

How consistent are individual egg rejection responses of avian brood parasite hosts?



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Human Frontier Science Program

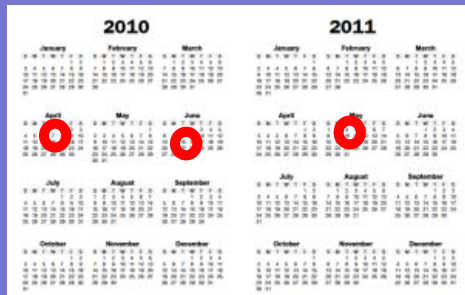
Fundamental assumption of all theoretical models

- "fixed" host response models:
 - rejecters always reject
 - acceptors always accept
- phenotypic plasticity models:
 - consistency within the same ecological/perceptual context
 - vs. "random noise" responses
- both interspecific & conspecific parasitism
- violation → large effects (non-linear dynamics)



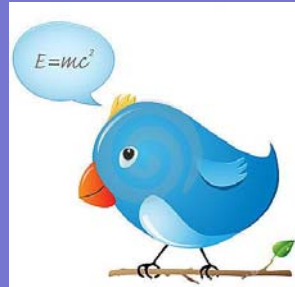
Three temporal scales

- within 1 breeding (WBA)
- 2 breedings within 1yr (BBA)
- between 2(+) seasons (BBS)
- **personality point of view:**
- complex cognitive task → temporally labile



- **coevolutionary point of view:**
- breeding stage ~ parasitism risk & cost
- WBA:

	1 st model egg	2 nd model egg
	laying	laying
	laying	incubation
	incubation	incubation



Bell et al. Anim. Behav. 2009; Davies & Brooke J. Anim. Ecol. 1989

Suitable model species

- only 1 sex reject foreign eggs
- rejection by ejection (desertion vs. WBA r!)
- between-id variation (do not test dunnocks!)
- models that elicit "intermediate" rejection rates



Samas et al. Ethology 2011

Taxa & stimuli replicates *meta*-replication



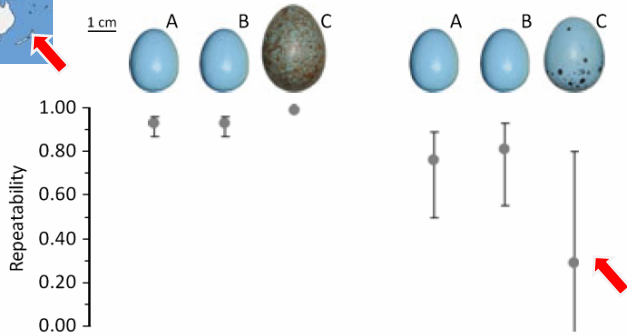
Blackbird (*Turdus merula*)



Song thrush (*Turdus philomelos*)

Grim et al. J. Anim. Ecol. 2011; Johnson J. Wildl. Manag. 2002

Repeatability within one breeding attempt



	Blackbird			Song thrush		
n (nests)	41	37	8	22	18	9
Ejection (%)	82.9	81.0	25.0	45.5	38.9	0.0

Samas et al. Ethology 2011

Perfect consistency = low repeatability!

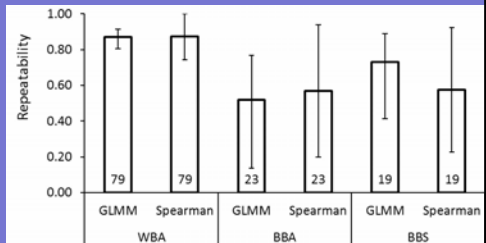
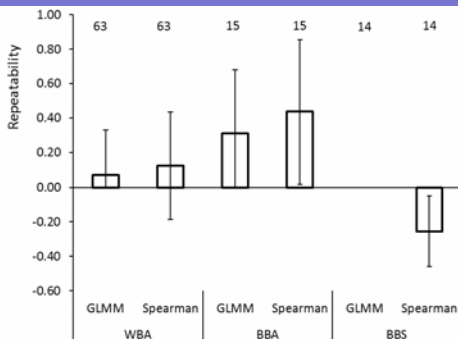
(Hayes & Jenkins 1997). Repeatability is the fraction of behavioural variation that is due to differences between individuals. Formally, repeatability is $r = s_A^2 / s^2 + s_A^2$ where s_A^2 is the variance among individuals and s^2 is the variance within individuals over time.

In other words, when individuals behave consistently through time and when individuals behave differently from each other, then the behaviour is repeatable. In the past, most studies measured

be calculated for non-Gaussian data (e.g. binary, proportion and count data). In addition to point estimates, appropriate uncertainty estimates (standard errors and confidence intervals) and statistical significance for repeatability estimates are required regardless of the types of data. We review the methods for calculating repeatability and the associated

Bell et al. Anim. Behav. 2009; Nakagawa & Schielzeth Biol. Rev. 2010

Three temporal scales



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laying	laying
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• WBA r : CZ = NZ

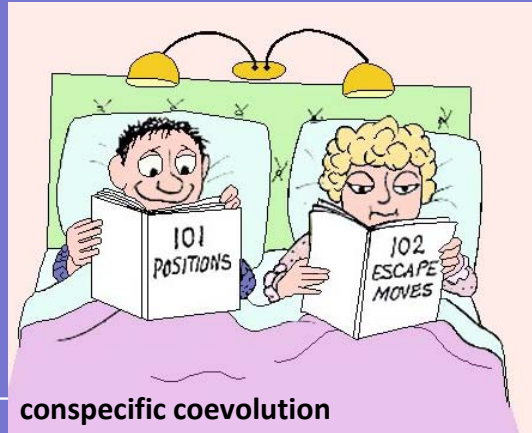
Samas et al. (in prep.)

Future directions

- model species: *interspecific* coevolutionary systems
- repeatability of egg removal by cuckoo females

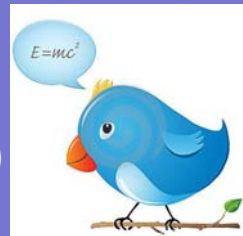


Grim Biol. J. Linn. Soc. 2005



Take-home messages

- consistency \neq repeatability
- no inter-id variation $\rightarrow r = 0$ (by definition!)
- test both acceptors and rejecters
- vs. biased sampling \rightarrow biased results
- do not pool data from WBA, BBA & BBS
- general stat. imperative: control for temporal variation
- do not *pseudo*-replicate ...
- ... instead *meta*-replicate across phylogeny, stimuli & time



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- The End -