Experiments are the key to understanding socially acquired knowledge in cetaceans

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Abstract: We agree with Rendell and Whitehead that cetaceans acquire knowledge from caretakers and peers, and that a clear understanding of this process can provide insight into the evolution of mammalian cognition. The passive observational methods they advocate, however, are inadequate for determining what cetaceans know. Only by experimentally investigating the cognition of cetaceans can we hope to understand what they learn through social interactions.

Under the tutelage of extraterrestrial black monoliths, prehistoric man-apes learned a skill not possessed by any other animal, a skill that ultimately gave rise to the complex human societies of today.[1] According to science-fiction author Arthur C. Clarke (1968), this skill was the ability to identify and use tools. Others would suggest that abilities such as speech, imitation, self-awareness, or pedagogy were the key adaptations leading to human advancement (reviewed by Tomasello 1999). The human-specific evolutionary processes proposed by these cultural theorists are hardly less mysterious than alien interventions. Rendell & Whitehead (R&W) provide a welcome respite from such Kipling-esque tales of Renaissance apes. Their descriptions of cetacean behavior should serve as a wake-up call to those that believe primates are the only animals capable of acquiring knowledge from their caretakers and peers (see also Box & Gibson 1999).

Cultural research often focuses on identifying key differences between humans and other animals. These isolationist tendencies have been driven by philosophical arguments about the role of language/intention/awareness in thought (Macintyre 1999). Like R&W, we are dissatisfied with such anthropocentric approaches. Neuroscientific and behavioral evidence suggest many similarities between cognition in cetaceans and humans (reviewed by Schusterman et al. 1986). Like R&W, we want to understand why such cross-species similarities exist

R&W suggest that cetacean culture can best be understood through passive behavioral observations in naturalistic social settings. Observational methods are useful for describing cetacean social structure and behavior, but less so for understanding what knowledge cetaceans possess, or how they acquire this knowledge. The ethnographic criteria proposed by R&W for what counts as evidence of culture (e.g., novelty, complexity, inexplicability) are highly problematic. Differentiating strategy shifts from innovations using observational methods is not possible and complexity lies in the eye of the beholder. How one might dissociate the influence of such interdependent factors as heredity, environment, and individual learning from that of social learning (which entails individual learning from perceived events that affect environmental conditions) is unclear. Many of the examples R&W provide as evidence of culture (e.g., vocal mimicry) do not require social interactions. Young cetaceans accompanying conspecifics (including mothers) will have opportunities to acquire similar knowledge, independent of whether those conspecifics know the youngsters exist.

R&W advocate ethnographic studies of cetacean culture on the premise that field observations provide a window into the real lives of cetaceans. Observing behavior in a natural setting does not, however, guarantee ecological validity (Hammersley 1992). Most of the observations reviewed by R&W were made by nearby humans. This invasion of privacy could affect behavior in unpredictable ways. A related concern is the proportion of cetacean behavior actually observed. Visual observations in the field are typically limited to opportunistic surface encounters occurring during the day. Behavior that occurs at night and/or underwater, in the absence of human observers, has scarcely been described. Drawing inferences from such grossly under-sampled observations of possibly observer-influenced behavior is probably not the best scientific approach to understanding cetacean culture.

Ethnographic studies of human culture usually involve participating observers. The human ethnographer, in addition to gaining a first-hand immersion experience, has the ability to interview subjects and determine whether they agree with her interpretations. Although this approach has succeeded in generating a large corpus of descriptions of human culture, it has produced only highly speculative theories about the evolutionary origins of human culture, and little understanding about how culture affects the behavioral development of humans. What then can we expect from the non-interactive ethnographic studies of cetaceans advocated by R&W?.

R&W suggest that learning capacities demonstrated experimentally are not representative of natural abilities. Most data, however, indicate that mental abilities exhibited by animals in laboratory conditions are strongly predictive of their competencies in the wild (Balda et al. 1998; Moss & Shettleworth 1996). Social learning, in particular, appears to be enhanced by unnatural conditions rather than degraded, as evidenced by the cultural sophistication of humans who have created totally artificial environments within which to live. Similarly, cetaceans given the choice between living in a natural setting or an artificial one may voluntarily choose the latter (Pryor 1991). Innovation is most likely to occur when animals have less to worry about (Gardner & Gardner 1994). The reliability of food and safety available in enclosures may thus be more conducive to observations of innovations, and their subsequent spread through a social group, than natural conditions.

Experimentation does not necessitate captivity. Field experiments can be as informative as laboratory experiments. An experiment could be as simple as introducing interesting artifacts into cetaceans' habitats and observing if (and how) different species interact with them. With respect to social learning, it might be particularly interesting to introduce objects that might be useful or attractive to cetaceans (e.g.,"snack" vending machines, vibrating massage stations, or shark-repelling enclosures). Assuming one or more cetaceans can discover the benefits of these artifacts (which would entail acquiring some new knowledge), one could measure the time it takes for other cetaceans to acquire this knowledge, and the conditions under which they do so.

Lorenz (1952, p.147) noted that, "It is only by living with animals that one can attain a real understanding of their ways." Cetaceans provide unique opportunities for such experimental approaches because of their willingness to interact socially with humans (Busnel, 1973). Scientists can "participate to investigate" in several ways. One approach might be to live with cetaceans in a shared environment for several months, and see what happens (Lilly 1967). Alternatively, groups of animals could be housed in more conventional settings, and given daily opportunities for cross-species interactions across several years (http://www.dolphininstitute.com). More naturalistic shared environments (e.g., the shallow waters of Shark Bay, Australia) are also feasible (Conner & Smolker 1985).

Socially acquired knowledge may differ from other knowledge primarily in terms of the events that are learned about (Shettleworth 1998). Comparing cultural faculties across different species without knowing what those faculties are is like comparing some fruits with some other fruits. Experimental studies are more likely to increase our understanding of the cultural capacities of cetaceans than are passive observations.

NOTE

1. See Clarke (1968) for the details of this fictional account.

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