

Can culture be inferred only from the absence of genetic and environmental factors?

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Abstract: Rendell & Whitehead's minimalist definition of culture does not allow for the important gaps between cetaceans and humans. A more complete analysis reveals important discontinuities that may be more instructive for comparative purposes than the continuities emphasized by the authors.

Although Rendell and Whitehead (R&W) choose a rather straightforward definition for culture, we think that this concept is insufficiently discussed in the target article. However, instead of debating about whether cetaceans have or have not a culture, we would rather like to concentrate in our commentary on the possible differences between cetacean culture and human culture.

A distinction is made by linguists and cognitive psychologists between performance and competence (Chomsky 1965). While performance refers to observable behaviors (e.g., spoken language as we hear it), competence refers to the set of rules and operations that make performance possible. This distinction can also be useful to critically examine R&W's approach because these authors seem to allude only to performance in discussing animal culture. We would like to focus on the interest of bringing up such distinctions in relation to culture in order to fully understand the nature and consequences of attributing its form of culture to cetaceans.

We start by pointing out some of the features that are associated with culture, in its full human sense. First of all, a single process of information transmission such as imitation cannot solely define culture. In this respect, and notwithstanding the controversies surrounding the definition of imitation (e.g., Calef 1998, many animal species and even invertebrates such as octopuses (Fiorito & Scotto 1992) show evidence of fast learning by observing conspecifics performing a specific action. Now, would it be sufficient to state from this finding that octopuses have a culture? Certainly not. Concerning the definitions of cultural behaviors (e.g., JW's Table 1), we note that all these definitions rely on some sort of social behavior (learning, modification, etc.), with or without reference to its likely mechanism (namely, some form of imitative behavior). But surprisingly, the proposed definitions do not mention competencies or processes related to culture for the organisms possessing it. In humans, some crucial features appear to be linked to culture either as necessary components or its by-products. Thus, language and more generally symbolic and instrumental systems probably constitute the main features of human culture. But culture is hard to conceive outside a process of accumulation and complexification of knowledge over generations (e.g., Donald 1991; Tomasello & Call 1997). A starting point of culture is the establishment of social rules that have a commonly defined conventionalized medium for which language is likely to be the best candidate. Moreover, it is likely that culture is organized as an autonomous system and thus presents similarities with linguistic organization. Each relation within this system is tied to other relations. In humans, this system has become independent from biology in such a way that the constraints acting for stabilization or for changes in a given culture are internal; and these features no longer require a parallel evolution of natural or genetic environments.

Let us briefly consider what could be equivalent in cetacean culture to the devices we just mentioned. First, according to R&W's minimalist definition, culture appears as soon as the behavioral repertoire is sufficiently broad to respond to environmental changes. From then on, a given species can develop specific traditions because learning abilities are, flexible enough to

make these behaviors possible. Is the existence of such flexibility sufficient to lead to culture or even to protoculture? We think it is not. In effect, cetaceans apparently have neither built artifacts nor accumulated cultural traits over generations. It is thus likely that the social repertoire of dolphins or whales have not changed over millions of years because of this lack of accumulation whereby culture at time $t + 1$ would depend on culture at time t .

Second, we would like to challenge the idea that inter-group variations not based on environmental or on genetic factors should automatically yield culture. A more economical explanation could be provided by the authors for all examples concerning cultural behaviors. For example, acoustic variations observed in humpback whales can be explained without reference to necessary environmental or/and genetic changes (a similar argument could be made for the sponging by dolphins in the target article). They could simply reflect the play of random processes associated with the plasticity of learning mechanisms. Thus, whales at the beginning of the breeding season might produce various songs that end up converging toward a unique interpretation within the group. In this respect, the case of robots is interesting, since robots can also learn simply by interacting with other robots (e.g., Picault & Drogoul 2000). It could be said that the observed change in their learning abilities that robots in the B group have a different "culture" from that of robots in the A group. However, using the concept of culture in such a context would be purely metaphorical.

Third, we think that the interesting question to ask is why cetaceans which possess advanced cognitive abilities, a complex social life, long lifetimes, and extended mother-infant relations, have not developed a true culture, in the sense we referred to earlier?

Three main functions can be identified in relation to cultural behavior of humans. The first function concerns the ability to cope with different environments (relations to the world). The second function controls social regulations (through language and other media), while the third deals with the relations between the representations built by our individual and the universe (as expressed by several systems of shared values such as an aesthetic, and religion that Darwin (1871) called "spiritual agencies." It seems that only the first function is present in cetaceans and that its role is minimal: a dolphin borer in captivity could probably survive in a more natural environment. The second and third functions are surely not fulfilled. If there are indeed some good evidence that dolphins can understand acoustic or gestural commands, it has not yet been shown that this kind of understanding is equivalent to human language (Vauclair 1996).

In brief, we think that considering the specificity of human culture lead to interpreting this concept when it is used in cetaceans in a more restricted and precise sense compared to the one used by R&W in effect, cultural manifestations in cetaceans or in other animal species can only be punctual and express responses to environmental constraints. Because these cultural components are reactions, they cannot serve (as it is the case for humans) as stimuli for prompting other cultural elements. If animal culture obviously reflects a behavioral flexibility associated with sophisticated learning abilities, a cultural behavior is not embedded in a system. Consequently, because of the predominance of environmental pressures, there is no cultural drift as these pressures lead to maintaining behavioral stability; in this respect, animal culture is highly reliant on environmental features.