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The Evolution of Quail Research: Trends in Themes, Cognitive Extent, and Lexical Diversity

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THE EVOLUTION OF QUAIL RESEARCH: TRENDS IN THEMES, COGNITIVE EXTENT, AND LEXICAL DIVERSITY

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EXTENDED ABSTRACT

Language is an interesting characteristic that is unique to humans. Language represents a method of human communication and is believed to reflect a person's view of reality (Kramsch 2004). The words used by a person or a community provide insight into the ideas, concepts, and worldview held by people (Pennebaker et al. 2003). In science, publications represent a primary form of communication of ideas among scientists. Publications provide a historical record of a discipline and reflect the relative interest of a scientific community in particular concepts during a given era (Kim et al. 2018). Consequently, how word use in publications changes over time can provide valuable insight into the evolution of a discipline and help identify possible shifts in thinking of the scientific community (McCallen et al. 2019).

Quail science is a research domain that is over a century old. Studies of the life history and ecology of quail began appearing by the late 1800s, and investigations into the management of quail were circulating by the early 1900s (Bent 1932). Research on quail continued and increased during the 20th century and remains active at the beginning of the new millennium. Despite this long-term and active research trajectory, quail science appears to be a stagnant domain of research, with the same general topics being investigated decade after decade (Hernández 2021). I explore this qualitative impression of quail science and quantitatively assess the level of novelty in quail research. My goal is to address 2 general questions: 1) What are the main themes of quail research? and 2) How has the frequency of these themes changed over time? My research hypothesis is that, although the amount of quail research has increased over the past century, the cognitive territory covered by this research has remained more or less the same.

Addressing this hypothesis requires the definition of a few linguistical terms and concepts. In linguistics, *tokens* is the total number of words in a sample, and *types* is the number of different words in that sample (Malvern et al. 2004). For example, the phrase, "The bison herd grazed on the plains" has 7 tokens. Because 2 of the tokens represent a repetition (the word "the"), the phrase contains only 6 types. Linguistic scientists have used the ratio of types (number of different words) to tokens (total number of words) as a measure of *lexical diversity*, that is, the level of vocabulary richness (Malvern et al. 2004). Repetition of words causes an imbalance in the number of types to tokens; thus, higher repetition results in lower lexical diversity and vice versa (Jarvis 2013). *Cognitive extent* is a concept similar to lexical diversity but is based on the number of unique phrases appearing in a text (Milojević 2015). It operates at the level of phrases rather than single words, requires large unit quotas of text, and reflects the cognitive territory being covered by the literature (Milojević 2015).

I used the Proceedings of the National Quail Symposia as the literature base to conduct a linguistic assessment of quail science. I obtained the titles, authors, and abstracts of all articles appearing in the 8 volumes of the proceedings, a literature corpus that spanned 45 years (1972–2017). I determined the number of articles appearing per volume and the number of years between volumes to obtain a standardized measure of publication rate (number of articles/year). I also calculated the lexical diversity of article titles to obtain a measure of mean lexical diversity by volume. Because calculating cognitive extent requires large unit quotas, the sample size of articles appearing in the proceedings was too small to calculate cognitive extent for the proceedings. Thus, I conducted a literature search for quail-related articles in 11 ecological journals using the Web of Science database. These journals were Conservation Biology, Ecology, Ecological Applications, Ecological Monographs, Ecosphere, Journal of Animal Ecology, Journal of Applied Ecology, Journal of Wildlife Management, Oecologia, Wildlife Society Bulletin, and Wildlife Monographs. I calculated the cognitive extent of quail science using article titles of this larger literature corpus. For comparative purposes, I also calculated the cognitive extent of the general ecological research appearing in these journals. The amount of quail research published in the proceedings increased exponentially during the 45 years (Figure 1). The number of articles more than doubled from 1972 (n = 40 articles) to 2017 (n = 94 articles). The number of coauthors per article also increased from a median of 1 author (range: 1–4) in 1972 to 4 authors (range: 1–12) in 2017. Despite an apparent exponential increase in the amount of quail research, the cognitive extent of quail science appeared stagnant during 1973–2020 based on the 11 journals (Figure 2). In contrast, the cognitive extent of general ecological research in these journals steadily increased over the same time period (Figure 2).

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Historians of science suggest that the evolution of a discipline appears to follow a model of iterative and incremental growth, a pattern that has been described as cyclical development (Nunez-Mir et al. 2015). In such cyclical development, a scientific field (or domain of research) begins with a stage of theoretical conceptualization in which concepts are defined and central hypotheses are identified. This stage is followed by a stage of experimentation where theory is tested (Nunez-Mir et al. 2015). The knowledge gained from the experimentation stage results in refinement and expansion of the theory, which is broadened to include new concepts and perspectives arising from such experimentation. The refined theory then reenters the cycle, and the scientific field or domain of research advances in an iterative, incremental manner (Nunez-Mir et al. 2015). Ecological research appears to conform to such a model of cyclical development based on its incremental increase in cognitive extent over time. In contrast, quail research does not. No new ideas or concepts appear to be entering the domain given its relatively constant and unchanging cognitive extent. Stated differently, the quail scientific community appears to be retracing the same cognitive territory decade after decade. Consequently, quail research seems to be a domain suffering from a lack of novelty and creativity.

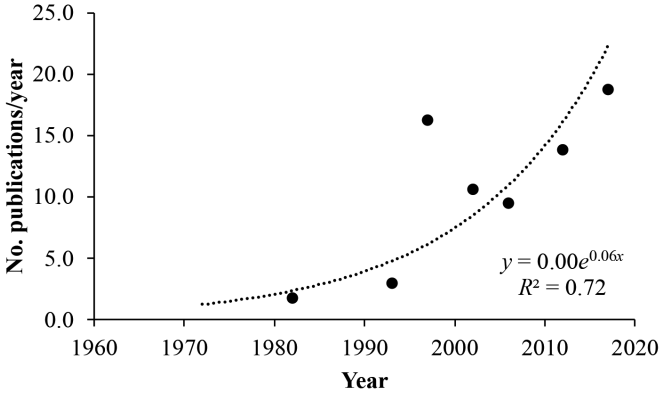

Fig. 1. Trend in publication rate (number of publications/year) in the Proceedings of the National Quail Symposia, 1972–2017.

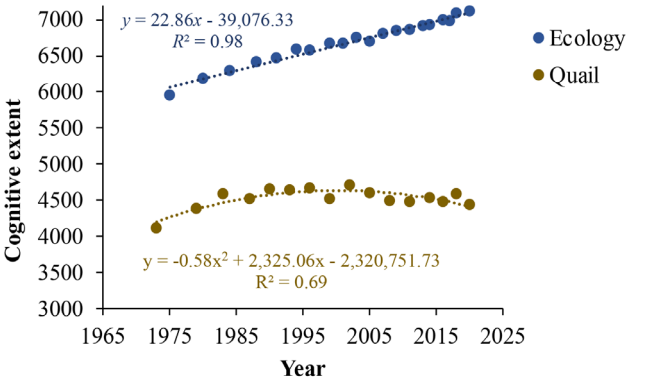

Fig. 2. Trend in cognitive extent for quail research and general ecological research appearing in 11 ecological journals, 1973–2020.

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Keywords: cognitive extent, content analysis, creativity, cyclical development, lexical diversity, northern bobwhite, quail, quail science, scientometrics, text mining

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