

The Conservation The Behaviorist



Animal Behavior Society  Conservation Committee

The Conservation Behaviorist, an electronic news-update, informs ABS members about the Conservation Committee's activities, research trends in behavior and conservation, and relevant scientific news in conservation research where behavior plays an important role.
www.animalbehavior.org/ABSConservation

The ABS Conservation Committee

Created in 1997, the Conservation Committee aims to encourage ABS members to participate in research programs addressing the interface between animal behavior and conservation science. By identifying and evaluating the areas in which behavioral research has contributed to conservation, as well as the fields that need development, the Committee seeks to generate discussion and promote studies in behavior and conservation.

Conservation Zoologist and Animal Behaviorist Devra Kleiman Dies – 67



Devra Kleiman, a long time member of the Animal Behavior Society and major contributor to the integration of behavior and conservation biology, died of cancer at age 67 on April 29, 2010. Devra was Senior Scientist emeritus at the National Zoological Park in Washington, D.C.

Source: <http://animalbehavioralsociety.org/central-office/absco-news/in-memoriam-devra-kleiman>

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From an Older Feature Article: Is captive breeding relevant for animal conservation efforts?

Take a look at **Ronal R. Swaisgood** feature article in Vol. 2 No. 2 (2004):
www.animalbehavior.org/ABSConservation/ConservationBehaviorist



Studies of reproductive behavior and communication are helping researchers tease out the components governing sexual motivation in giant pandas. New scientific understandings of panda behavior have played a crucial role in recent successes at the Wolong breeding center, where the numbers have increased from 25 to nearly 80 in recent years. Ronald R. Swaisgood © photo.

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Interact with The Conservation Behaviorist

Send letters, announcements, comments and contributions to The Conservation Behaviorist dschier@sandiegozoo.org. Deadlines for articles are the 15th of the month preceding the next news update. The next deadline is **October 15th**. Contributions submitted by members of the Animal Behavior Society and judged by the Conservation Committee to be appropriate will be published in The Conservation Behaviorist. The publication of such material does not imply ABS or Conservation Committee endorsement of the opinions expressed by contributors.

Editor **Guillermo Paz-y-Miño C.**
Associate Editor **Debra M. Shier**

Is teaching behavior relevant for animal conservation efforts?

Take a look at **Richard Buchholz's** article in Vol. 4 No. 1 (2006):
www.animalbehavior.org/ABSConservation/ConservationBehaviorist

Should Animal Behaviorists Teach Conservation?

By Richard Buchholz*

The neglect shown ethology in conservation-biology textbooks was an impetus for the formal development of conservation behavior. Now that scholarly texts are available for conservation behaviorists, it is time to address the absence of conservation in animal behavior textbooks and in our classes. First, I ask whether conservation belongs in the undergraduate animal behavior course. Next, I review the conservation content of a recent sample of ethology textbooks. Finally, I suggest ways in which conservation could be incorporated into both the lecture and laboratory work in animal behavior, behavioral ecology, comparative psychology and ethology.

47th Annual Meeting of the Animal Behavior Society, 25-29 July, 2010 College of William & Mary



Featured Speakers:

Keynote speaker: Ellen Ketterson, Indiana University,
Lecture title: The hormone in the middle: Integrative animal behavior as learned from an adaptable songbird.

Distinguished Animal Behaviorist Address: Lee Drickamer,
Northern Arizona University, *Lecture title: Animal behavior at a crossroads.*

ABS Fellow Lecture: Andy Sih, University of California at Davis
Lecture title: Behavioral syndromes: three major directions for future study.

Symposia, Workshops, and Special Sessions:

ABS Presidential symposium: Adaptive Variation in Female Mate Preferences Organizer: **Molly Morris**, Ohio University

Symposium: Collective Animal Behavior: Decision-Making of Groups Organizers: **Noa Pinter-Wollman**, Stanford University; **Deborah M. Gordon**, Stanford University

Symposium: Signaling in Multiple Modalities Organizer: **James Higham**, University of Chicago

Career Workshop: Thriving as a Beginning Assistant Professor Organizer: **Jennifer Mather**, University of Lethbridge

Special Poster Session: Applied Animal Behavior, Monday July 26 Organizer: **John Wright**, Mercer University ■

Conservation Zoologist and Animal Behaviorist Devra Kleiman Dies - 67

The following note has been taken from the ABS website:
<http://animalbehaviorsociety.org/central-office/absco-news/in-memorial-devra-kleiman>

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Giant Panda researcher Devra Kleiman records Hsing-Hsing's vocalizations during breeding season (The Smithsonian Photography Initiative - National Zoo)

Devra Kleiman, a long time member of the Animal Behavior Society and major contributor to the integration of behavior and conservation biology, died of cancer at age 67 on April 29, 2010. Devra was Senior Scientist emeritus at the National Zoological Park in Washington, D.C. She was originally from New York. During her undergraduate years at the University of Chicago, she worked at the Brookfield Zoo; her experiences there lead to a career in behavior and zoo biology. She obtained a B.S. from Chicago in 1964 and a Ph.D. from the University of London in 1969. Shortly after completing her degree, Devra joined the staff at the National Zoo, where she remained for her entire career, retiring in 2001. She directed the zoo research program for 17 of those years (1978 – 1995). Devra held an adjunct appointment at the University of Maryland in College Park starting in 1979. Married to John Eisenberg, from whom she later divorced,

Devra was, at the time of her death married for 22 years to Ian Yeomans.

Devra helped establish the modern approach to scientific research at zoological parks. She was a pioneer in combining studies of animal behavior and reproduction with conservation biology. Her most notable work was with golden lion tamarins (*Leontopithecus rosalia*). Her success with breeding this species in captivity and reintroductions to the wild, in Brazil, are recognized as a model approach to attempts to conserve and manage endangered populations. The principals she helped to develop are used in many locations today and include successes with California condors, ibex, and other species. Careful studies of reproduction, combined with detailed records of locations and breeding of tamarins resulted in reintroductions and the establishment and augmentation of viable wild populations. Devra also pioneered many aspects of the cooperation of zoological parks and related animal facilities with regard to sharing their tamarins so that a breeding program that would maximize genetic diversity could occur.

Known best to the public for her decades-long studies on giant pandas (*Ailurupoda melanoleuca*), Devra worked closely with colleagues in China to foster both panda conservation and international goodwill. She was the 'den mother' for Ling-Ling and Hsing-Hsing when they arrived at the National Zoo in 1972, and lead a team of fellow investigators to learn about the behavior and reproductive biology of the species. This knowledge of panda behavior, as well as new information on dietary preferences, enhanced efforts to successfully breed the species in captivity in the U.S., China, and additional locations. Studies on tamarins, pandas, and several other endangered mammals provided a new basis for public understanding of zoos and their mission in terms of animal conservation. Many of the ongoing breeding programs at zoos and animal parks derive from her work.

Her contributions to the sub-discipline she helped to found include numerous articles in professional journals. Many of these works provide evidence of her research, in conjunction with numerous colleagues on the investigations of mammals in zoos, but some publications are aimed at assisting zoos, aquariums, and other animal facilities with the structural framework to accomplish conservation efforts similar to those she pioneered. Further, Devra was skilled at writing for a public audience about her work, fostering understanding for and enthusiasm about the studies of reproduction and species conservation. Her co-edited volume, *Wild Mammals in Captivity*, published in 1996 is a widely used reference work for investigators exploring conservation biology and management of mammals.

Devra's connections with and service to the Animal Behavior Society abound. She served as secretary (1978-1981) and in the presidential sequence (1981 – 1985), as well on the Ethics and Nominating Committees. She was elected a Fellow of the Society in 1986. She was a superb ambassador for the Society and for animal behavior around the globe. Devra Kleiman's quick wit, enormous energy, and gift for working with people will remain, along with her scientific accomplishments, as a true legacy. A memorial celebration of her life occurred at the National Zoo on June 1st (ABS ©) ■

Robert Found, student at the University of Alberta, receives E.O. Wilson Conservation Award

"...Elk are keystone herbivores that affect significant impacts throughout trophic levels, and this leads to a conservation paradox in many areas where elk are protected: they are an important and desirable conservation target, but in protected areas where they can thrive, their tendency to become habituated to human presence creates new conservation problems. I became interested in how we might use an understanding of elk behavioural syndromes to address the problems wrought by elk habituation," said Found on learning that the ABS chose to fund his proposal "Behavioural syndromes and application to aversive conditioning of habituated elk." He will receive the E. O. Wilson Student Research Grant for Conservation.



Found will quantify the behavioural responses of individual elk to determine if elk have individual personalities. He plans to compare measures of personality across different elk herds, and individual elk that either remain in the townsites areas throughout the summer (residents) or retain the natural spring migratory behavior (migrants). If elk show stable behavioral types, Found will establish how aversive conditioning of habituated individuals can be optimized by tailoring conditioning methods and intensity to behavioural type and migratory status.

"Rob is studying a problem of widespread importance in protected areas around the world: why do some animals become so casual around people that they are dangerous while other individuals, who are superficially similar, remain wary of humans even when they share space with them", says advisor Colleen Cassidy St. Clair professor at University of Alberta. "Rob's project will provide information relevant to

both managers and the research community investigating animal personality. In particular, he'll determine whether there are measurable tendencies in elk responses to novel objects that correlate with aggression towards other elk and people. He also hopes to refine current management techniques based on aversive conditioning to increase their efficacy across a range of behavioural types. By working on both captive and wild animals, he has a unique opportunity to unite lab and field studies of personality.

I predict that Rob will make lifelong contributions to Conservation Behavior. He has an insatiable curiosity about animal behavior and a passion for wild places and their inhabitants. He is a born experimenter (which has produced some very funny stories), impeccably logical, and a very gifted writer. Combined with his energy, perseverance, and imagination, Rob is a personality study in himself and a model graduate student. I'm very lucky to work with him".

The Conservation Behaviorist talked with Rob Found about the E. O. Wilson Conservation Award:

CB: What was your immediate reaction to receiving the E.O. Wilson award?

RF: My immediate reaction to receiving the E.O. Wilson award, other than the expected delight and triumphant raising of my fist, was to be glad I had listened to my advisor when she encouraged all of her grad students to apply for the award. I guess I'll keep listening...

CB: What do you think about the award? Will it encourage students to present more proposals with conservation content?

RF: I think the award encourages students already interested in animal behavior, to participate in research with applied conservation benefits. Conservation research is growing in importance, and I think it is critical that behavior studies grow along with it. If we want conservation and animal behavior to become further entwined as we move into the future, it is certainly a great idea to encourage our future behaviorists to start down this path while they are still grad students. For better or for worse, students building careers in biology can't help but be attracted to tangible benefits like awards, so it is fantastic to have an award that also gives positive affirmation that a student's chosen line of research is worthwhile. Naming the award after one of the more recognizable names in our field (well known even among non-scientists) also helps students gain future recognition for their work.

CB: Why do you work in the interface of animal behavior-conservation biology?

RF: My lifelong fascination with animal behavior naturally lead to an appreciation of animals, and subsequent desire to ensure the incredible diversity of life – and incredible diversity of animal behavior – can continue to be appreciated. I am fortunate that my interests in animal behavior and the conservation of animals are not just compatible, but are mutually beneficial. Carefully designed behavioural research can make significant contributions to conservation while also furthering our understanding of fundamental animal behavior. Conversely, increased understanding of animal behavior can lead directly to conservation gains. I am particularly interested

in animal personality, partly because we have already seen (e.g. gorilla and chimpanzee studies) how the conservation of a species is more successful when humans have empathy for it, and nothing breeds this empathy more effectively than realizing that animals are not just units and automats to be manipulated, but individuals like us.



CB: How did you become interested in behavioural syndromes and aversive conditioning of elk?

RF: For my undergraduate honors thesis I studied the population ecology of urban-dwelling whitetailed deer, and while I wanted my graduate work to make use my ungulate experience, I wanted to focus more on behavioural ecology. I was also looking for a project that would use behavior research to address a current and important conservation problem, and produce results that might be used as part of the solution. Elk are keystone herbivores that affect significant impacts throughout trophic levels, and this leads to a conservation paradox in many areas where elk are protected: they are an important and desirable conservation target, but in protected areas where they can thrive, their tendency to become habituated to human presence creates new conservation problems. I became interested in how we might use an understanding of elk behavioural syndromes to address the problems wrought by elk habituation. Piquing my interest even more, this elk habituation problem exists in Canada's rocky mountain parks, which happens to be my favorite region in the world. I am lucky enough to study exactly *what* I want to, exactly *where* I want to!

CB: How do you see yourself in the future? Academic work? Conservation-oriented work?

RF: In the future I hope to get a taste of both conservation-oriented and academic work. The benefits of each are appealing to me, and it doesn't seem prudent to rule out any career options, but right now I am leaning more towards a conservation-oriented path. Conservation-work has greater potential to provide more of the hands-on, in-field work that I enjoy, while opening doors to exciting adventures in exotic locales with some of the species we most need to conserve. On a longer term basis, I would like to work on conservation here in Canada, possibly with Parks Canada, and hopefully in that favorite region of the world I mentioned earlier: the Canadian Rockies ■

The E. O. Wilson Conservation Award

The Edward O. Wilson ABS Student Research Grant for Conservation seeks to encourage graduate students of animal behavior to participate in meaningful conservation-related research. The award is part of the **ABS Student Research Grant Program** and it supports a *proposal* considered meritorious for its science and conservation component.

E. O. Wilson, professor at Harvard University, who in 2002 received the ABS Distinguished Animal Behaviorist Award, is one of the world's most eminent scientists and pioneers in biodiversity conservation.

Award Recipients

2010: **Robert Found**

University of Alberta

2009: **Julie Rushmore**

University of Georgia

2008: **Julie Jedlicka**

University of California Santa Cruz

2007: **Jordan Thomson**

Simon Fraser University

2006: **Alysa Remsburg**

University of Wisconsin

2005: **Heidi Fisher**

Boston University

2004: **Jason Munshi-South**

University of Maryland College Park

For additional information on this award visit

www.animalbehavior.org/ABSGrants or

contact the **Conservation Committee**

rswaisgood@sandiegozoo.org

TRANSFORMATIONS

Restoring the balance of native Australian wildlife: novel methods to influence the conservation and welfare of predator and prey

By Michael H. Parsons

Our understanding of science is often restricted to the exploration of data, pondering of experimental designs, and reflections on the implications of the outcomes, but we are rarely exposed to the circumstances that drive the research- the story behind the story. I reflect on my experiences of moving abroad in hopes of constructing a meaningful research program. The primary driver for this research was a sense of urgency to promote animal welfare and conservation in Australia through good science. Our program was centered on the development of sensory based deterrents to mitigate the consequences of native herbivory in revegetation and agricultural settings. I commenced my program with scarce familiarity of the remarkable flora or fauna, however I was aware of the proliferation of macropod numbers which shadowed the decline of Australia's top order predator- the dingo. I further relate how serendipity, good fortune and the recruitment of a highly competent team helped us achieve some of our idealistic aims in a politically indeterminate climate. Of critical importance was learning how the attainment of success differs for academics, industry and stakeholders. We hope to inspire others to learn from our lessons, build on the momentum generated and continue the quest for improved animal management practice in Australia.

Précis

European settlement has led to the proliferation of kangaroos, primarily due to the introduction of stock watering points in arid areas and the subsequent baiting of their primary predators. There are now more kangaroos (c. 25 million) than people living in Australia. Kangaroos have a substantial impact on agriculture, viticulture, revegetation and roadside safety. Consequently, these iconic animals are perceived as pests. Native animal management consists of rather extreme measures such trapping, poisoning and shooting; 7.6 million kangaroos are killed each year in Australia. Similarly, dingoes, the primary predator of kangaroos for the past 6-10,000 years (Pople et al. 2000), are now a threatened species due to death by 1080 poison baiting (mono-sodium fluoroacetate), shooting and hybridization with domestic dogs. Non-lethal animal repellents have poor reputations among stakeholders and novel methods for animal control have been in critical demand for decades. These circumstances enabled me to construct an extramurally funded program aimed at

delivering valuable outcomes to science, industry and stakeholders. I now relate my experiences.

The pursuit of meaningful science

As an eager and perhaps naïve PhD student I embarked on a quest to find opportunities to practice meaningful science. I arrived in Australia during November, 2001. The ethereal burnt red soils, the cast of creatures teeming with unique adaptations, and a safe political climate led me to select Australia over my dream research destination, Ngorongoro crater in Tanzania. I had long been inspired by conservation biologists Mark and Delia Owens who developed the North Luangwa Conservation Project (NLCP) in Zambia in response to the poaching of elephants (*Loxodonta africana*) and black rhinos (*Diceros bicornis*) (Jachman and Billiouw 1997). I sought to retrace the Owens' steps and somehow share in the special meaning they had found in their science and in their lives.

Instead, my quest led me to enroll as a PhD student at Curtin University in Western Australia. I soon learned that Curtin was not a window adornment as implied by its common misspelling (Curtain). Rather, it was a thriving metropolitan university situated near the Darling Range of southwestern Australia. The Darling Range is near one of the world's 31 hotspots of biodiversity as related by E.O. Wilson in his book *Consilience* (Wilson 1998)- a book that I had internalized to the point that I could recapitulate it without prompts.

Of course there are no elephants, honey badgers, or black rhinos to conserve in Australia. However, due largely to the absence of predators, kangaroos have reached critically high numbers in areas of consequence. It is estimated that 3.8 million macropods are legally killed (harvested) each year in Australia (Grigg 1989), at least that many are killed illegally. I was honored to undertake my PhD on such an important topic.

I had barely stepped off the plane when my world view was shaken to its core. I was jetlagged in a hotel and barely able to discern night from day when I witnessed 'the second plane' a Boeing 767, flying into the South Tower of the World Trade Center. The now infamous Flight 77, which crashed into the Pentagon moments later, was bound for LAX, an airport I had departed only 48 hours earlier.

My worldview wasn't only shaken by the 911 disaster. Not unlike most tourists, I expected to step off of the plane and into the audience of koalas, bandicoots and wombats. This confession will no doubt be to the chagrin of fellow yanks and to the horror of my fellow scientists. Had I taken a cursory look at a field guide I would have realized how unreasonable this expectation was. Instead, what I learned startled me, 11 of the 19 extant mammals in the Murchison region north of Perth, Australia are introduced. Of these 11 species, predator status varies from threatened to locally extinct, while native herbivores are proliferating with significant consequences to agriculture and biodiversity.

The genesis of the project

Our project had an unorthodox beginning. The foci of my research were centered on the impacts of drought and herbivory on native plants. Throughout most of the project, animal selection and impacts were viewed from the plant's perspective. We used large scale exclosures to quantify the extent of damage and the selectiveness of kangaroo herbivory. We then established an index to identify vulnerable and compensating species by comparing animal selection and impact (Parsons et al. 2007a). The results from my field work

suggested kangaroos impacted 17 of 24 native species, and in turn shaped the system through their selective herbivory (Parsons et al. 2006a). To the chagrin of our industry sponsors, it seemed the more recalcitrant or expensive the species was to grow, the more likely it was to be consumed by kangaroos (John Koch, Alcoa).



Large scale paired enclosures help us understand the impact of herbivory by kangaroos. Up to 90% of new seedlings (marked by white stakes) may be lost outside protective barriers. Photo courtesy (Parsons et al. 2006a)

Though I was making significant progress on my PhD, I was disappointed with my work. First, I was concerned that my work could be used to justify further slaughter of kangaroos. Secondly, we had exhausted a large grant to produce a series of peer reviewed papers, but without proposing viable solutions to the problem. We were investing heavily in the search for a mathematical index to quantify herbivory and to better characterize plant defense mechanisms, but little was being done to mitigate the actual effects of herbivory, or to curb the lethal control of kangaroos.

Serendipity

I reached a turning point in my program when I learned that one of my six paired enclosure sites was not regularly visited by kangaroos. Despite a smorgasbord of palatable seedlings and nearby water, the kangaroos would not browse in the area (presumably due to fear of mining trucks in the area). There was no data to collect from this site, and lack of replication became a problem for the completion of my PhD. Some among our team felt we had wasted our resources setting up the expensive enclosures. However, looking outside the box, this serendipitous finding directly led us to consider *fear* as a mechanism to deter kangaroos from target plants (Parsons 2005).

This lesson motivated us to shift emphasis from plant ecology to animal studies. I was referred to Carol Lander of the Roo Gully Wildlife Sanctuary for a deeper appreciation of kangaroo behavior. Carol became my site supervisor for the remainder of my PhD. She encouraged me to broaden my perspective by relying less on the literature and more on anthropomorphic reasoning- an acrimonious suggestion to an early career biologist! Carol defended her alternative approach by referencing the lack of progress in science over the past sixty years. My reluctance became acceptance when Carol sermonized the first rule of warfare as a basis for the pursuit of novel animal deterrents- 'know thy enemy'!

Unfortunately, my PhD was well beyond the half-way mark, my expenses were accruing and we didn't have much time to

practice this alternative approach to science. After finding scant literature on kangaroo deterrents, I adapted a Blitzkrieg approach to hit 'them with everything we had' until we could propose a non-invasive deterrent. Our initial targets were olfactory, auditory, tactile and visual repellents- hopefully synergistic effects may be observed among them.

Blitzkrieg Approach

I hoped to incorporate responses to all stimuli in order to uncover tendencies for kangaroo fear and avoidance. Our approach was partially out of desperation to fill the gaps in the literature. But we also understood that where multiple repellents are found, then synergistic effects may be observed, especially with respect to maximizing area effects and delaying animal habituation (Darrow and Shivik 2009). There were no published studies on Western Grey kangaroo (*Macropus fuliginosus*) deterrents, though we understood that Eastern Grey kangaroos (*Macropus giganteus*) may avoid the sound of foot stomp alarms generated by their own species (Bender 2005).

By the process of elimination we began exploring olfactory deterrents. I purchased coyote (*Canis latrans*) urine from Leg-Up Enterprises in Montana, and following some raised eyebrows from the Australian Quarantine Office, I was able to import the urine for trials with kangaroos. We placed the urine in canisters suspended from tree branches. The kangaroos approached, but were not deterred by the coyote urine. Carol noted that coyotes urinate on the ground and not in trees, and that kangaroos were intelligent enough to know the difference. This advice was a harbinger for each of our studies since. We decided to trial the urine of a natural, rather than a non-historic predator, and see if the kangaroos could discriminate between them.

The results were unexpected and instantaneous, 40ml of dingo (*Canis lupus*) urine (a typical void) was enough to keep kangaroos away from their most palatable food sources for two weeks (Parsons et al. 2007b). Other studies have shown that animals avoid eating near the feces of predators (Arnould et al. 1998), however these effects may have been generated by noxious smell rather than fear because predator feces are generally more noxious than those of herbivores (Kimball and Nolte 2006). Fear may be quantified when animals flee from an area and demonstrate increased stress hormones and vigilance.

Though the constituents that compose the 'smell' of urine may only travel for a few meters (Ken Dods, Chemistry Centre WA), I hoped that area effects might be achieved if patch entry points are treated, and if kangaroos are able to be influenced toward alternate food sources. When we learned that kangaroos were only repelled by fresh urine and had no aversion to stale urine (see account by Nowak, 2008) we thought we might be onto an important discovery that had implications for improved wildlife management. It was also expected that our work might influence the literature and future studies in the area of fear ecology, thus providing applied and theoretical benefits to drive future studies.

We had accomplished the most difficult task of providing a substance that invoked fear (vigilance and flight) in the animals (Parsons et al. 2007b), to stay on target, we had to explore other means to reinforce and maximize these effects. Feedback from our trials led to sustained international publicity. The public had been in such dire need of non lethal repellents that many had resorted to purchasing ultrasonic repellents which elicited no response from the target animals (Bender 2003). There were few other kangaroo deterrents available other than plastic mesh

bags to protect seedlings. Unfortunately, these devices may be as likely to signal food availability as to discourage kangaroos from eating the seedling advertised inside. Consequently, the media exposure of our work was accompanied by enormous pressure to provide novel solutions to the public.



Western grey and red kangaroos participating in deterrent trials at Caversham Wildlife Park in Perth, Australia. For over 10 days, 40ml of dingo urine deterred all kangaroos from a tray of highly palatable food (center).

Despite the early success, we did not yet have a viable solution to the problem. There are very few pure-bred dingoes remaining in Australia, and obtaining urine from a wild predator is not easy. Artificial urine had to be both synthesized and commercialized if we were to present a widespread solution to the problem.

How do you get urine from a dingo to the end user?

Pure dingoes are endangered, and those that survive have been hybridized with domestic dogs. Our first dilemma was to obtain enough urine from pure dingoes to fuel a billion dollar industry in animal deterrents (Peter Murray, University Queensland). We had to establish an extramurally funded program to generate funds to cover the research. To complicate matters, we had to synthesize the urine in its complete form because we discovered a time-stamp in the urine: the urine had to be fresh in order to generate a flight response, while stale aged urine elicited trivial responses (Nowak 2008).

Finally, we were directed to commercialize in order to turn concept into solution. Capitalists will not invest in research unless the ideas have been protected. I was told that entering concepts into the public domain via publication will not necessarily result in the production of end-user products to fill public demand. Our *only* mechanism to provide solutions to the public was to obtain patents, venture capital, manufacturers and distributors, not a cheap exercise for a student of biology. A three-day commercialization workshop constituted the extent of my training. I was ill prepared for what was to follow.



Collage of dingo urine and delivery mechanisms. Left: Raw dingo urine and cold-set gel. Right: Longer life, timed release gel for non-arid environments like Tasmania.

Understanding animal welfare issues

Navigating the sensitive areas of animal welfare and pest management require skills that are not restricted to science. In creating our first deterrent, I learned that dingo urine elicits a startling effect from kangaroos, while I have not observed equivalent behavioral effects from other canine urines (Parsons et al. 2007b). Conservationists began to promote the outcomes of our work to underwrite the value of the dingo, the top order predator, as a natural control mechanism of kangaroos (Carol Maassen, WA Dingo Conservation).

Kangaroos are responsible for lost agricultural productivity (Grigg 1989), while their primary predators, dingoes, are considered principal threats to sheep. Consequently dingoes and kangaroos are persecuted (Glen and Dickman 2005). One state level policy maker explained this conundrum to me "pastoralists want livestock and dead bodies".

Macropod numbers have proliferated in the absence of dingoes. The decline of dingoes is also linked to secondary extinctions of native animals, while dingo recovery is associated with increased biodiversity (Wallach et al, 2008). When dingoes are absent, foxes assume the role of top-order predator. This is a phenomenon known as *mesopredator release* (Glen and Dickman 2005).

For example, the Mallee fowl (*Leipoa ocellata*) is a ground nesting solitary bird which benefits when its nests are scent marked by dingoes (Wallach et al, 2008). Dingoes do not consume the eggs of Mallee fowl; however in the absence of the dingo, foxes are a threat to the eggs. For further information on similar trophic cascades see (Johnson et al. 2007).

Consequently, many were calling for us to shift our focus to reintroducing the top order predator itself (Carol Maassen, WA Dingo Conservation). And with the thrust of this aspect of our research came increased concerns from the farming industry due to the perceived threats of dingoes to agriculture.



A student receiving hands on experience preparing ethogram for dingo behavior at the Dingo Discovery Centre in Victoria, Australia.

However, if dingoes are reintroduced, scientists hope to inspire improved methods for dingo management to minimize any negative impacts for pastoralists. Interestingly, dingo urine may be a beneficial tool for farmers who could utilize the urine to keep most other canines away, including foxes. Other management techniques include merima guard dogs, alpaca guards, and a better understanding of dingo behavior. For

example, resident dingoes kill fewer sheep than mongrel dingoes that encroach from previously baited areas (Mark Alchin, WA Agriculture Department).

The perils of maintaining objectivity in conservation science

Working for a cause may be a struggle that many scientists will face when working toward conservation behavior projects. As an early career scientist, I justified the investments into my research based solely on the expected benefits. I was trained to be detached from my research; however it was a constant battle to not cross the line of objectivity when I became emotively involved and expectant regarding outcomes.

Specifically, I wanted to play a role in reducing the number of kangaroos being slaughtered. Managers often rely on the politically correct word 'cull' to describe kangaroo shooting. Cull is defined as 'the selective remove of an animal that has been sick or rejected'. This is entirely inappropriate. The targeting and shooting of kangaroos is non-selective and the word 'kill' is far more descriptive of the actual events. Our common misuse of the more comfortable word 'cull' may be lethal to research programs set on enabling change.

By introducing methods of managing kangaroos, we were pressuring others to adapt our standards, from an ethical perspective as well as practical. Industry has long standing methods for controlling kangaroos, and if our deterrents worked, they may be obligated to change practice before they were prepared. Perhaps if dingo urine was a perfect deterrent (it was proclaimed a 'magic deterrent' by the Sydney Morning Herald), then this might be a feasible option. However, dingo urine must be targeted and utilized with much discipline and patience, and it should be used concurrently with other sensory based cues such as auditory, visual and even tactile to achieve maximum area effects. We hoped to produce a tool box of solutions to fit different applications and to interact synergistically.

I publicized an analogy between the use of wildlife deterrents and strategies for weight loss. The synthetic dingo urine may be analogous to a dumbbell- one tool, not a magic pill for weight loss. We can provide this tool to someone who wants to lose weight and teach her how to use it. If she is disciplined and consistent, the tool will have a demonstrable effect. However, this individual will eventually require other tools to work synergistically with the dumbbell; possibly including a treadmill, stair climber, and stringent diet monitoring. This approach requires far more work and dedication than portrayed in the media, and this is one reason adults struggle with weight loss and managers struggle with animal management. I could hardly wait to move on to the investigation of combination-repellents, but I was distracted.

The substitution of science for politics

I was burdened by the expectations generated by the publicity. On 19 May, 2008, the Curtin University Public Relations team contacted me while I was trialing deterrents in Hobart, Tasmania. A high profile incident was occurring in Canberra where 400 Kangaroos were scheduled to be 'culled' at the Balconnen Naval Transmission Station because there weren't any non-invasive methods to encourage their movement (Batty 2008).

I was asked by my employer to visit Peter Garret, the Minister for the Environment, in Canberra before my return trip to Perth. I felt hopelessly inadequate. Was I meant to approach the Minister and present him with a jar of dingo urine? Bringing him a dumbbell might make more sense. Though, I fear he might misunderstand what I expected him to do with the dumbbell.

I repeatedly asked myself at what stage did I transition from being a student of plant ecology to being invited into the center of a faunal related crisis of international proportions? I envisioned Carol Lander on my right shoulder cheering me on with a sense of urgency, "Save the kangaroos". I sensed Carol Maassen perched on my left shoulder urging me to "save the dingo". Both women have fully committed themselves to the task, and I was their instrument to help promote awareness. Unfortunately, for most people in Australia, neither the kangaroo, nor the dingo *need* saving.

I did not end up making the trip to Canberra because I did not have any tangible offerings for the minister. Success isn't about peer recognition, or a 'paper mill' of tier-one manuscripts. Success will be achieved when we are finally able to turn concepts into practical solutions and work with a sense of urgency to solve societal problems.

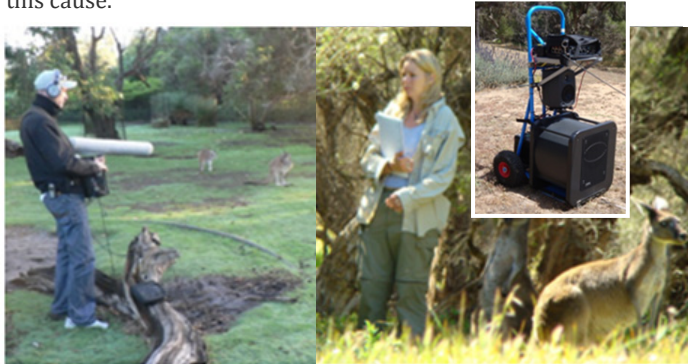
How do we make this work?

Dingo urine elicits a deterrent response that often involves kangaroo flight from the immediate area. The duration of this response depends on presentation and delivery of the deterrent. My interests include a better understanding of the conditions necessary to engender the strongest area effects, while working against the process by which kangaroos habituate or grow used to the signal. If the cues are sincerely fear generating, then area effects could be achieved by targeting animal entry points (Parsons et al. 2006b).

The second step of our deterrent plan includes best use of the auditory modality. Researchers at the University of Melbourne have learned that kangaroos may flee from the sound of their own alarm foot stomp (Bender 2003). It was expected that kangaroos would not soon habituate to the hardwired response to the sound of their own foot stomp. When the foot-stomp was recorded and played back to red-necked wallabies, the response was not consistent (Ramp 2007). However, when the animals weren't reacting to the recorded sound stomp, they were reacting to live foot-stomps occurring about 50M in the distance (Daniel Ramp, New South Wales). We presumed that the recording and playback parameters were limiting the efficacy of the response.

International Masters student Tine Biedenweg has taken up this arm of the research. She intends to improve the effectiveness of Bender's and Ramp's work by providing a near-digital signal for increased clarity and playback, and by subsequently mixing with an artificial cue for reinforcement. Tine's results will be described fully elsewhere. However, I am at liberty to say Tine has quantified consistent deterrent responses among semi-wild western grey kangaroos consistent within the overall management strategy. Optical deterrents may add further benefits. Despite the farsighted vision of most macropods, kangaroos have been shown to demonstrate tri-chromatic vision (Arrese et al. 2003). Semi-wild western grey kangaroos appear to be avoiding warning colors (noted anecdotally), we hope to further investigate this opportunity. We have limited expertise in the area of tactile repellents, but we understand that synergistic effects are likely, enabling many presentations

and applications for combination repellents. Outcomes will be dependent on our abilities to inspire and motivate others to invest their creativity, time and resources into furthering this cause.



Left: Mr. Scott Montgomery, adjusting acoustic parameters to best capture foot stomps. Right: Tine Biedenweg Captures foot stomps to play back to kangaroo mobs. Inset: The bioacoustic sound trolley produced for research undertaken by Tine Biedenweg.

Discussion

We aren't often afforded the opportunity to understand the complexity involved in establishing meaningful research projects. Significant opportunities exist locally and abroad. I hope to impart to the reader that research in conservation behavior can sometimes encompass multiple disciplines of study and require a broad spectrum of expertise and cooperation. It is imperative that a standard definition and agreement of success is established before undertaking multi-disciplinary projects. One must be prepared to navigate sensitive issues in order to survive in this field. Ideally, a better understanding of commercialization is encouraged for all early career scientists. Above all else, one must be dedicated to working with a sense of urgency to circumvent the typical pace of science, if we are to make tangible progress.

As a PhD student, my intentions were simple; to be part of a team dedicated to finding solutions to kangaroo herbivory and wildlife management. My research reinforced the extent of damage caused by selective kangaroo herbivory, though I completed my thesis with an action plan to counteract my findings. Chance events led to a few discoveries and widespread publicity. Along the way, I attracted champions of significant interest groups such as Carol Lander of the Roo Gully Wildlife Sanctuary and Carol Maassen of the WA Dingo Conservation Society. Out of desperation, I rejected some of my training and became open to alternative methods to practicing science. The complexity and value of what others have attached to this work have potential to move participants from objectivity to expectancy regarding outcomes. This may be a constant dilemma for early career researchers who are driven to accomplish a mission.

The Definition of Success

Research in conservation behavior depends on a deeper understanding of success. While all participants may enter into a project generated by noble causes, the currency of success may differ among groups and create conflict. An academic may feel successful when multiple peer reviewed papers are produced, which in turn provides momentum for additional grants and repeats the cycle. Small steps of progress would generate a career full of meaningful opportunities.

For external stakeholders and significant interest groups, success may include a greater level of applied progress. Nothing short of end-user solutions will satiate the urgency created by the causes they champion. To many laypeople, tax dollars are spent in vain unless demonstrable solutions are realized- in their lifetime. It is my feeling scientists who encourage participation by these groups should be prepared to commercialize. Theoretical questions may not be sufficient to hold their interest.

For industry, success may be about tangible outcomes that work within the business structure of the company. Solutions are acceptable when they are seen to make significant contributions without significantly hampering accepted protocol and day to day operations. A grey area exists between these three definitions of success. It would be wise to establish, and thoroughly communicate, what your definition of success means to you.

The Future of Animal Welfare in Australia

I propose that the approach I have adapted will enable us to reach our expectations for the enhanced non-invasive management of animals. Specifically, my plan is to:

1. Provide sensory cues which invoke manageable fear responses (like dingo urine).
2. Employ combination repellents to mix with multiple modalities (olfactory, auditory, optical, tactile).
3. Present a management plan to encourage targeted patch selection and discourage possible habituation.

It is further hoped that momentum from this research will lead to additional novel technologies beyond the scope of our work. By sharing the lessons I have learned, I hope to inspire others to maintain the momentum we have generated and to work with a sense of urgency. Ideas are as varied as our imagination, but all are worth pursuing until legitimate solutions are discovered.

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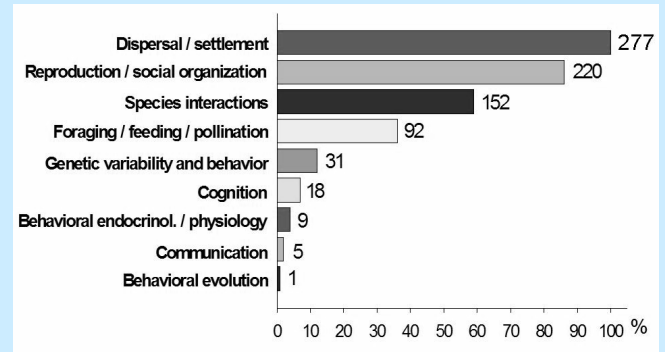


Figure 1. Areas of animal behavior most commonly discussed in conservation biology studies. Number of articles per category is indicated next to each bar. Percentages were calculated for each category in respect to the total number of articles in the survey.

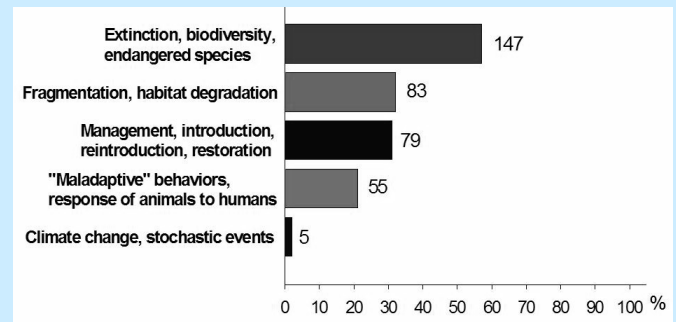


Figure 2. Conservation problems most commonly discussed in behavioral conservation studies. Values correspond to categories explained in Fig. 1.

Conservation Behavior Statistical Trends

Take a look at **Guillermo Paz-y-Miño C.**'s article in Vol. 4 No. 1 (2006): www.animalbehavior.org/ABSConservation/ConservationBehaviorist

Contribution of Animal Behavior Research to Conservation Biology

By Guillermo Paz-y-Miño C.

Behavioral research encompasses the study of the physiological and sensory mechanisms that control behavior, the development or ontogeny of behavior, and the function and evolution of behavior. Conservation biologists have debated about these paradigms for decades, at times not realizing that their discussions have contributed directly or indirectly to the area of animal behavior and conservation.

To assess the contribution of behavioral paradigms in conservation studies, I identified and evaluated 277 articles (N=1631) published in Conservation Biology between 1987 and 2002 that were directly related to animal behavior and conservation. Four main areas of behavioral research were commonly addressed in these studies (Fig. 1): dispersal and settlement, reproductive behavior and social organization, species interactions, and foraging/feeding and pollination. These areas have helped biologists to understand and alleviate conservation problems such as extinction of endangered species and biodiversity loss, habitat destruction and ecosystem management and restoration (Fig. 2).

Is captive breeding relevant for animal conservation efforts?

Take a look at **Ronal R. Swaisgood** feature article in Vol. 2 No. 2 (2004): www.animalbehavior.org/ABSConservation/ConservationBehaviorist

What can captive breeding do for conservation and what can behavior research do for captive breeding?

How can we justify confining animals in small enclosures, often far removed from many salient features of the animal's natural environment? This question speaks to concerns of animal welfare, and I see it as a challenge to behaviorists and managers to understand the behavioral needs of animals and develop captive environments that meet these needs. How can we justify the expenditure of money to maintain a few representatives of endangered species in captivity when the same funds could significantly enhance in situ conservation efforts? A reasonable answer must show that these expenses actually do not take away funds that otherwise could go to conservation of animals in their natural environments and that captive breeding programs contribute to in situ conservation. These questions are interrelated because minimal well-being is a prerequisite for reproduction (18) for conservation breeding.

The Conservation Behaviorist

Captive breeding, conservation and behavioral research

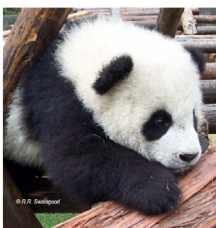


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The Conservation Behaviorist Vol. 2, No. 2, November 2004

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"How can we justify confining animals in small enclosures, often far removed from many salient features of the animal's natural environment?... How can we justify the expenditure of money to maintain a few representatives of endangered species in captivity when the same funds could significantly enhance in situ conservation efforts?... These questions are interrelated because minimal well-being is a prerequisite for reproduction for conservation breeding..." says Ronald R. Swagwood in our Feature Article: "What Can Captive Breeding Do for Conservation and What Can Behavior Research Do for Captive Breeding?" (page 3)

Conservation Tips

By Daniel T. Blumstein
Is there anything a behaviorist can do to help conservation?
A question: "The Four Questions" to a conservation question: the physiological and sensory mechanisms that control behavior, the development or ontogeny of behavior, its function and evolution. Applying our major conceptual framework can provide novel management questions and can help structure the scientific study of an endangered species. Share this conceptual framework with other behaviorists and it can surely work well for mainstream conservation biologists.

The Conservation Behaviorist

Heidi Fisher, student at Boston University, receives E. O. Wilson Conservation Award



"...As a field biologist, it is difficult not to become a conservationist, particularly when you study animal behavior. An animal's first response to a stressor is often a change at the behavioral level. Behavior is a reliable indicator of ecological disturbance..." says Fisher. Her proposal "Communication breakdown and hybridization in *Xiphophorus* fishes" will be funded by the ABS Student Research Grant Program and she will receive the 2005 E. O. Wilson Conservation Award.



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The Conservation Behaviorist Vol. 1, No. 1, May 2005

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Conservation Tips

By Daniel T. Blumstein
Is there anything a behaviorist can do to help conservation?
Work in an endangered habitat. Even if you are not focusing on an endangered species, by working in an endangered habitat you will illustrate, by example, the value of the habitat and you may be able to collect additional information that will be useful for endangered species management.

The Conservation Behaviorist

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The Conservation Behaviorist

Vol. 4, No. 2, November 2006

Colleen Cassidy St. Clair, New Chair of the Conservation Committee

Greetings Conservation Behaviorists! It's an exciting time to be working on conservation behavior and it's a pleasure to take on the reins of the Animal Behavior Society's Conservation Committee. In the coming years, I hope I can share with you inspiring development of behavioral approaches to conservation problems.

As incoming Chair of the Committee, I'd like to begin my term with some appreciation. I am sure I speak for everyone in thanking Guillermo Páez-Milo C., outgoing chair, for his tireless efforts (continues on page 2)

Colleen Cassidy St. Clair, Chair

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University of Massachusetts Dartmouth

Daniel T. Blumstein

University of California Los Angeles

Richard Buchholz

University of Mississippi

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ABS Conservation Committee

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Julie Jedlicka receives ABS Edward O. Wilson Conservation Award

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Vol. 5, No. 1, May 2007

Social behavior and Conservation...

"This is the first evidence that a predator training regime, which incorporates the target species social environment, can mimic experiences in the wild and improve long term survival post-release..." says Debra M. Shier in our Feature Article: "Social influence on predator training for conservation" (see page 6)

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The Conservation Behaviorist

Vol. 1, No. 1, May 2006

Building a Case for Conservation Behavior

In this special issue of The Conservation Behaviorist (TCB) we include articles published since 2003 and new essays. The area of conservation behavior has grown significantly during the past decade and the Animal Behavior Society Conservation Committee has played an important role in this process. Besides TCB, the Committee has created the E. O. Wilson Conservation Award, three data bases available online (funding opportunities for behavioral research, publications in conservation behavior, members in conservation behavior), and has also sponsored scientific events at the Society's annual meeting. We are confident that our efforts benefit ABS, the conservation community, and the public at large.

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What can captive breeding do for conservation and what can behavior research do for captive breeding? By R. Swagwood, page 6

Behavioral deficiencies and the reintroduction of animals into the wild. By E. Fernandez, page 7

Family support increases the success of translocated prairie dogs. By D. M. Shier, page 8

Animal cognition and its role in conservation behavior. By G. Páez-Milo C., page 11

The role of studying behavior in the conservation of chimpanzees and gorillas. By E. Fernandez, page 12

The role of reproductive behavior in the conservation of fishes, examples from the Great Plains riverine fishes. By K. Buchholz, page 13

Kidnapping the Don Juanos of Guatemalan. By A. C. Adams, page 19

Conservation behavior in Borneo's logged forests. By J. Munshi-South, page 20

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