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LETTERS

EDITORIAL: SHOULD SINGLE OBSERVATIONS BE PUBLISHED?

Observation of a single natural event can bias one's biological perception because the event may appear to occur more frequently than it actually does. Because the frequency of occurrence of an event is often equated with the event's biological importance, single observations have been given little credence in the scientific literature, especially by ecologists. This topic is especially pertinent for *The Journal of Raptor Research* because the aims of the Raptor Research Foundation, Inc., call for the study and conservation of all raptors, not merely those that are sufficiently abundant and accessible for intensive study. Consequently, *The Journal of Raptor Research* has published articles based on single observations. Reports of single observations may waste space in any scientific journal if a larger and more representative sample could be obtained with reasonable effort. However, there are several reasons why single events should be published on their own, or be mentioned as unusual occurrences when describing a more frequent event.

In some instances, events may be so rare that it requires many published reports of one event each for a concept to gain recognition. What biologist in her or his right mind would design a study of the rare use of rocks dropped by Ferruginous Hawks (*Bueto regalis*) presumably attempting to deter human intruders? One published record of this exists (C.L. Blair 1981, *Raptor Res.* 15:120). Would doubt of an event's existence linger in one's mind if the event could not be re-examined? Members of the French Academy of Sciences refused to accept the existence of meteorites for nearly all of the eighteenth century. Academy members chose to ignore reported sightings of falling meteorites because the fall was never witnessed by Academy members (B. Barnes 1988, About science, Basil Blackwell Inc., NY)

Another reason for taking seriously rare observations that may "occupy the valleys of concept topography," is because part of knowing what something is, is to know what it is not. If a behavior or character is truly rare in the biological world, this rarity itself has potentially important implications. The existence of an event, no matter how rare, indicates that genes and environment have made a match. The rarity of an event that nonetheless exists suggests that under currently existing selective scenarios the behavior or character has not been favored yet. It could represent the raw material for future evolution.

Another reason for taking rare events seriously touches on the potential limitations of the scientific way of knowing. Some very perceptive scientists encourage us to focus widely, not narrowly. According to them, the hypothetico-deductive method is one of many tools available to the scientist. K. Lorenz (1983, Der Abbau des Menschlichen, R. Piper and Co. Verlag, Munich, Germany) cautions that hypothesis testing can be akin to chickens pacing for hours trying to reach food close to them but behind a single panel of 10 m of fence. If the chickens were released some distance from the fence and saw the food from there, they would have a better chance to perceive a route around the fence than if they find themselves within touching distance barred by wire. T.S. Kuhn (1970, The structure of scientific revolutions, University of Chicago Press, Chicago, IL) suggests that contrary to the textbook's portrayal of reconstructed scientific progress, scientific understanding evolves in three stages that repeat themselves. "Normal science" occurs when hypotheses are tested, "extraordinary science" marks the appearance of unexplained anomalies, and "scientific revolutions" occur when old paradigms and theories are abandoned and reformulated into new ones to include anomalies. T.S. Kuhn makes much of the importance of anomalies. Anomalies can be rare in and of themselves, or only rarely perceived because they are not within the scientist's primary focus. Sometimes unusual events are only recognized as anomalies after one's conceptual framework changes (A. Lightman and O. Gingerich 1991, Science 255:690–695). For these reasons also, unusual events deserve to be described in detail.

In summary, one can defend the cautious use of single observations in enhancing biological understanding and justify their publication. Such observations can be important in furthering biological understanding, they can be a great source of inspiration for new ideas and they make for interesting reading. I thank Gary R. Bortolotti, Richard J. Clark, Michael Collopy, C. Stuart Houston and Cristoph Rohner for their helpful comments on this manuscript.—**Josef K. Schmutz, Department of Biology, University of Saskatchewan, Saskatoon, Canada S7N 0W0.**