

Editor:

Stan Kuczaj
Department of Psychology
University of Southern Mississippi
118 College Drive #5025
Hattiesburg, MS 39406, U.S.A.
animalbehaviorandcognition@gmail.com

Associate Editor:

Lauren Highfill
Department of Psychology
Eckerd College
4200 54th Avenue South
St. Petersburg, FL 33711, U.S.A.
highfile@eckerd.edu

Editorial Advisory Board:

Adam Barrett, University of Sussex, UK
Patrick Bateson, Cambridge University, UK
Robert Batsell, Kalamazoo College, USA
Isabel Behncke, Oxford University, UK
Thomas Bugnyar, University of Vienna, Austria
Fay Clark, Bristol Zoo, UK
Holli Eskelinen, Dolphins Plus, USA
Justin Gregg, Dolphin Communication Project, USA
Martine Hausberger, University of Rennes, France
Gisela Kaplan, University of New England, Australia
Alban Lemasson, University of Rennes, France
Eduardo Mercado, University of Buffalo, USA
Ádám Miklósi, Eötvös University, Hungary
Robert Mitchell, Eastern Kentucky University, USA
Tadamichi Morisaka, Kyoto University, Japan
Kazuo Okanoya, University of Tokyo, Japan
Mathias Osvath, Lund University, Sweden
Sergio Pellis, University of Lethbridge, Canada
Anne Russon, York University, Canada
Marek Špinka, Institute of Animal Science, Czechia
Masaki Tomonaga, Kyoto University, Japan
Jennifer Vonk, Oakland University, USA
Shige Watanabe, Keio University, Japan
Meredith West, Indiana University, USA
Deirdre Yeater, Sacred Heart University, USA

Editorial Assistants:

Holli Eskelinen, Pepper Hanna, Lauren Miller

ABC logo and cover designed by Conrad Eskelinen
Cover: Gorilla with bark board
Photo Credit: Jim Schulz, Chicago Zoological Society



Animal Behavior and Cognition

Special Issue on Environmental Enrichment

2015, Volume 2, Number 3

- iii More Research on Environmental Enrichment for Animals is Needed
Lauren E. Highfill and Stan A. Kuczaj II
- 200 Putting the “E” in SPIDER: Evolving Trends in the Evaluation of Environmental Enrichment Efficacy in Zoological Settings
Christina Alligood and Katherine Leighty
- 218 The Four Cs of Psychological Wellbeing: Lessons from Three Decades of Computer-based Environmental Enrichment
David A. Washburn
- 233 Impact of Different Forms of Environmental Enrichment on Foraging and Activity Levels in Gorillas (*Gorilla gorilla gorilla*)
Kristie Charmoy, Tim Sullivan, and Lance J. Miller
- 241 Sex, Age, and Individual Differences in Bottlenose Dolphins (*Tursiops truncatus*) in Response to Environmental Enrichment
Holli C. Eskelinen, Kelley A. Winship, and Jill L. Borger-Turner
- 254 Human-Animal Relationships: The Use of Species-Typical Food Calls and Chimpanzee (*Pan troglodytes*) Names: Welfare-Oriented Tools to Manage Sanctuary Chimpanzees
Leilani Case, Akie Yanagi, Erin Loeser, and Amy Fultz
- 267 Young Belugas Diversify Adult Beluga (*Delphinapterus leucas*) Behavior
Heather Hill, Sara Guarino, Shirlee Crandall, Emily Lenhart, and Sarah Dietrich
- 285 Utilizing Scents as Environmental Enrichment: Preference Assessment and Application with Rothschild Giraffe
Caitlin Fay and Lance J. Miller
-

More Research on Environmental Enrichment for Animals is Needed

Lauren E. Highfill
Eckerd College

Stan A. Kuczaj II
University of Southern Mississippi

It has been ten years since the publication of Swaisgood and Shepherdson's (2005) seminal review of research on environmental enrichment in zoo animals, and the study of animal enrichment has blossomed in the interval. Nonetheless, the answers to many important questions continue to evolve. What exactly does it mean to "enrich" an animal's life? How does enrichment improve an animal's well-being? For that matter, what do we mean by "well-being"? What is the relationship between well-being and welfare? These are complex and important questions for scientists investigating animal enrichment and animal well-being as well as individuals involved in the care and management of animals, and the efforts being made to answer them are invaluable.

The papers in this special issue of *Animal Behavior and Cognition* are intended to stimulate discussion about existing approaches to studying and improving animal well-being. It is our hope that such discussion will provide the foundation for improved enrichment efforts, better methods for evaluating the efficacy of various enrichment efforts, and a better sense of what constitutes animal well-being and welfare.

Allgood and Leighty's article jump-starts the special issue with an excellent and comprehensive review of recent environmental enrichment research that supplements an earlier effort by Mellen & MacPhee (2001). Their article should be required reading for anyone interested in environmental enrichment, and provides a solid framework from which to interpret research in this area.

Washburn presents an examination of computer-based enrichment within a laboratory. Although a common goal of enrichment is to increase species-typical behaviors, Washburn demonstrates that enrichment need not be limited to naturalistic experiences (see also Kuczaj, Lacinak & Turner, 1998). He notes that "manipulating a joystick or responding to a touchscreen might not look exactly like foraging in the wild, but the difference is technological, not psychological" (p. 227). Consequently, enrichment efforts need not be constrained to efforts to create situations that encourage species-typical behaviors and mimic challenges in the species' natural environment. This is an important perspective to consider when addressing concerns of visitors' perceptions of laboratory and zoological settings. In addition, Washburn's discussion of "The four Cs of psychological well-being" (comfort, companionship, challenge, and control) highlights the need for research that addresses the significance of these variables for animal welfare.

The remaining articles focus on specific enrichment strategies within zoological institutions. Charmoy, Sullivan and Miller assess the effectiveness of different forms of enrichment for a group of Western lowland gorillas. Automatic belt feeders proved most successful at increasing foraging behaviors, but their results emphasize the importance of the unpredictability of the enrichment (see also Kuczaj et al., 2002), as well as the need for multiple enrichment sites when attempting to enrich a group of animals with a hierarchical dominance structure.

Eskelinen, Winship, and Borger-Turner present a systematic examination of responses to enrichment within a group of bottlenose dolphins, and illustrate the importance of considering age, sex, and personality when attempting to enrich animals' lives. Despite these differences, there was a general tendency for these dolphins to prefer enrichment that involved human interactions, perhaps because human behavior provides more variability than do objects typically used for enrichment (see Kuczaj et al., 2002). However, it is also possible that human interaction provides social stimulation that objects cannot. Of course, the nature of the interaction is also important. Case et al. report that the use of species-typical

vocalizations (by human caretakers) was slightly more effective than the use of other human vocalizations when humans wished to shift the locations of members of a group of chimpanzees.

Hill et al. demonstrate that enrichment does not always come in the form of caretakers modifying aspects of the environment. Although age, sex, and personality influenced the interactions of the belugas with all forms of enrichment, their data suggest that social grouping can be a form of enrichment for beluga whales and that the presence of young animals can be enriching to adults. More research is warranted on social interactions as forms of enrichment, including both within and across species interactions.

The final article in the special issue examines olfactory enrichment in the Rothschild giraffe. Fay and Miller's article highlights the importance of considering individual differences when designing enrichment, a recurring theme throughout the special issue. Allgood and Leighty report that only 3% of peer-reviewed enrichment articles focused on hoof stock species, so we hope the Fay and Miller article will stimulate additional research with underrepresented species.

There is clearly much that remains to be learned about animal well-being and environmental enrichment. One thing that is clear is that species vary, as do individuals within a species, and enrichment programs must be tailored to individuals and species if they are to be successful.

The overwhelming majority of research on environmental enrichment has focused on animals in zoological settings (in addition to articles in this issue, see Hosey, Melfi & Pankhurst, 2009), and although much remains to be done in this area, expanding research on well-being and enrichment in laboratory and farm settings is necessary to improve our understanding of how to best assess animal well-being and to improve best practices for environmental enrichment in a variety of contexts. In this same vein, there is precious little research on pet well-being and effective ways to enrich the lives of the hundreds of thousands of pets in human care (Weiss, Mohan-Gibbons & Zawistowski, 2015). In addition to expanding both the species and contexts being studied, we urge more research on the efficacy of social enrichment, especially for social species. Loneliness can have negative physical and psychological consequences (Capioppo et al., 2015), and we need to know more about the ways in which loneliness and other forms of impoverished social structures affect animals in all domains.

References

- Allgood, C., & Leighty, K. (2015). Putting the "E" in SPIDER: Evolving trends in the evaluation of environmental enrichment efficacy in zoological settings. *Animal Behavior and Cognition*, 2(3), 200–217. doi: 10.12966/abc.08.01.2015
- Capioppo, J. T., Cacioppo, S., Cole, S. W., Capitanio, J. P., Goossens, L., & Boomsma, D. I. (2015). Loneliness across phylogeny and a call for comparative studies and animal models. *Perspectives on Psychological Science*, 10, 202–212.
- Case, L., Yanagi, A., Loeser, E., & Fultz, A. (2015). Human-animal relationships: The use of species-typical food calls and chimpanzee (*Pan troglodytes*) names: Welfare-oriented tools to manage sanctuary chimpanzees. *Animal Behavior and Cognition*, 2(3), 254–266. doi: 10.12966/abc.08.05.2015
- Charmoy, K., Sullivan, T., & Miller, L. J. (2015). Impact of different forms of environmental enrichment on foraging and activity levels in gorillas (*Gorilla gorilla gorilla*). *Animal Behavior and Cognition*, 2(3), 233–240. doi: 10.12966/abc.08.03.2015
- Hill, H., Guarino, S., Crandall, S., Lenhart, E., & Dietrich, S. (2015). Young belugas diversify adult beluga (*Delphinapterus leucas*) behavior. *Animal Behavior and Cognition*, 2(3), 267–284. doi: 10.12966/abc.08.06.2015
- Hosey, G., Melfi, V., & Pankhurst, S. (2009). *Zoo Animals: Behaviour, Management and Welfare*. Oxford, UK: Oxford University Press.
- Eskelinen, H. C., Winship, K. A., & Borger-Turner, J. L. (2015). Sex, age, and individual differences in bottlenose dolphins (*Tursiops truncatus*) in response to environmental enrichment. *Animal Behavior and Cognition*, 2(3), 241–253. doi: 10.12966/abc.08.04.2015
- Fay, C., & Miller, L. J. (2015). Utilizing scents as environmental enrichment: Preference assessment and application with Rothschild giraffe. *Animal Behavior and Cognition*, 2(3), 285–291. doi: 10.12966/abc.08.07.2015
- Kuczaj, S. A. II, Lacinak, C. T., Fad, O., Trone, M., Solangi, M., & Ramos, R. (2002). Keeping environmental

- enrichment enriching. *International Journal of Comparative Psychology*, *15*, 127–137.
- Kuczaj, S. A. II, Lacinak, C. T., & Turner, T. N. (1998). Environmental enrichment for marine mammals. In D. Shepherdson, J. Mellen & M. Hutchins (Eds.), *Environmental Enrichment for Captive Animals* (pp. 314–328). Washington, D.C.: Smithsonian Institution Press.
- Mellen, J., & MacPhee, M. S. (2001). Philosophy of environmental enrichment: Past, present, and future. *Zoo Biology*, *20*, 211–226.
- Swaisgood, R. R., & Shepherdson, D. J. (2005). Scientific approaches to enrichment and stereotypies in zoo animals: What's been done and where should we go next? *Zoo Biology*, *24*, 499–518.
- Washburn, D. A. (2015). The four Cs of psychological wellbeing: Lessons from three decades of computer-based environmental enrichment. *Animal Behavior and Cognition*, *2*(3), 218–232. doi: 10.12966/abc.08.02.2015
- Weiss, E., Mohan-Gibbons, H., & Zawistowski, S. (2015). *Animal Behavior for Shelter Veterinarians and Staff*. New York: Wiley-Blackwell.