Biodiversity vs. paleodiversity measurements: the incommensurability problem

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1. Introduction
- The paper hypothesizes a current biodiversity crisis based on comparing paleodiversity and modern biodiversity.
- Claims it's harder to justify this crisis due to incommensurability between paleodiversity and biodiversity measurements.

2. Measuring Biodiversity
- **2.1 Disclaimer on Measurements**
  - Terminology and process orientation.
- **2.2 Species-Based Measurements**
  - **Species Richness Index:** Basic species count measure with limitations (sampling effect, nonlinearity).
  - **Menhinick Species Richness Index:** Corrects sampling bias but has conceptual issues (normal distribution assumption).
  - **Gini-Simpson Index:** Measures species richness and evenness but has non-linearity and practical issues.
- **2.3 Conceptual Limitations**
  - Richness and abundance as parts or proxies for biodiversity but not exhaustive measures.
- **2.4 Processual Approach**
  - Phylogenetic systematics operationalizes biodiversity through evolutionary history (Faith's PD index).

3. Measuring Paleodiversity
- **3.1 Basics**
  - Paleodiversity tracks macroevolutionary trends using fossil records (Sepkoski's paleodiversity curve).
- **3.2 Methodology**
  - Two-stage process: Fossil data collection and statistical correction to create paleocurves.
- **3.3 Issues in Data**
  - Incomplete fossil record, biases (differential preservation, sampling), classification issues.

4. The Incommensurability Problem
- **Conceptual Incommensurability**
  - Different frameworks and purposes.
  - Biodiversity as evolutionary process vs. paleodiversity as taxonomic patterns.
- **Data Incommensurability**
  - Different taxonomic levels (species vs. genera/families), representation biases.
- **Implications**
  - General crisis claims lack strong justification without shared measurement criteria.

5. Three Solutions
- **Restructure Paleodiversity:** Incorporate phylogenetic distance and functionality.
- **Simplify Biodiversity:** Operationalize biodiversity closer to taxa counts.
- **Eliminative Approach (Santana):** Focus on specific biological values rather than broad biodiversity.

6. Conclusion
- Recommends using a more practical approach by focusing on specific biological measures.
- Argues for more precise conservation strategies based on deconstructed biodiversity values.