

Hurlbert S H. The nonconcept of species diversity: a critique and alternative parameters. *Ecology* 52:577-86, 1971. [Div. Biological Control, Dept. Entomology, Univ. California, Riverside, CA]

The literature on the measurement species diversity contains many semantic, conceptual, and technical problems. These are summarized and some solutions and alternative approaches are suggested. [The SCI® indicates that this paper has been cited over 120 times since 1971.]

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April 14, 1980

"In 1968 I was a postdoctoral fellow in the department of entomology at the University of California at Riverside and investigating, among other things, the effects of mosquitofish on freshwater ecosystems. I was especially interested in how mosquitofish predation altered the species diversity of zooplankton assemblages. In reviewing the ecological literature on diversity and, especially, on methods for quantifying the concept, I uncovered a few errors and much evidence that ecologists were approaching the measurement of diversity in an uncritical manner.

"The most basic problem was that indices of species diversity usually were selected on purely mathematical grounds without prior consideration of how diversity should be defined in ecological terms. This habit is unfortunately still widespread.¹

"More reasonable approaches gradually occurred to me and I decided to develop a paper on the topic. The paper went through several revisions, and changes in tone and title, becoming more critical with each one. It was accepted by the editor, Monte Lloyd, over the objections of the sole reviewer,

because he felt it would 'be stimulating to many ecologists.' I appreciated that independence of judgment. Ironically, in the obligatory final struggle for condensation, I had to delete a brief tribute to Lloyd's own work² on a related topic, viz: 'Lloyd (1967)... defined two parameters, mean crowding and patchiness, which, by the simplicity and directness of their biological interpretation, render superfluous much of the accumulated literature on indices of spatial distribution.'

"The attention this paper received came as no surprise. It strongly criticized certain fashionable approaches to an ecologically important topic. Some of the problems I pointed out probably were already widely recognized. To that extent, I was only stating publicly what many ecologists thought privately: the emperor has no outer garments and his underwear is in bad shape.

"More positively, my suggestion that the probability of interspecific encounter serve as a conceptual foundation for the quantification of diversity has appealed to some ecologists. It has also proved a useful foundation for the analysis of niche overlap.³ The provision of an exact expression for calculating the number of species expected in a sample from a community of known composition was the primary technical contribution of the paper. The expression is now used by many workers, and has been elaborated upon by Smith and Grassle.⁴ I suspect many citations have been of the neutral sort found in citation constipated introductions and discussions. A few workers have criticized the paper as being overly pessimistic, though without refuting any of its arguments. Admittedly, I have not read the majority of articles citing my own, since I never did further work on the topic. The zooplankton study that began the whole business has only recently (a decade late!) been written up. A much more solid, but less flashy, contribution than the 'non-concept' paper, it has already been rejected by *Ecological Monographs*: Monte Lloyd is unfortunately not on the editorial board of that journal."

1. **Hurlbert S H.** A paean to H. A review of *Ecological diversity* by E.C. Pielou. *Ecology* 59:422, 1978.
2. **Lloyd M.** 'Mean crowding.' *J. Anim. Ecol.* 36:1-30, 1967.
3. **Hurlbert S H.** The measurement of niche overlap and some relatives. *Ecology* 59:67-77, 1978.
4. **Smith W & Grassle J F.** Sampling properties of a family of diversity measures. *Biometrics* 33:283-92, 1977.