

Exploring Gloger's ecogeographic rule

Why organisms are darker in wetter & warmer environments

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BSc Hons Biological Sciences

Critical theory essay

For Dr A. Amar & Dr P. Sumasgutner

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Ecogeographic and biogeographic "rules"

Lomolino et al. (2006) outline the study of observed patterns or trends of organismal traits across geographical space. These ecogeographic "rules" (i.e. observations) highlight examples of pattern at broad ecological scales as consequence of processes at a range of scales.

Gaston et al. (2008) (has a def for Gloger's rule too) (also d/d's betw intrasp. traits, intersp. traits, and assemblage patterns (e.g. Bishop 2016 on ants) (in community properties or community trait avgs))

Ontogenetic level too! (Booth, C.L. 1990)

- Theory vs empiricism of "rules"
- Gloger's rule
- Manifestations of Gloger's rules
 - Intraspecific. Gloger's rule manifestations vs interspecific/community level manifestations (Lev-Yadun 2015)
- Some intro stuff
- "Herein, I argue that there is sufficient evidence to sup-

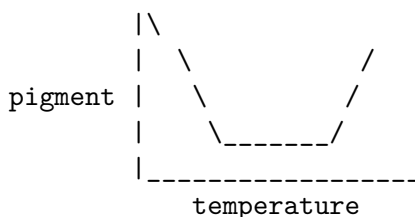
port Gloger's rule as a useful and true generalisation [...]"

Origins of the rule

- Gloger's observations
 - Gloger noted bird plumage darkness ~ warmth, humidity (Miksch; Burt & Ichida 2004)
- His contemporaries' thoughts
- Theoretical reasoning behind the rule

Evidence & examples

- ...
- Gloger vs anti-Gloger patterns (Lev-Yadun 2015)
- Does the pattern exist? Is it observed in the first place?
- Dissect the observations at the intrasp., intersp., and assemblage levels
- Kamilar & Bradley (2011) primate *interspecific* coat colour follows Gloger's rule -> little mechanistic work in this paper though! They speculate about 1) background matching, 2) anti-bacterial stuff, and 3) maybe thermoregulation (#FutureStudies)
 - unlikely to be UV, because primates live in trees!
 - * (not even in the upper-canopy, where UV is strong—primates do not spend tonnes of time up there)
- Bishop et al. (2016) ant *assemblage* work (ECTOTHERMAL):
 - organismal darkness as a modal pattern
 - at low temperatures for thermoregulatory needs
 - at higher temperatures for UV-B protection
 - also darkness incr with smaller body size
 - these patterns are evident at the *assemblage* level



- Animal vs plant e.g. -> differences in meaning and interpretation
 - Dominy & Lucas (2004) food colour and primates?
 - * could THIS connect to an environmental pattern in plant colour?

Mechanisms behind the pattern

- ...
- Burt & Ichida -> dark plumage resistant to bacterial degradation (~ pigments), a common problem in humid climates; methods: measure intrasp. Δ colour vs bacterial activity

- cf Koski & Ashman -> UV role (in plants)
- Persistent colour polymorphism (Tate et al. 2016) within a population of a species -> equivalent fitness of the morphs in heterogeneous habitats; results: darker species forage/hunt better in darker habitats (~ hiding in the ambient background). Since (Ruan says) darker habitats are wetter (ish), this relates to Gloger's rule.
- Connect evidence above to mechanisms described in their respective papers (if applicable)
- & mechanisms from other papers concerning pigment and environment (e.g. Tate et al. 2016)
- Dissect the observations at the intrasp., intersp., and assemblage levels MECHANISTICALLY
- Animal vs plant e.g. -> differences in meaning and interpretation for MECHANISM

Concluding remarks

- ...

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