The culture that wasn't?

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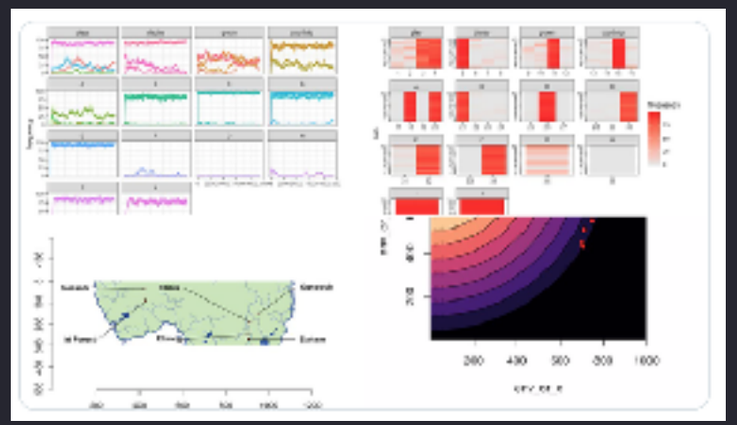
Culture: something to be explained

- Saying that *X* is *cultural* hardly gives more information about *X*

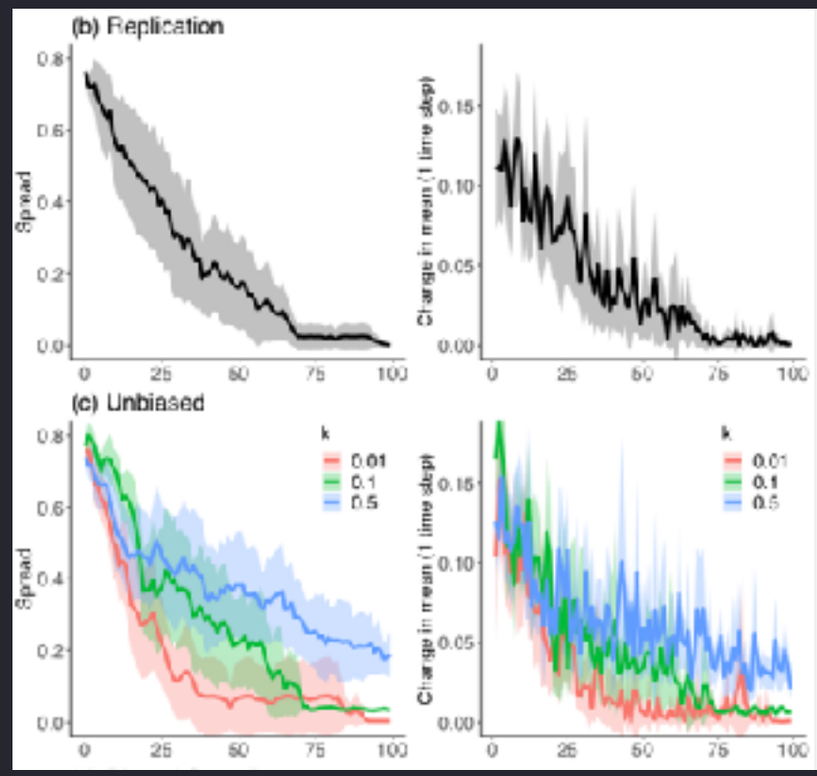
- What about saying that *X* is *socially learnt*?

Culture: something to be explained

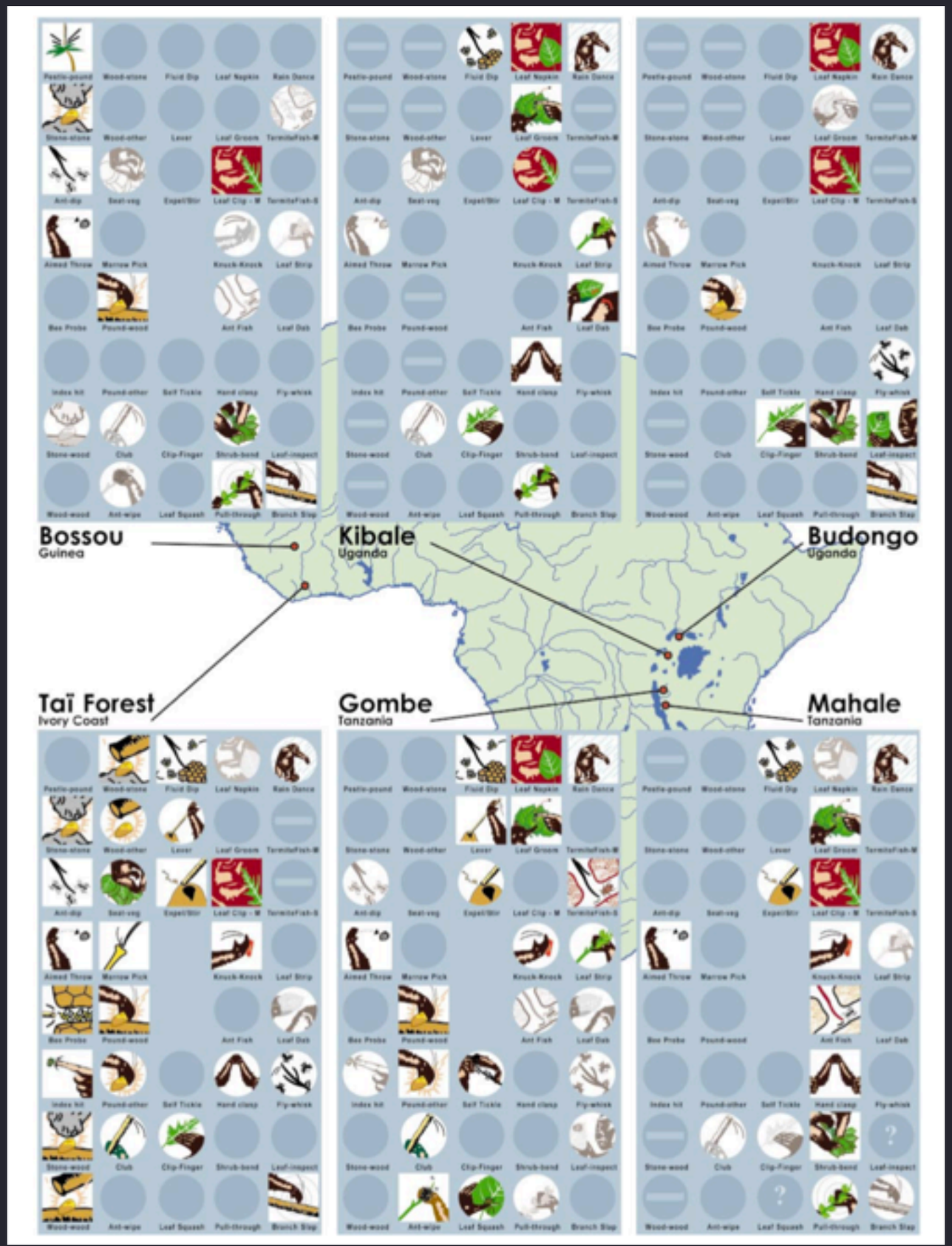
Culture in oranzees



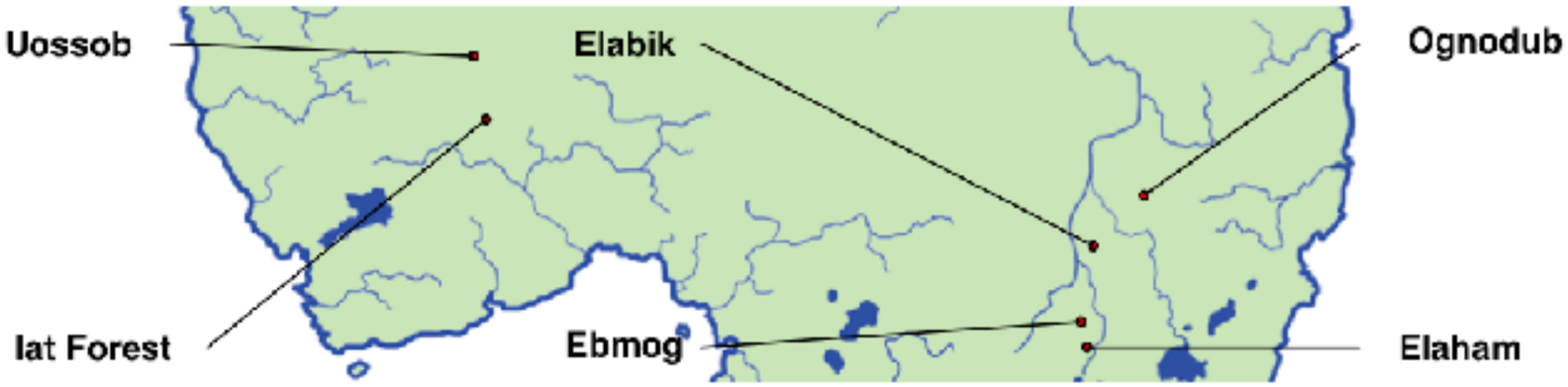
Cultural stability without copying or selection



Culture = social learning (or not?)



Culture in oranzees

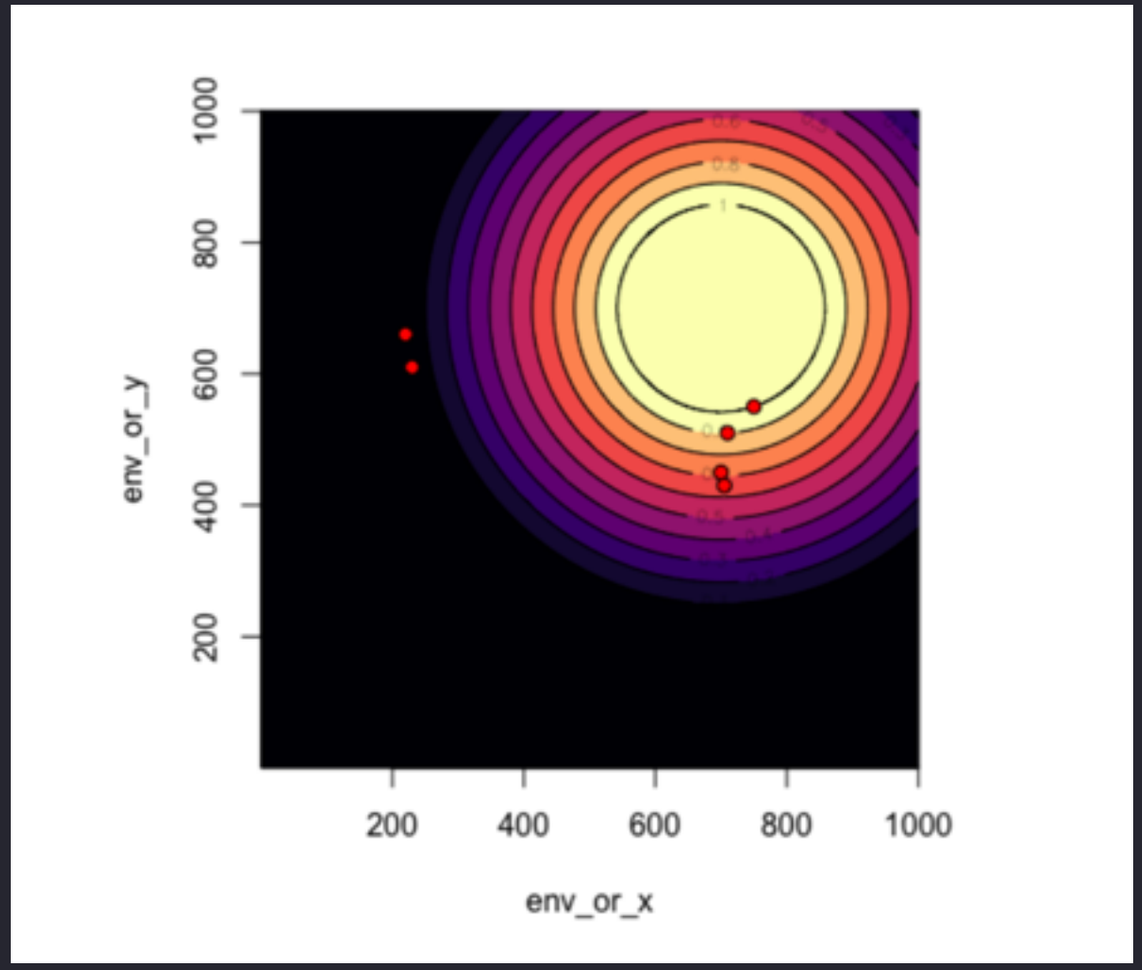


Group	Population size
Uossob	20
Elabik	42
Ognodub	49
Iat Forest	76
Ebmog	50
Elaham	95

- 64 possible behaviours
- 32 “social” behaviours associated to genetic propensity
- 32 “food-related” behaviours associated to genetic propensity and ecological availability

- *alpha_g* and *alpha_e* are two parameters of the simulation that regulate the importance of genetic propensity and ecological availability

- That is, they regulate if the probability to express a behaviour is (i) randomly drawn, and equal in all populations, or (ii) determined by a geographical gradient

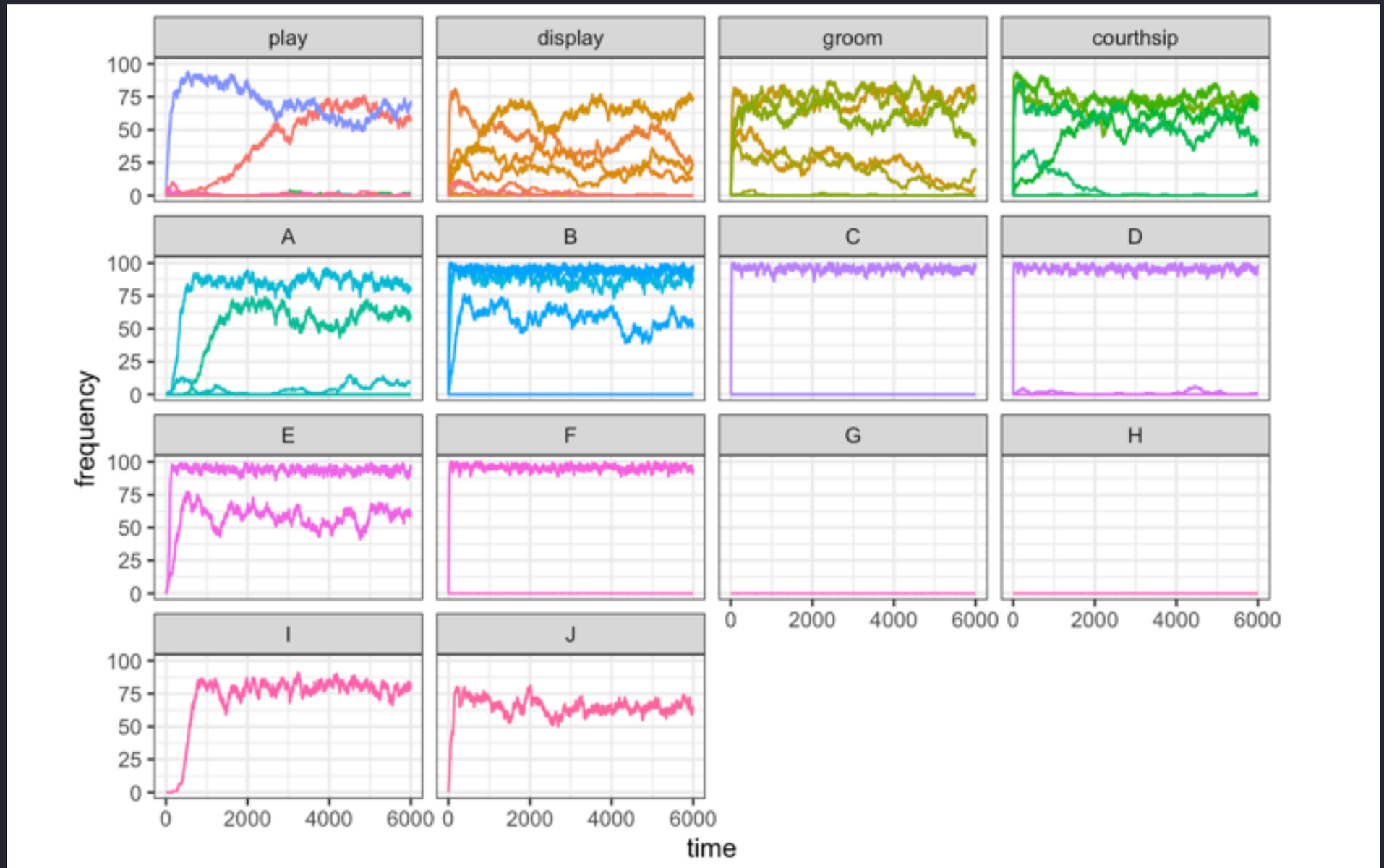


- oranzees are born naïve, and they fulfil their goals through individual innovations
- A further parameter *S* regulates the probability that innovations are socially mediated

Sub-category								
play	1	2	3	4	5	6	7	8
display	9	10	11	12	13	14	15	16
groom	17	18	19	20	21	22	23	24
courtship	25	26	27	28	29	30	31	32

Sub-category									Nutrient
A	33	34	35	36	27	38	39	40	Y
B	41	42	43	44	45	46	47	48	Z
C	49	50	51	52					Y
D	53	54	55	56					Z
E	57	58							Y
F	59	60							Z
G	61								Y
H	62								Z
I	63								Y
J	64								Z

Example run (one population)



Culture in oranzees

We aggregate results in the same way of Whiten et al.

For each population:

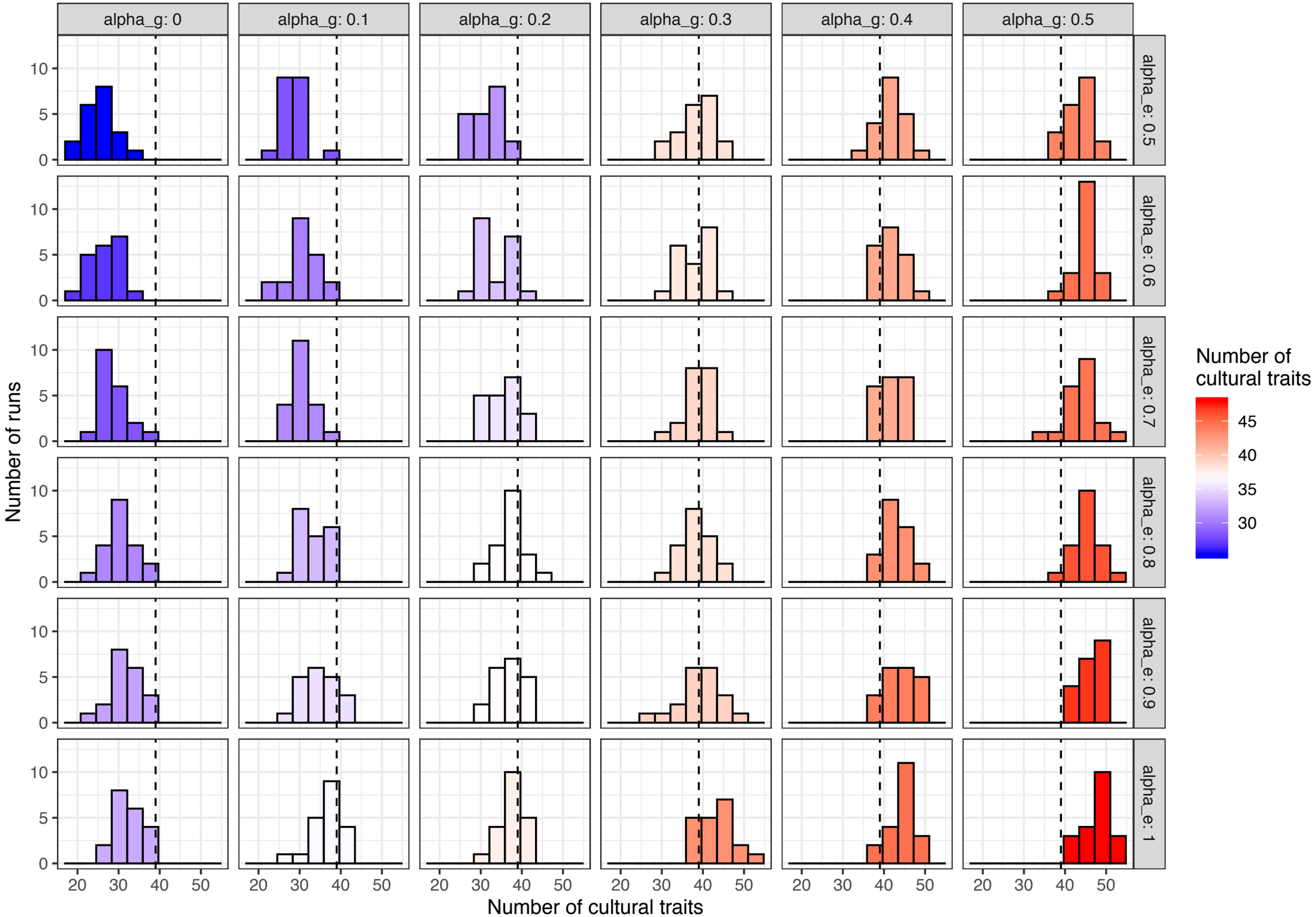
- *customary*: a behaviour observed in over 50% of individuals in at least one age class.
- *habitual*: a behaviour observed in at least two individuals over all the population.
- *present*: a behaviour observed in at least one individual over all the population.
- *absent*: a behaviour never observed.
- *ecological explanations* is a behaviour that is absent because of local ecological features (i.e. associated to $p_e = 0$).

For the six populations:

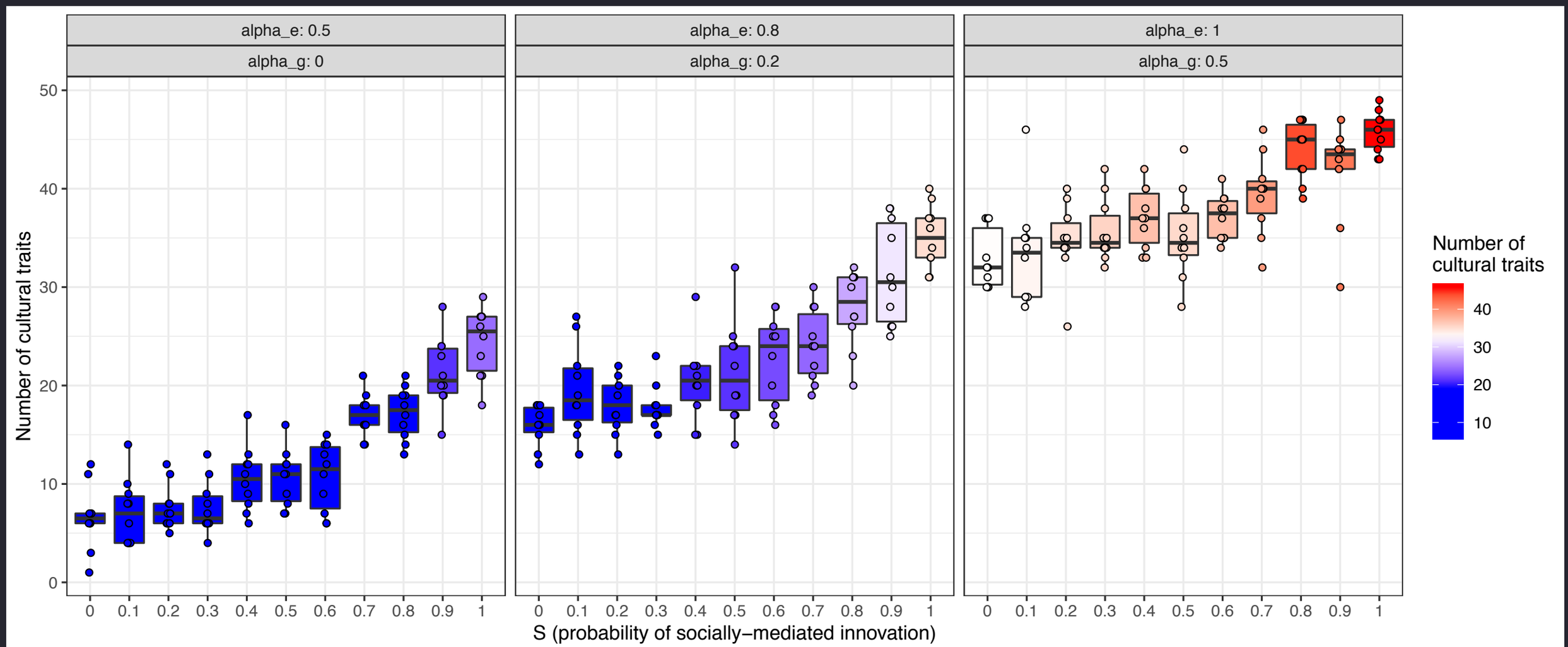
- A: patterns absent at no site.
- B: patterns not achieving habitual frequencies at any site.
- C: patterns for which any absence can be explained by local ecological factors.
- D: patterns customary or habitual at some sites yet absent at others, with no ecological explanation, i.e. the "cultural" behaviours.

- How likely is to reproduce Whiten et al. results without implementing high-fidelity social learning (copying) in oranzees?

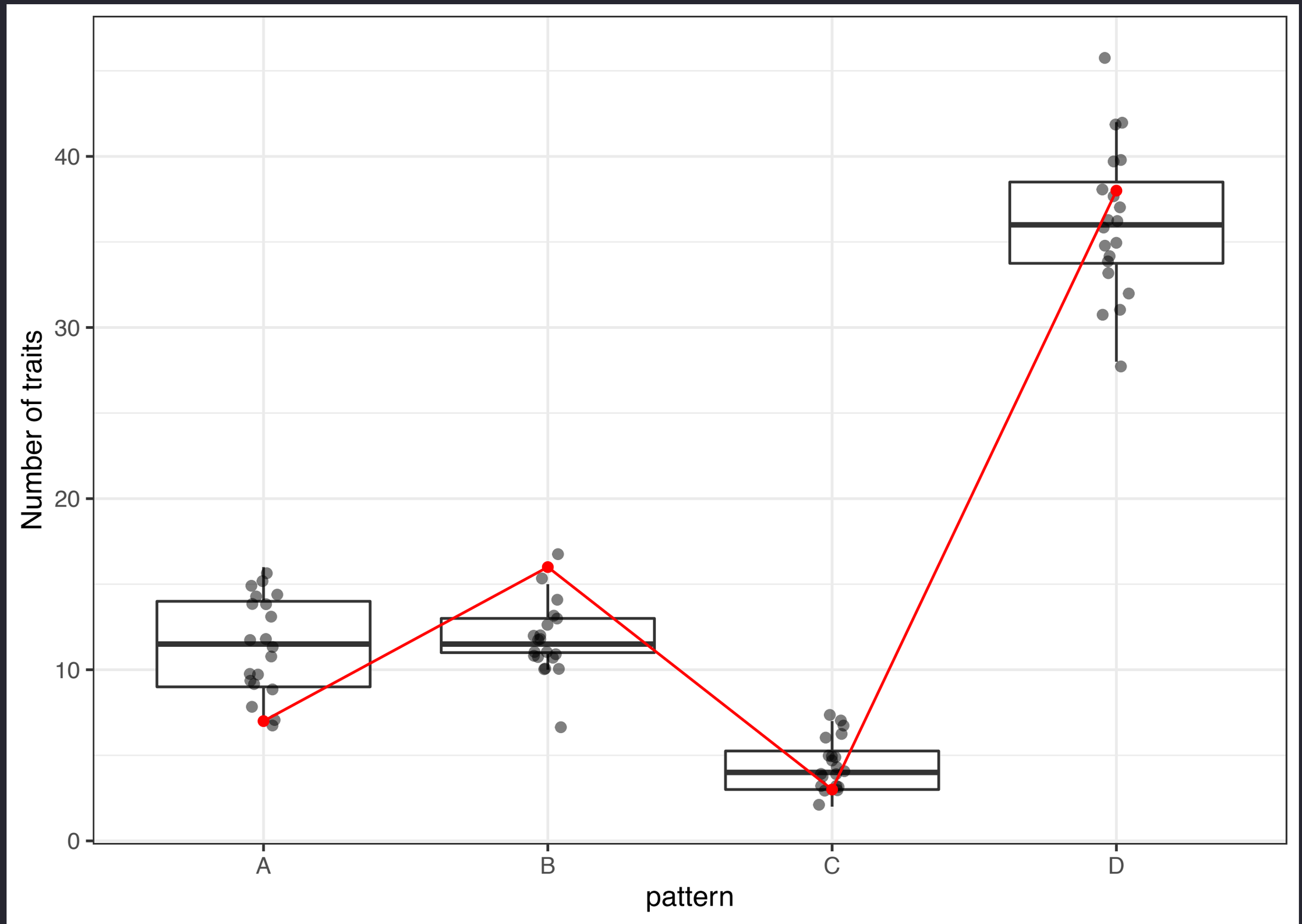
Culture in oranzees



Culture in oranzees



Culture in oranzees



Culture in oranzees

- We can reproduce the same distributions of Whiten et al. with various (and realistic) values of parameters

- The distribution in Whiten et al. does not prove the existence of culture in chimpanzees, or…

- …culture in chimpanzees is not dependent from high fidelity social learning (copying)

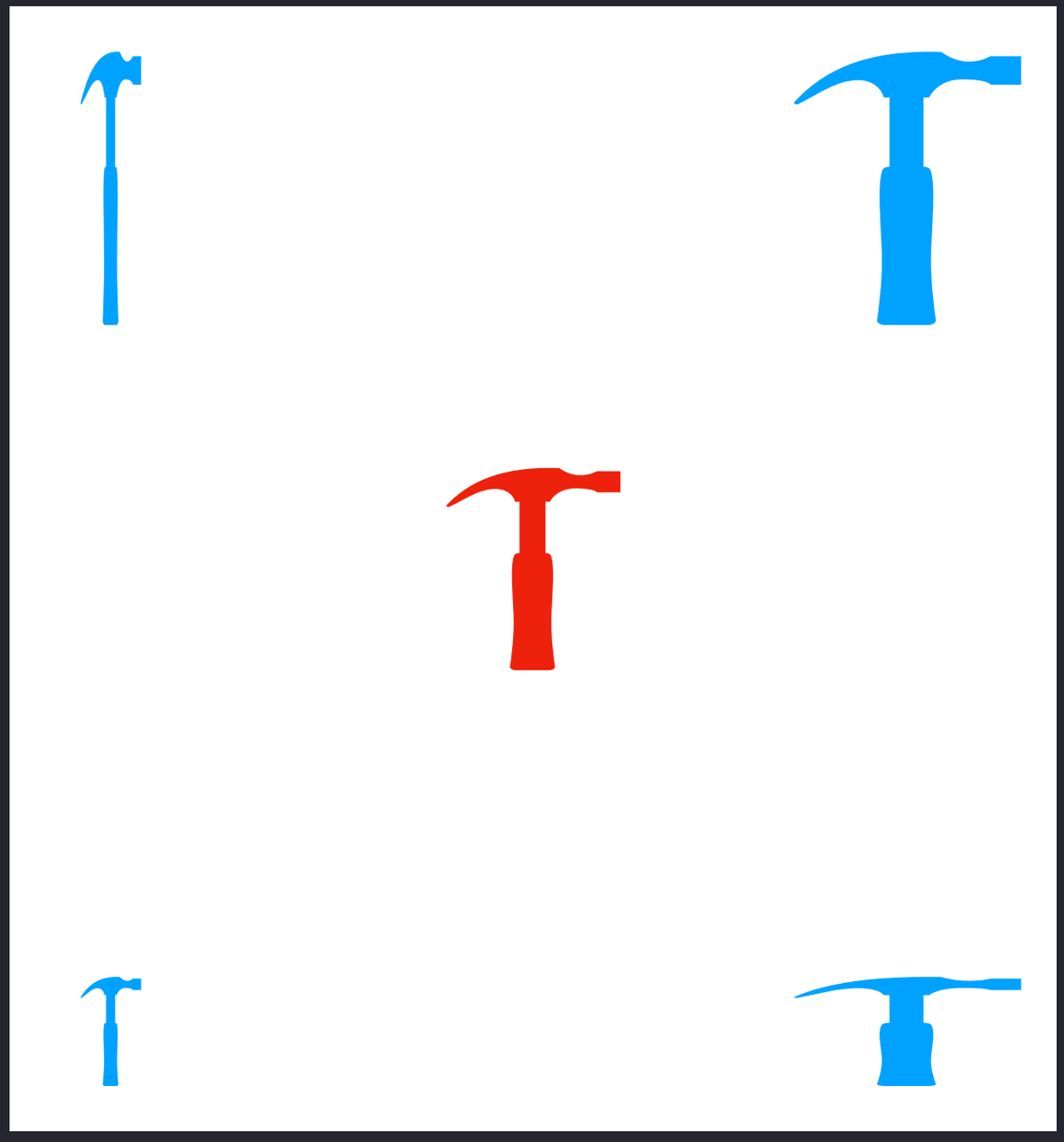
- Permanence of behaviours, artefacts, ideas, etc. (stability) is a necessary condition of culture

- In cultural evolution, stability is obtained by high fidelity social learning (copying) and/or selection

- We study convergent transformation where a trait causes the production of another trait that deviates from the original in a non random way

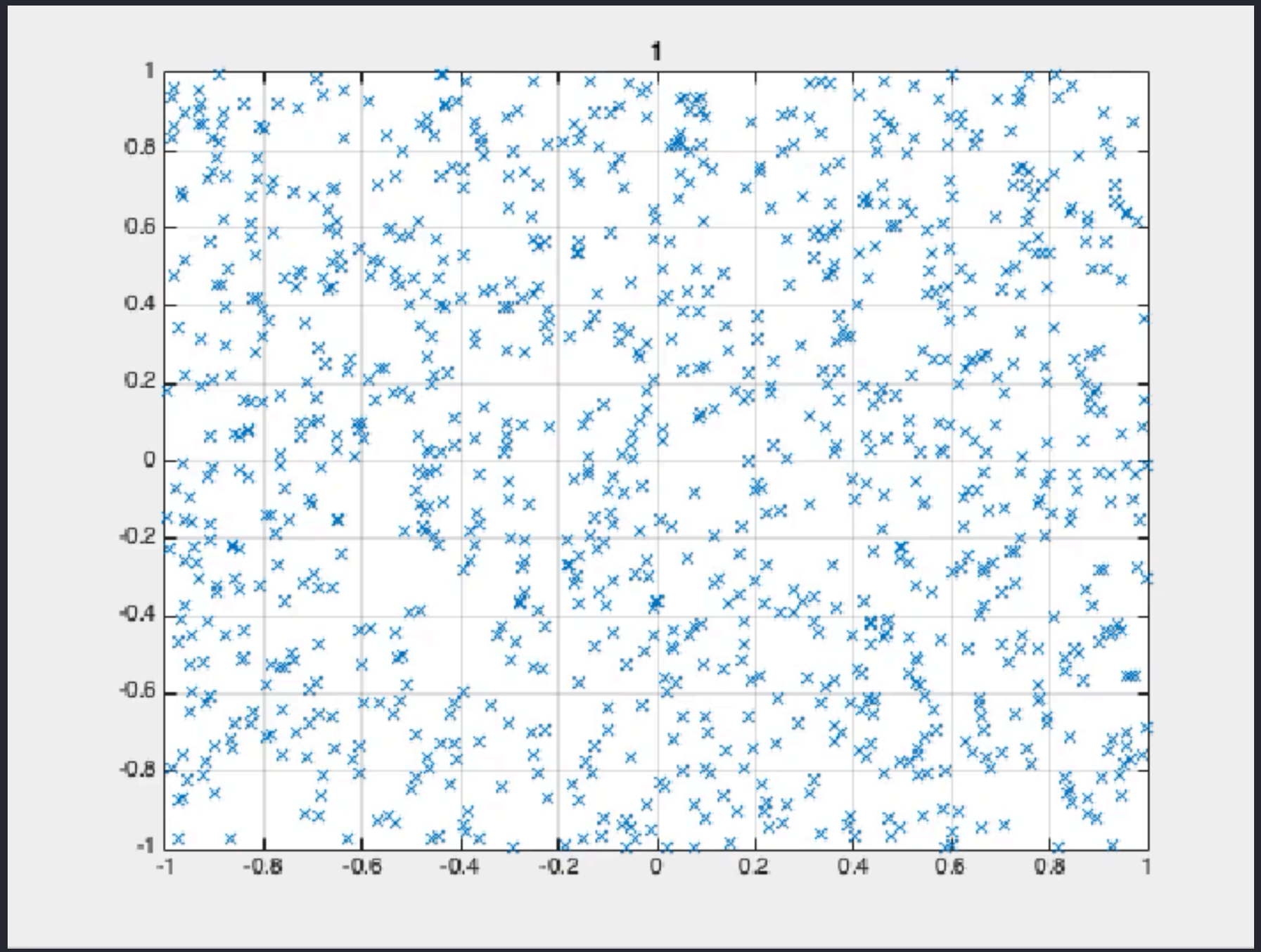
Cultural stability without copying or selection

- Population of evolving items in a bi-dimensional variation space



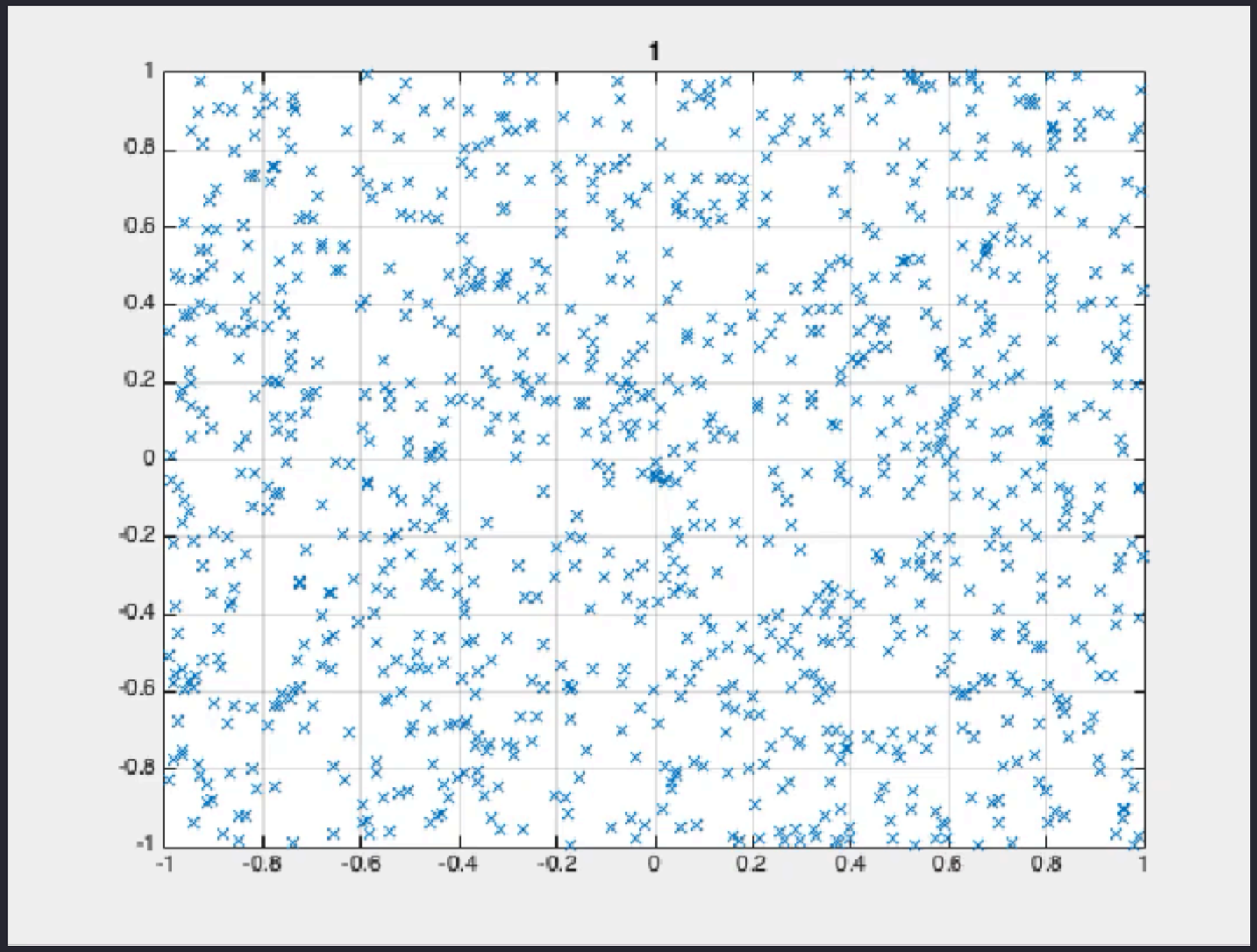
- Evolutionary processes:
  - replication
  - copying (random error) with no selection
  - copying (random error) with selection
  - no copying (convergent transformation) and no selection

Replication



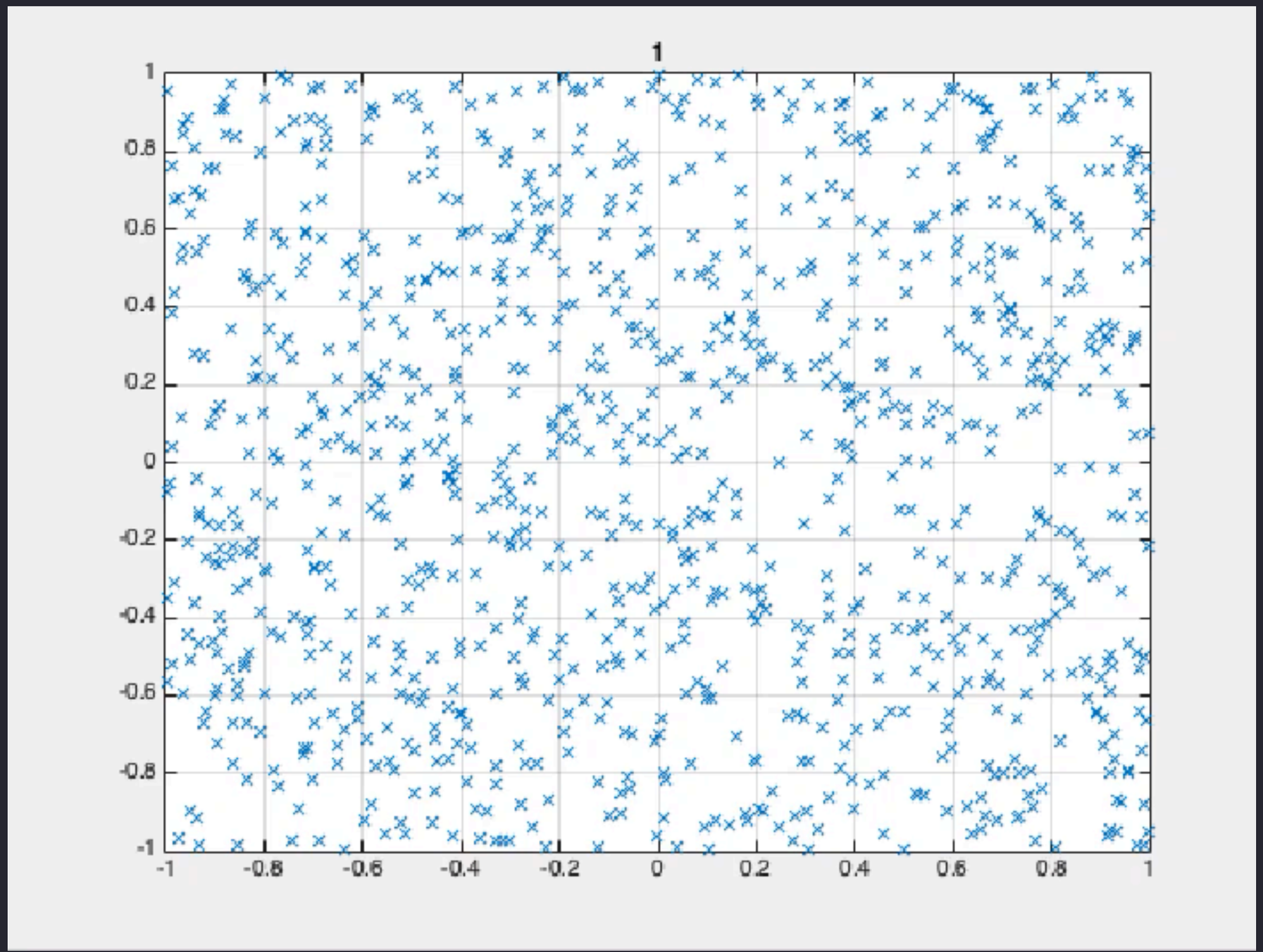
Cultural stability without copying or selection

Copying with no selection



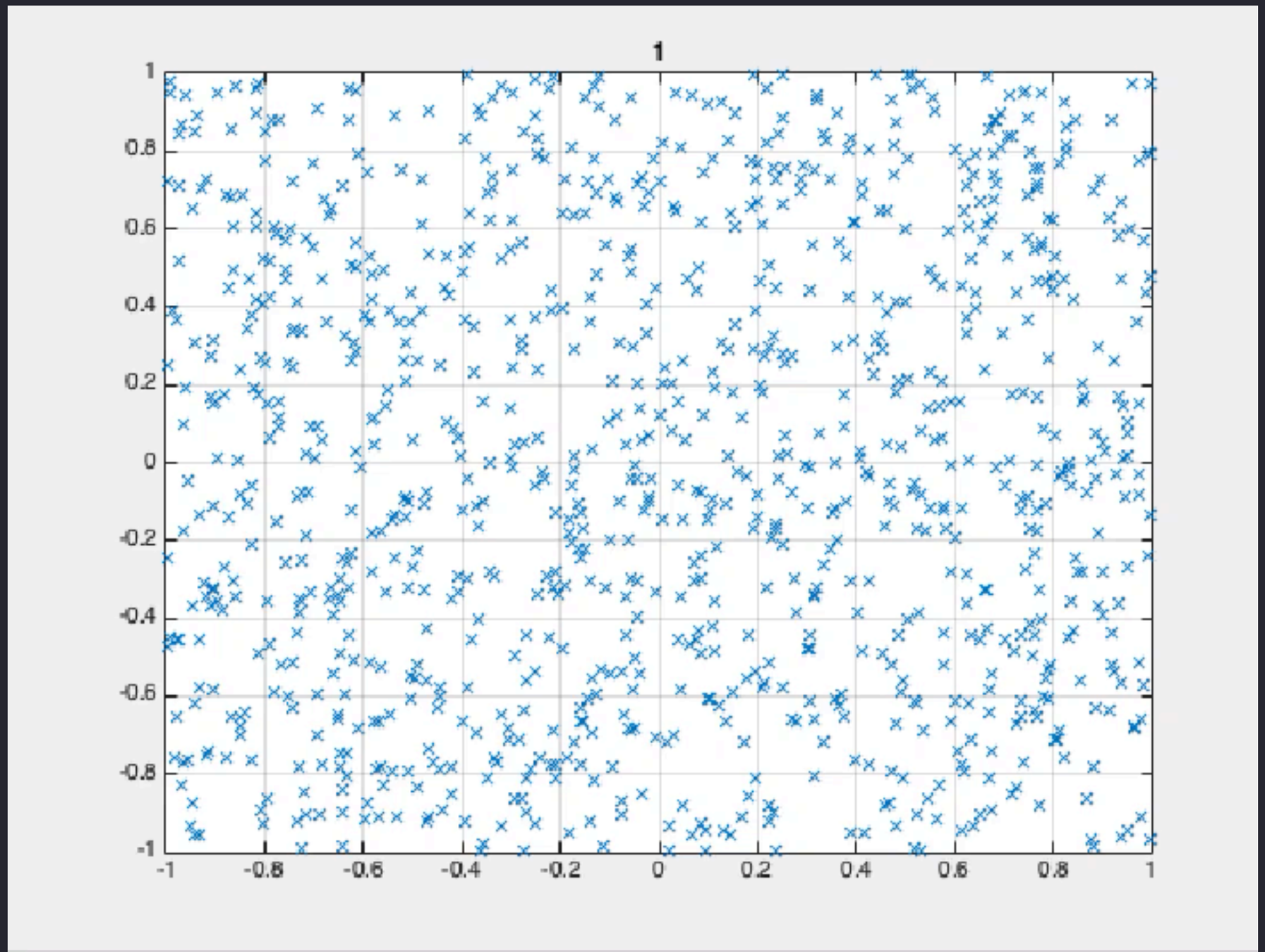
Cultural stability without copying or selection

Copying with selection

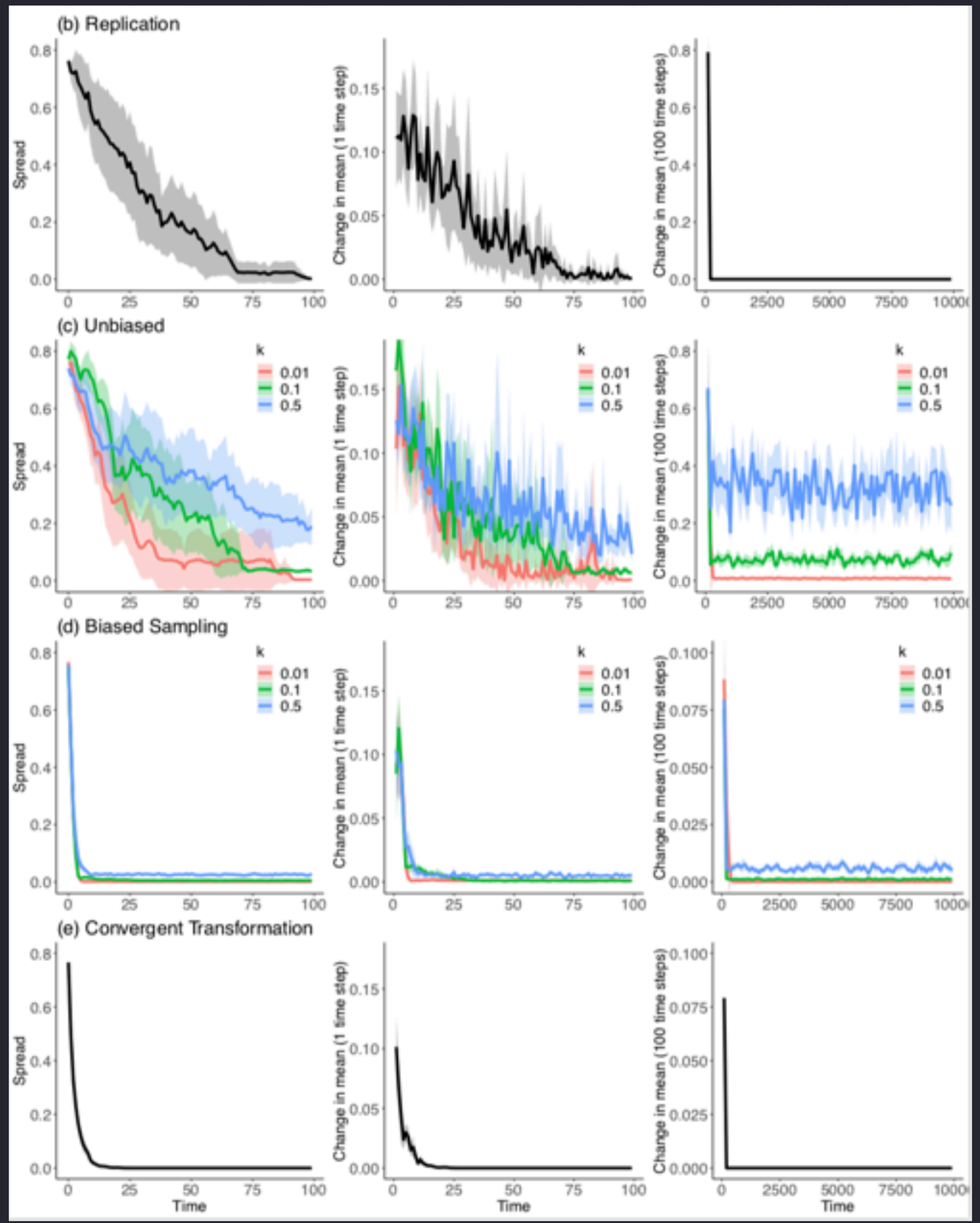


Cultural stability without copying or selection

Convergent transformation and no selection



Cultural stability without copying or selection



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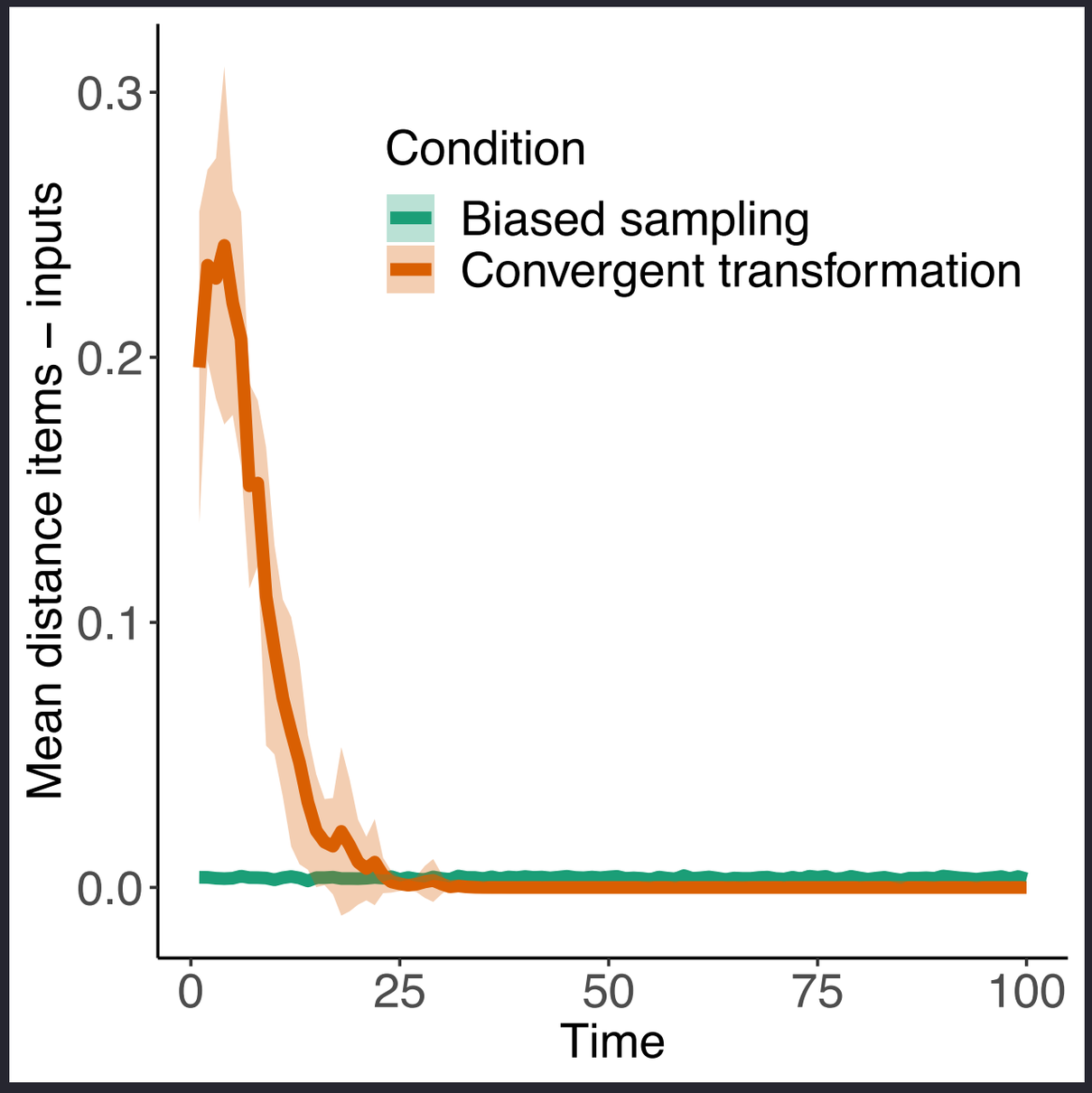


Cultural stability without copying or selection

- Stability is not a indicator of high-fidelity transmission and/or of selection

- High-fidelity can emerge from evolution by convergent transformations, it does not need to be a property of transmission mechanisms

- stable traditions are not cultural or…

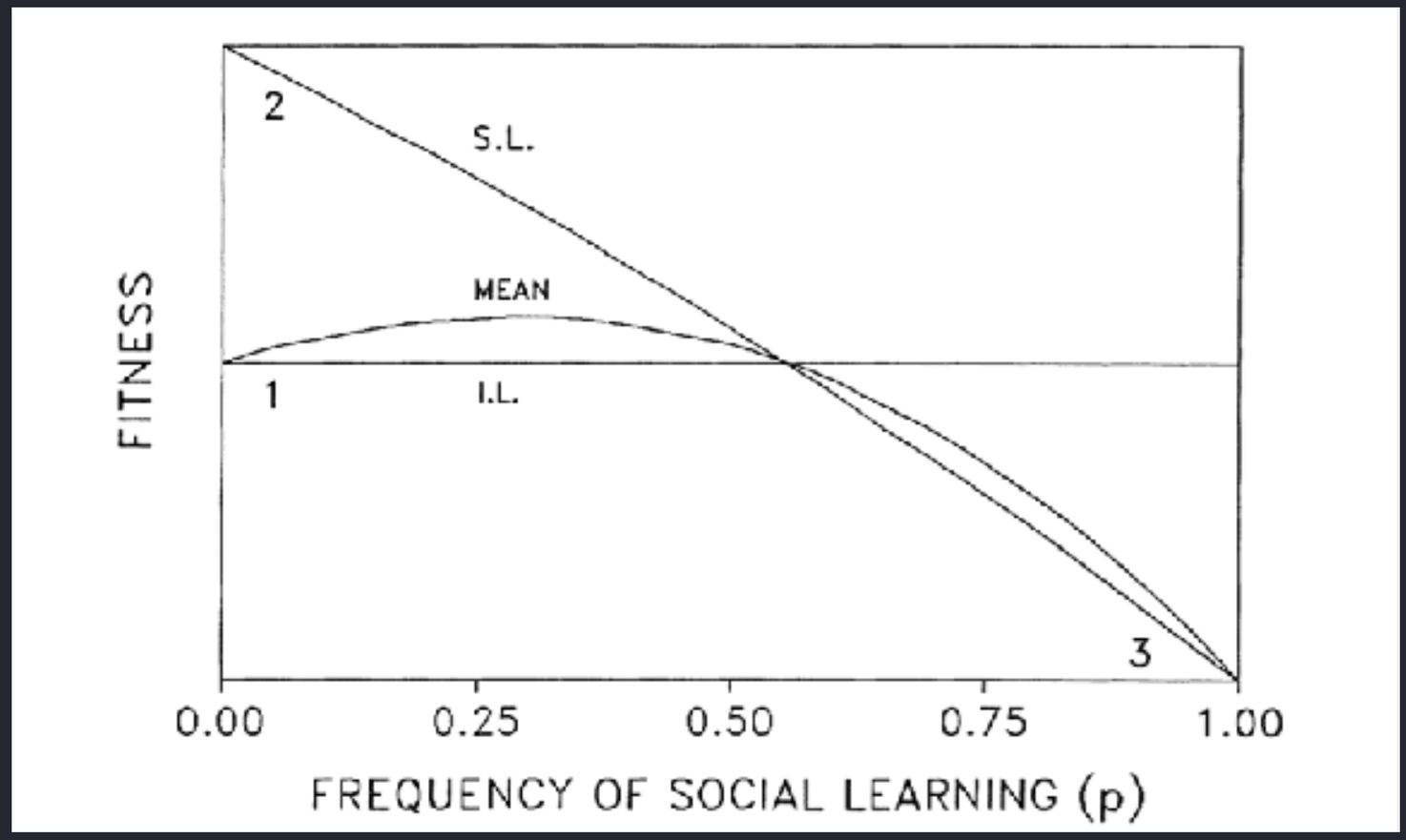
- …culture does not need high fidelity social learning

Conclusion

- Defining culture as socially learnt behaviour is problematic
- Considering social learning and individual learning two distinct processes is problematic
- Words' definitions are opaque (that's why we model!), but we need to be careful of the consequences for our theories/models

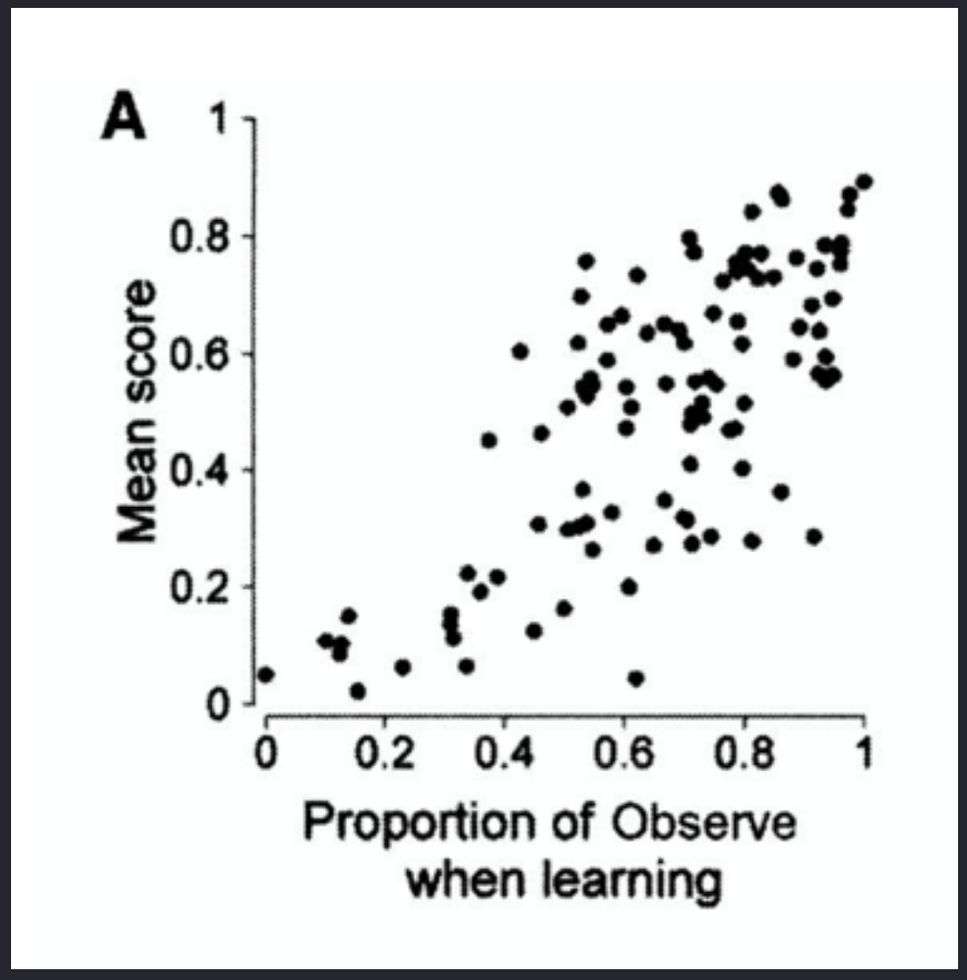
Conclusion

- models that assume that social learning evolves on top of pre-existent individual learning capabilities (e.g. Rogers' model)



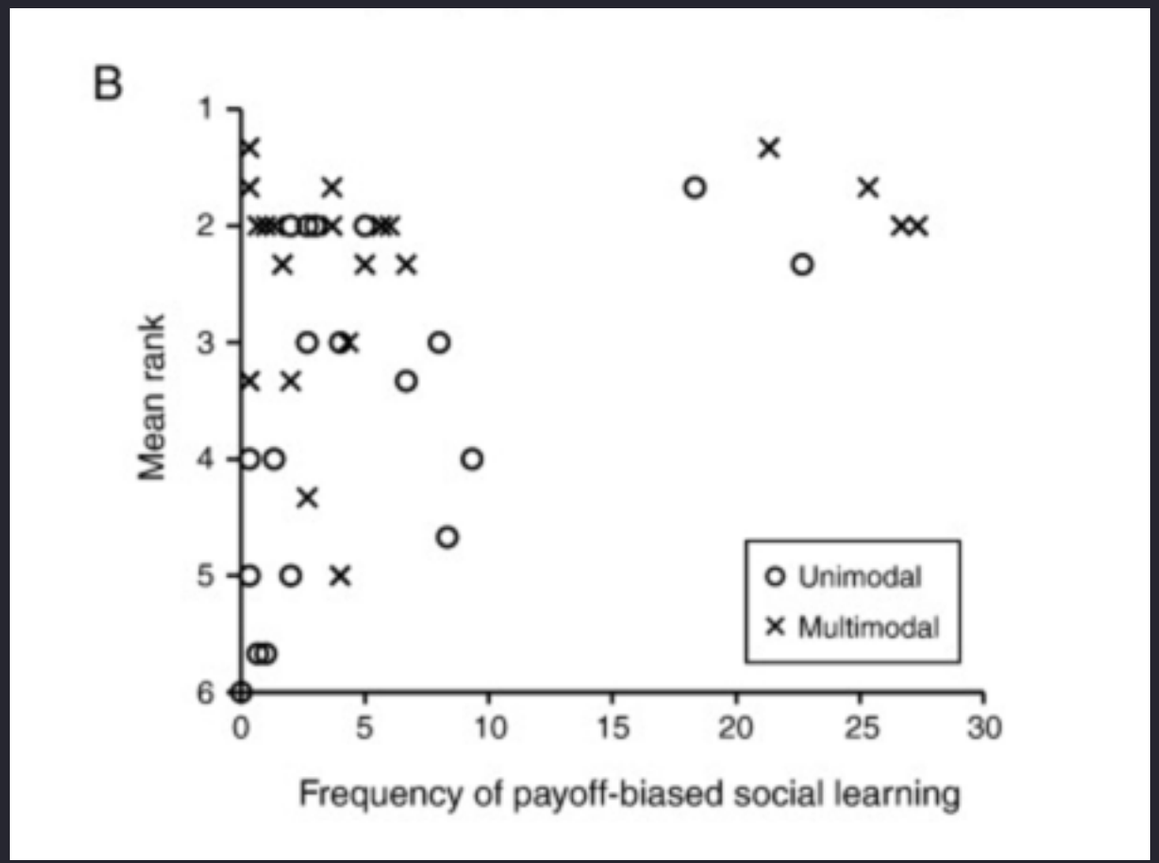
Conclusion

- model-based assessments of the relative importance of social versus individual learning (e.g. social learning strategies tournament)



Conclusion

- experimental assessments of the relative importance of social versus individual learning



Conclusion

Thank you!

Acerbi, Snyder, Tennie, Culture in oranzees, GitHub repository: https://github.com/albertoacerbi/oranzees

Acerbi, Charbonneau, Miton, Scott-Phillips, Cultural stability without copying or selection, OSF preprint: https://osf.io/vjcq3/