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Title Ecological Modelling

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Abstract

An ecological model relates interactions within and between people and other life forms in an ecosystem context. Anthropologists use ecological modelling to address issues such as sustainability of cultural practices, population structures responding to policies, or ecological impacts of human activities. In Anthropology ecological modelling initially arose in response to Cultural Ecology as developed by Julian Steward and Leslie White, but eventually positioned agency and cultural processes as the principle drivers in ecosystems. Ecological models tend towards explanatory rather than descriptive accounts, with detail often specified at the level of individual interactions. Ecological modelling makes possible research that might otherwise be unethical or impractical.

Main Text

In Anthropology an ecological model describes and relates interactions within and between groups of people and other life forms, including associated knowledge, organisation, materials and processes, in material contexts including spatial range, terrain, rainfall and riverine networks. These models aid understanding the impact of activities and events within a corresponding ecosystem. Anthropologists use ecological modelling to explore, contextualise, form and evaluate conjectures and hypotheses relating to biological, social and cultural stability or change, addressing issues such as sustainability of cultural practices, population structures responding to policies, or ecological impacts of human activities.

Ecological modelling in Anthropology arose in the 1960s, adapting modelling concepts from Systems Ecology to theories of Cultural Ecology developed by Julian Steward (1902-1972) and Leslie White (1900-1975) from the 1930s to the 1950s, typified by Roy Rappaport (1926–1997), a student of Steward. Ecological modelling was initially criticised for its emphasis on identifying and maintaining static equilibria, inherited from Systems Ecology, and the position that culture was determined by ecological interaction. The response was a modelling approach emphasising agency and cultural processes shaping changes in human relationships to complex dynamic ecosystems rather than the converse.

Ecological models tend towards explanatory rather than descriptive accounts. Often models aim to support or validate ethnographic accounts. Populations and processes are represented in some detail, incorporating logical, mathematical or algorithmic descriptions of individually well-understood subprocesses, such as population growth in relation to available food or other resources. Detail is often specified at the level of individual interactions. Ecological models can be deterministic or non-deterministic. The former are usually represented as interacting differential equations, but can be less formal. Non-deterministic ecological models are much more common in Anthropology, typically evaluating the consequences of cultural practices, decision processes, or imposed policies in the context of probabilistic elements relating to resources, behaviours, decisions or other parameters, such as rainfall, crop yields, and birth or death events.

Ecological modelling makes possible research that might otherwise be unethical or impractical. In André Singer and J. Stephen Lansing's (1989) film, *The Goddess and the Computer*, Lansing uses ecological models to investigate the impact of Balinese religious practices on irrigation, water control, pest suppression and rice agriculture, and conversely potential impacts of Indonesian Government policies. Lawrence Kuznar (2001) employed novel ecological modelling to reconstruct prehistoric Andean society. Most ecological models are formed and evaluated manually. Increasingly, as in Lansing (2006) and Kuznar (2001), ecological models are enacted using a computer program or spreadsheet, providing scope for far more detailed and complex models.

See Also:
Ecological Anthropology
Environmental anthropology
Cultural ecology
Irrigation
Resilience and complex adaptive systems

References and Suggested Readings

Kuznar, L. A. 2001. *Ethnoarchaeology of Andean South America: Contributions to Archaeological Method and Theory*. International Monographs in Prehistory.
Lansing, J. S. 2006. *Perfect Order: Recognizing Complexity in Bali*. Princeton: Princeton University Press
Singer, A. and Lansing, J. S. 1989. *The Goddess and the Computer.* Film: 52 min. London: Independent Communications Associates.

Jørgensen, S. E., & Bendoricchio, G. 2001. *Fundamentals of Ecological Modelling*. London: Elsevier.