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The illusion of invariant quantities in life histories.

Nee S, Colegrave N, West SA, Grafen A

Science. 2005 Aug 19; 309(5738):1236-9

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Recommendations:

Very Good **02 Sep 2005**

Sunetra Gupta
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INTERESTING HYPOTHESIS | TECHNICAL ADVANCE

DOI: 10.3410/f.1027635.334671

This paper deals the same blow to the theory of life history invariants as Wohler's synthesis of urea did to vitalism.

It will transform the field.

The accompanying Perspective is also a fine piece of writing (see Jong G, Science 2005, 309:1193-5 [PMID:16109870]).

Disclosures
None declared

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Exceptional **14 Sep 2005**

Andre de Roos
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CONTROVERSIAL | TECHNICAL ADVANCE

DOI: 10.3410/f.1027635.334871

After reading this excellent paper, you are bound to be sceptical about any study that attempts to infer understanding from a regression analysis of two log-transformed life history quantities.

Most remarkably, the paper shows that such a regression analysis is bound to yield a high R^2 value, even when the data are not related to each other.

In studies of life-history invariants, but also in the context of metabolic theory, the fact that a particular regression equation seems to fit data that span many orders of magnitude is forwarded as support for the theory. This paper basically shows that it is the other way around: the most important reason that the regression equation fits the data is not that the underlying equation applies, but that data spanning so many orders of magnitude are included in the analysis.

Disclosures
None declared

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Very Good **16 Sep 2005**

Nigel Yoccoz
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CONTROVERSIAL

DOI: 10.3410/f.1027635.335888

Reports the important finding that the careless use of ratios and regression analyses when analysing life history traits may lead to spurious results.

It is often tempting to use simple ratios or products of demographic parameters - e.g. mortality and age at maturity - and assess if such ratios or products vary among species, often by regressing one parameter against the other.

This paper clearly shows that such an approach does not provide adequate statistical evidence for the existence of invariant ratio or product.

Disclosures
None declared

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Exceptional **21 Sep 2005**

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CONTROVERSIAL | TECHNICAL ADVANCE

DOI: 10.3410/f.1027635.335880

This article demonstrates why the standard approach for testing for life history invariants is flawed.

For example, the standard approach for testing if offspring weight, w, is a constant fraction of mature weight, m, is to regress log(w) against log(m) and test if the slope is significantly different from unity.

Unfortunately, when offspring weight is some random fraction of mature weight, say uniformly distributed between 0 and 1, then the expected slope is unity, and provided the data cover a wide range of mature weights, then the proportion of the variance explained will be high (>0.70). This result is problematic for the study of life history invariants and might provide an explanation for several other remarkably consistent patterns in a range of other fields.

Disclosures
None declared

Add a comment

Exceptional **01 Nov 2005**

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CONTROVERSIAL

DOI: 10.3410/f.1027635.334742

Nee and colleagues point out a fundamental flaw in a method commonly used to examine life-history strategies.

Apparent invariance in the dimensionless ratios of pairs of life-history traits can arise when one is a fraction of the other and X is essentially regressed on X.

On log-log axes where X spans several orders of magnitude this inevitably leads to very high R-squares. It will be interesting to see if there are any implications for other areas, like macroecology, which also feature analyses of dimensionless ratios that span many orders of magnitude.

Disclosures
None declared

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Abstract:

ABSTRACT

Life-history theory attempts to provide evolutionary explanations for variations in the ways in which animal species live their lives. Recent analyses have suggested that the dimensionless ratios of several key life-history parameters are the same for different species, even across distant taxa. However, we show here that previous analyses may have given a false picture and created an illusion of invariants, which do not necessarily exist; essentially, this is because life-history variables have been regressed against themselves. The following
question arises from our analysis: How do we identify an invariant?
DOI: 10.1126/science.1114488
PMID: 16109879

Comments:

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