

Animal behavior in conservation biology

Short communication

As a component of biotic community, different species of animals need to behave and interact with one another in a wide range of natural conditions which help to understand the function of, and variation in animal behaviors.^{1,2} However, human activities, such as poaching, wildlife trading, habitat destruction and fragmentation, and introduction of invasive species are commonly observed to aggravate the rates of vulnerability and extinction of many wild animal species and their natural behaviors.³ To combat with these multifaceted problems, conservation interventions depend on the knowledge of species biology, behavior, and ecology. Understanding of how human activities can modify behaviors and subsequently, cause negatively impacts on the biodiversity of an area is crucial. From a management perspective, searching for the fitness consequences of behavioral responses may provide insights into the impacts of certain human activities on wild animals. For example, a strategy to better manage the negative impacts of tourism on wild animals is to understand the proximate mechanisms underlying the response of wild animals to humans.^{4,5} Under such conditions, management decisions should be focused on manipulating behavior because it can be used as a leading indicator of anthropogenic disturbances or population health conditions.³ Moreover, unlike population density, animal behavior instantaneously can be changed with changing of environment.^{5,6}

How does understanding the behaviors of an animal species contribute to its conservation? The answer might vary depending on the focal species but it has profound consequences for our efforts toward conserving endangered and/or rare species. By doing so, the conceptual framework can provide novel management questions and can help to make the structure of the scientific study of an endangered species. For example, behavioral knowledge implicitly guides conservation and monitoring strategies because ranging patterns, breeding times and locations affect spatial and temporal aspects of population censuses.¹ Previous theoretical and empirical studies suggested that behavioral responses of organisms to environmental changes are quick and can represent true leading indicators which are useful to conservation biology.^{3,5,6} However, the linkage between animal behavior and conservation biology is very weak due to historical and cultural setbacks,⁷ and scientific roadblocks.^{8,9} For example, differences in scales, themes, professional biasness, and approaches have hindered such important progresses. Recently, a growing interest in integrating an understanding of animal behavior into conservation biology is clearly present.^{6,9} By virtue of this reality, recent books and journals imply to a new movement toward integrating animal behavior and conservation biology.⁹ For example, a number of behavioral biologists have written several reviews and book chapters on the role and importance of animal behavior in conservation arguing which form a fundamental understanding of behavioral processes for contributing to conservation biology.^{1-3,6-13} Without a clear conceptual framework for such integration, conservation biologists may have difficulties to recognize that how behavioral knowledge can help them to solve real-world conservation problems.^{6,9} For example, if behavioral research becomes more central than to conservation, it needs more professionals working at the interface, and its nature should also be changed.^{1,6,8,9} Most importantly, it needs to focus on

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aspects of animal behavior which are most likely to influence vital rates or susceptibility to exploitations or perturbations by humans.^{9,13}

Conservation biologists have already begun to apply general principles of animal behavior to solve conservation problems.^{5,9} In serving to examine both the sources of conservation principles and the expanded concept of biodiversity conservation, it is clear that animal behavior should be considered as an explicit part of conservation biology.⁹ Animal behavioral studies should change their focus on study from individuals to populations of organisms as conservation biology which has successfully emerged from population ecology, population genetics, and population sociobiology.^{4,9,14,15} Leading animal behaviorists should mention the ways in which animal behavior and conservation interact,² investigate the conservation impacts of people,^{4,15} and identify novel behavioral threats to wild populations of animals.¹³ Animal behaviorists may also act to conserve biodiversity by applying their professional skills to conservation problems, or they may act on a personal level by supporting conservation groups and acting locally to preserve animal habitats. Consequently, animal behaviorists should develop theoretical and empirical frameworks which can help to identify conservation priorities and behavioral approaches using for conservation applications. Animal behavior and conservation is relatively a new approach with no underlying paradigms.⁶ However, the underling paradigms can be derived from the two fields i.e. "animal behavior and conservation biology". In view of the relevance of combining animal behavior and conservation, I recommend that "animal behavior in conservation biology" should be treated as followed.

Conclusion

As an applied science, "animal behavior in conservation biology" should be investigated based on the integration of behavior and conservation biology paradigms. The first approach is "the behavior and the individual species or population" approach. It is indispensable for the species and populations which are biological entities and can be easily defined and measured. Therefore it is relatively easy to model animal behaviors and provide reliable predictions for conservation applications. Human activities are usually observed to modify animal behaviors^{5,15} that will ultimately impact biodiversity. To make ease of investigation, behavioral indicators can be used as cues of anthropogenic disturbances. Management decisions are, therefore, made for manipulating animal behaviors through the implementation of proper conservation measures. However, there

are so many animal species and populations are endangered and their managerial resources are also limited. Hence, it is not usually possible to address all human induced behavioral and conservation problems for each animal population or species separately. Rather, in recent years, holistic approach is sought as another conservation alternative for better successes. The holistic approach deals with higher levels of ecological organizations, i.e. community, ecosystem, and landscape. In holistic approach, any effort to conserve the behaviors of one animal species may be based on the account of some other species. For example, by studying several species simultaneously, one species can gain a much better understanding of how different species respond to the same ecological problems (e.g. disturbance, climate change, disease prevalence, etc.). However, whether different animal species respond to stimuli in the same or different way which can be used as good information for answering to both conservation and behavioral questions. Each approach has its own advantages and limitations in comparison to the other; however, the optimal approach should be chosen based on the existing realities. Thus, I suggest that both approaches should be treated in an integrated fashion to conserve and sustainably utilize the biological resources found on the planet earth.

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Conflict of interest

The author declares no conflict of interest.

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