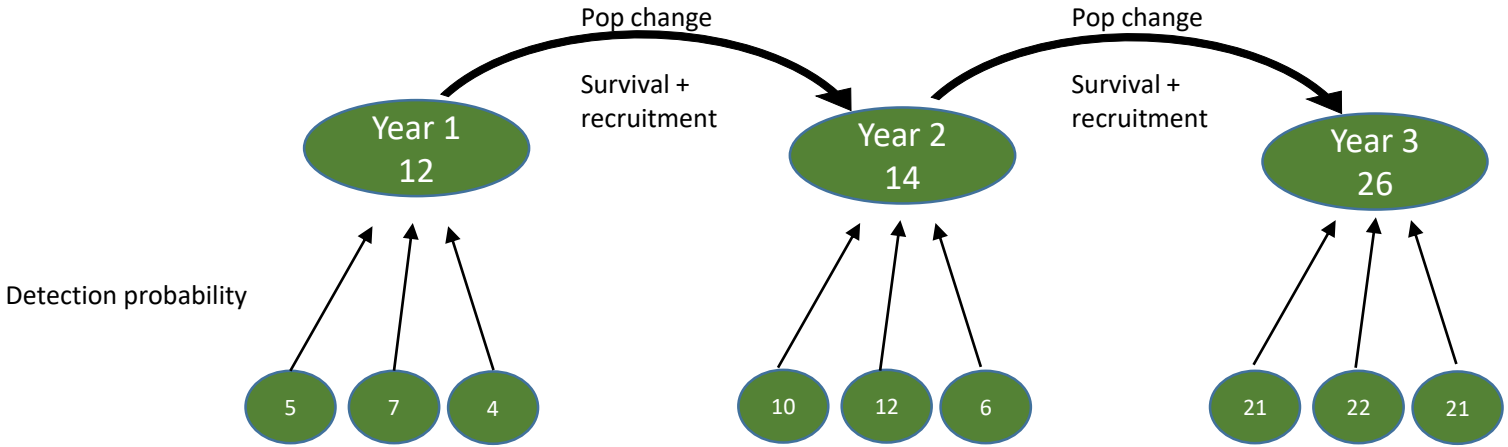
- Estimate abundance from repeated counts

$$\text{Abundance} = \frac{\text{Count}}{\text{Detection probability}}$$

- Key assumption: **population closure**

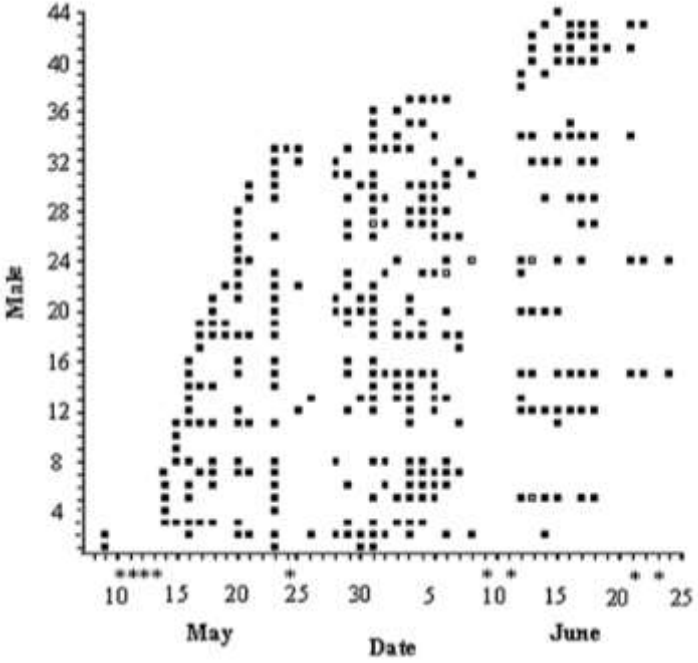
Dail-Madsen

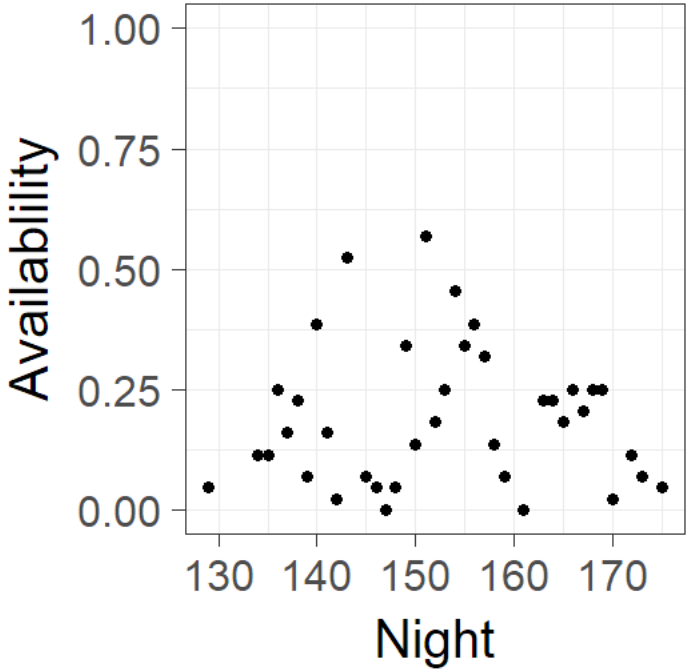
Abundance AND survival/recruitment



Case Study 1: Tree Frogs

Random availability

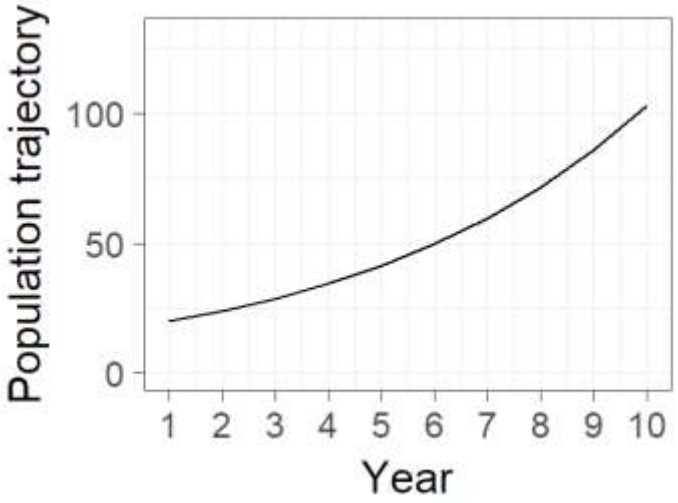




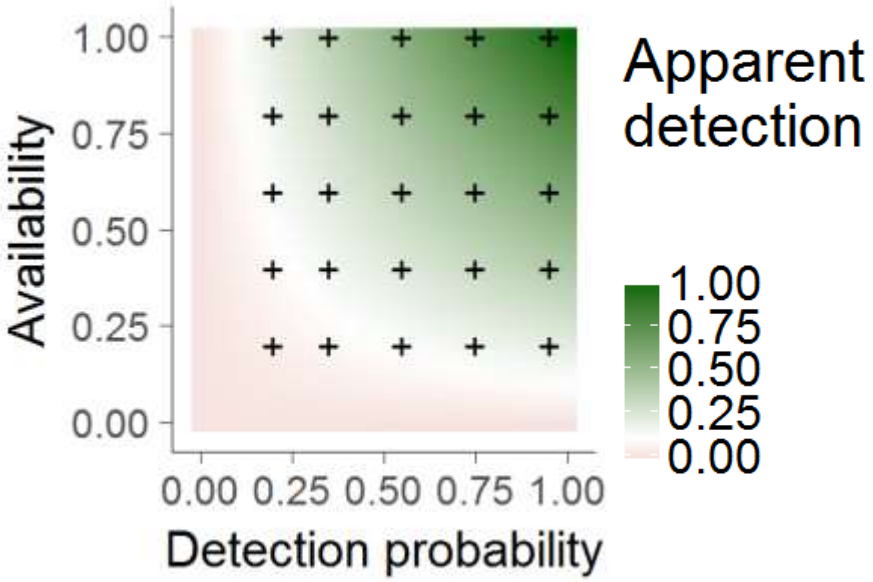
From Grafe & Meuche 2005 Amphibia-Reptilia

Apparent Detection = Detection probability * Availability

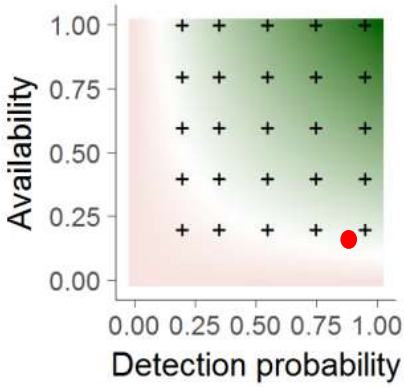
$$\text{Abundance} = \frac{\text{Count}}{\text{Detection probability}} \Rightarrow \text{Abundance} = \frac{\text{Count}}{\text{Detection probability} * \text{Availability}}$$

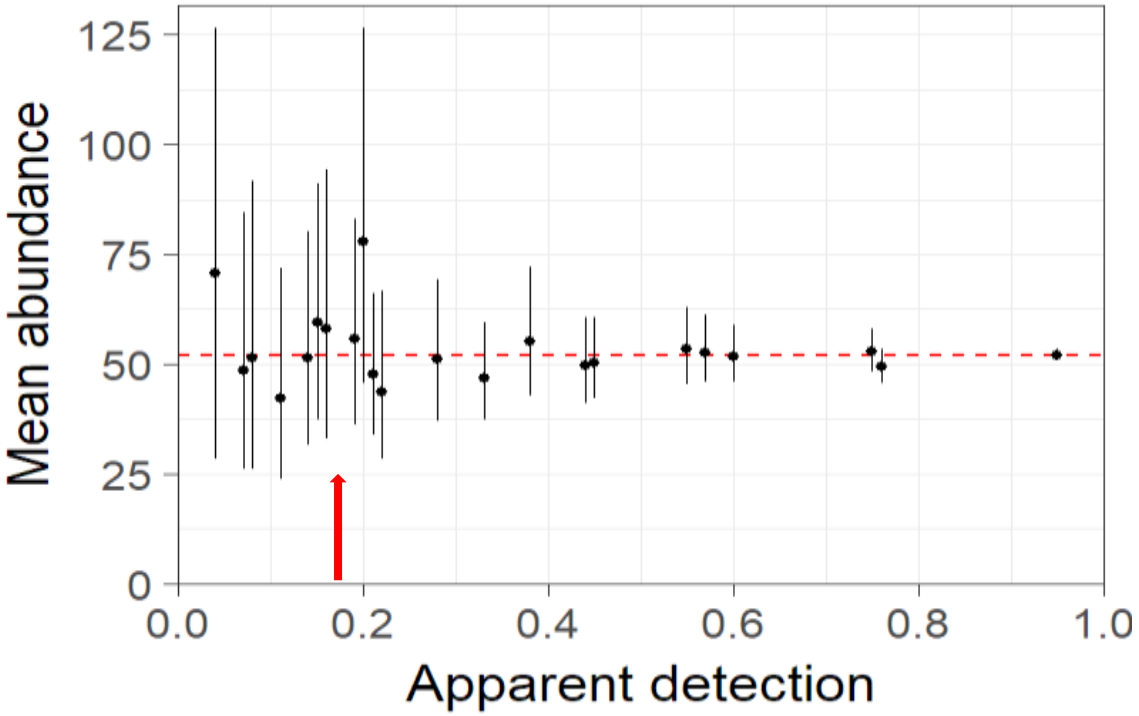


30 sites, 3 obs/year



Abundance Results

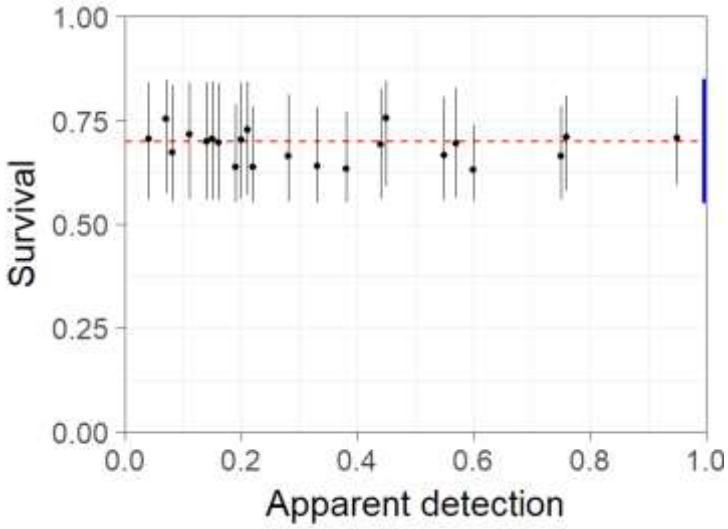


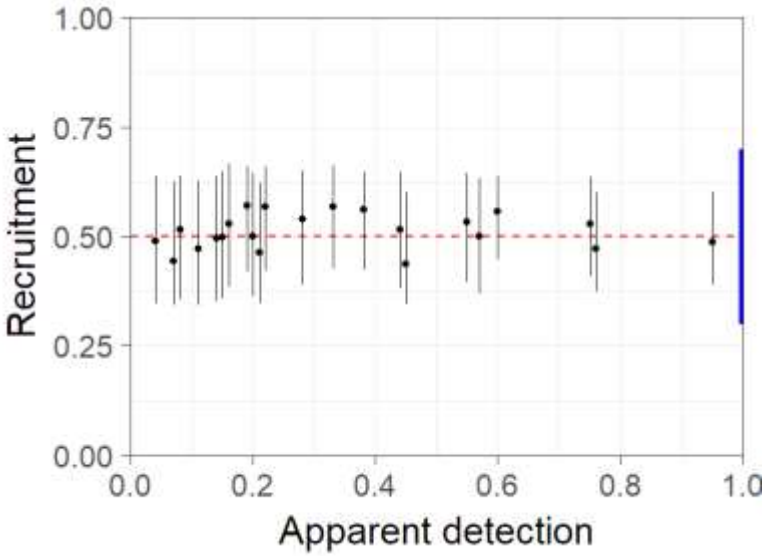


Detection probability	0.9
Availability	0.2
Apparent detection	**0.18**

- Abundances estimated well when apparent detection > 0.5

Survival and Recruitment



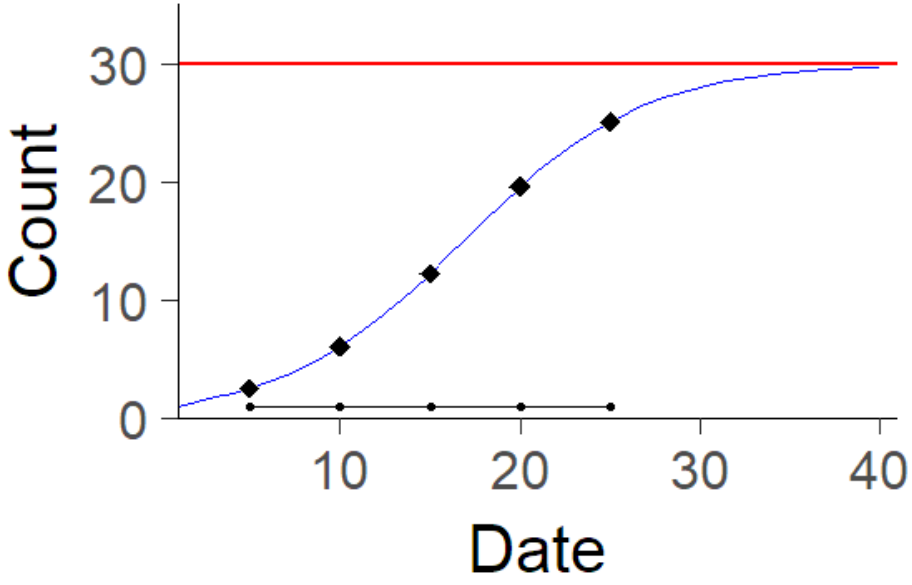


- Both parameters have wide uncertainty at all apparent detection levels
- Dail-Madsen models are not useful when availability is low and random

Case Study 2: Egg Counts

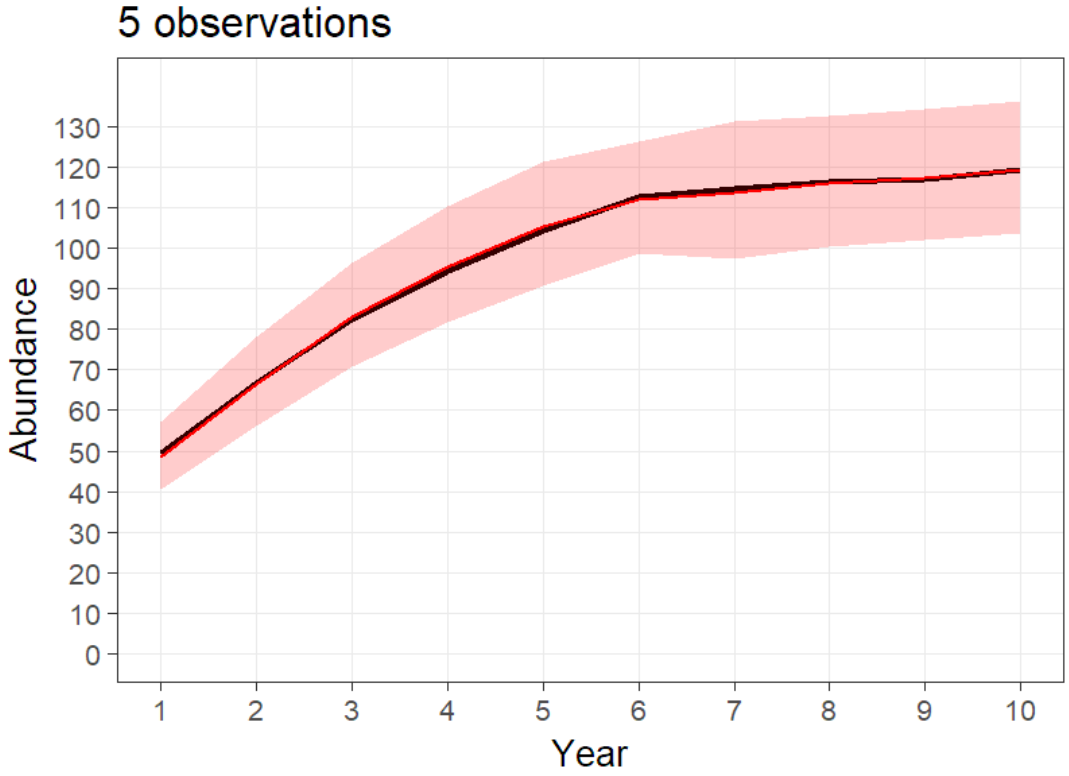
Non-random availability

- Known pattern of availability
- Persistent
- Easy to detect



Egg Count Model

- Density dependent growth
- Model performs well



Next Step: Real data…

Conclusions

Not all count data are equal!

- Closure is likely violated a lot
- The consequences of this are sometimes manageable

N-mix can estimate abundances well if:

- Availability is non-random and can be explicitly modelled
- Apparent detection is high (> 0.5)
  - Moderate-high levels of **detection probability** AND **availability**

Dail-Madsen Models: Too good to be true…..

Acknowledgements

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karch

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