The Conservation Behaviorist

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

© Photo Sherri Michaud

"…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.

(see Award page 8)

Animal Behavior Society ABS Conservation Committee

The Conservation Behaviorist, an electronic biannual 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.

The Conservation Behaviorist **Vol. 3, No. 1, May 2005**

In this issue

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 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.

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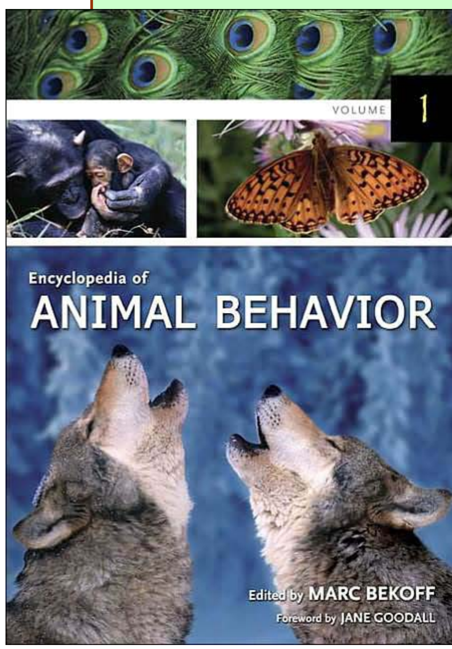
Interact with the Conservation Committee

Send letters, announcements, comments and contributions to The Conservation Behaviorist
gpazymino@worcester.edu
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 Allison C. Alberts

Encyclopedia of Animal Behavior wins "Best Reference Source" award from Library Journal

This three-volume "endlessly fascinating set is a seminal work in its field and one of the first complete resources on animal behavior" (Library Journal review)



Greenwood Publications

Edited by **Marc Bekoff**
Foreword by **Jane Goodall**

ISBN 0-313-32745-9

Elizabeth V. Lonsdorf and Mark L. Wildhaber join ABS Conservation Committee

Elizabeth V. Lonsdorf is the Director of Field Conservation at Lincoln Park Zoo in Chicago and a faculty member of the Committee on Evolutionary Biology at the University of Chicago. She administers the zoo's support of and participation in field conservation projects, which include overseeing the zoo's Africa/Asia and Neotropic Field Conservation Funds. Elizabeth works at Gombe National Park, Tanzania, where she supervises a health monitoring project for the Gombe chimpanzees (funded by the US Fish and Wildlife Great Ape Conservation Fund). This project includes the Lincoln Park Zoo, the Jane Goodall Institute, University of Minnesota and Tanzania National Parks. Lonsdorf serves on the Field Conservation Committee of the American Zoo and Aquarium Association (AZA) and on the Section on Great Apes of the IUCN Primate Specialist Group.

Mark L. Wildhaber is a quantitative ecologist and conservation behaviorist at Columbia Environmental Research Center, US Geological Survey. His research includes studies of the reproductive behavior and physiology and abiotic and biotic requirements for reproductive success of fish species that are federally-listed as threatened or endangered. One of Mark's ultimate goals is to use this information, along with information on fish behavior as it relates to thermoregulation, foraging, and bioenergetics, to develop mathematical models within an individual-based and spatially-explicit framework that describe aquatic community dynamics.

The Conservation Behaviorist

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Perspectives

Animal cognition and its role in conservation behavior

By Guillermo Paz-y-Miño C.*

Animal cognition includes processes such as perception, learning, memory and decision making in which animals obtain information about the environment through their senses, process, retain and act on it[1,2]. Here I discuss case-studies that have used animal-cognition principles in conservation. My goal is to draw attention to the value of these studies -conducted mostly by non-behaviorists, remark on the cognitive concepts intrinsic to each case, and encourage discussion and research in the interface animal cognition-conservation behavior.

Animal cognition (=cognitive ethology[3]) has contributed to conservation in four main areas: i) training animals to avoid predators, ii) eliminating inter-specific sexual and social imprinting, iii) identifying inappropriate conservation strategies, and iv) identifying and minimizing the negative effects of maladaptive behaviors.

Training animals to avoid predators

Animals that have been isolated from predators, either throughout their lifetime or over evolutionary time, may no longer express effective anti-predator behavior[4]. Mortality due to predation is the principal cause of failure in animal reintroduction and translocation programs: It is easier to teach animals to cope with predators if they have experienced ontogenetic isolation than if they have undergone evolutionary isolation from predators[4]. In the absence of predators, anti-predator behavior may degenerate or be lost. For example, a significant threat to released California Condors (*Gymnogyps californianus*) is nest predation by Common Ravens (*Corvus corax*). Wild and/or released condors lack defenses against ravens, possibly because ravens have become abundant during recent times and condors have had limited evolutionary exposure to raven predators[5].

Learning theory principles can be used to predict which anti-predator responses can be enhanced or recovered by training animals prior to their reintroduction into the wild or translocation into new habitats[4]. Training techniques involve conditioning procedures in which animals learn that model predators are predictors of aversive events. Researchers have documented how terrestrial predator recognition and defense behaviors are more developed and easier to restore in the Pukeko (*Porphyrio porphyrio*), an Australian and New Zealand bird that evolved in the presence of terrestrial marsupial predators, than in the Takahe (*Porphyrio mantelli*), a large flightless gallinule that evolved in the absence of predators until the end of the nineteenth century, when European settlers introduced the stoat (*Mustela erminea*) to New Zealand[6].

Animals on islands are extraordinarily tame relative to animals on continents and, when exotic predators arrive, they trigger a shift in selective forces on the insular fauna. Feral cats (*Felis catus*) in the Galapagos Islands, for example, are responsible for increased wariness (loss of "unusual tame behavior") in the lava lizards (*Tropidurus* spp.) as a result of predation pressure[7]. Survival of lizards in islands inhabited by cats is attributable to fast development of predator avoidance strategies (i.e., associative learning, aversive events) supported by selection toward phenotypes with effective fleeing responses.

Eliminating inter-specific sexual and social imprinting

Puppet rearing, a technique aimed to reduce sexual and filial imprinting on human caretakers, has been used in bird species. Maladaptive imprinting is most likely to occur during early stages in an animal's behavioral development. Studies indicate that rearing common ravens (*Corvus corax*) with a puppet does not affect social behaviors prior to release, dispersal from the release area, or interaction with wild birds after release. Ravens raised with a puppet, however, are more fearful of caretakers and more vigilant prior to release than ravens reared without a puppet and in full view of humans. These effects on behavior have translated to changes in survival after release of captive-reared young[8]. Likewise, aversive conditioning of puppet-reared California Condors in later releases has reduced initial tendencies to approach humans and human structures (i.e., collisions with electric wires and towers) [5, but see 9].

Enhancing social learning and social facilitation

Animals that live in stable social groups have substantial cognitive abilities and usually interact with conspecifics and the environment in complex manners. Orangutans (*Pongo pygmaeus*), for example, have extensive parental care and prolonged infant and juvenile periods in which animals are extremely dependent; their appropriate social and sexual responses are learned within the context of the social group[10]. The ability to find and prepare food is generally acquired through a combination of observational and experimental learning. Most non-human primates reared in captivity exhibit behavioral abnormalities (e.g., repetitive behaviors, rocking, self-abuse) not observed in wild populations, particularly those who have been reared or housed in social isolation. Lack of stimulation and social interaction can result in developmental retardation[10].

Some reintroduction programs have taken these premises into consideration. For example, female and male wild-born orphan chimpanzees (*Pan troglodytes troglodytes*) have been successfully released into the Conkouati Reserve, Republic of Congo, by identifying behavioral traits that the animals required prior to translocation from diverse localities into the release area, e.g., the release of mostly adolescent females mimicked the natural pattern of movement between communities. The complexity of chimpanzee social behavior also required that the released animals have the full species-specific repertoire (e.g., greetings, grooming, and agonistic behaviors needed to establish and reaffirm relationships) and show no abnormal or inappropriate patterns of behavior[11].

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Identifying inappropriate conservation strategies

Mate choice, sexual selection, and dominance associated with mate acquisition depend on cognitive processes such as perception, learning, memory and decision making. For example, rhino dehorning, a controversial practice designed to remove the incentive for poachers to kill the hornless animals, may have had mate choice implications in both the one-horned rhinoceros (*Rhinoceros unicornis*) and the white rhinoceros (*Ceratotherium simmum*), two sexually dimorphic species with males having larger horns than females[12]. Horn size is likely a consequence of sexual selection and it is positively associated with dominance in males. Because dehorning generates unnatural horn size asymmetries that affect combat outcomes between males, dehorning may have had fitness consequences due to female assessment (perception) of male quality. [Note: dehorning was discontinued as a conservation practice due to high neonate mortality; females use horns in neonate defense[12]].

Identifying and minimizing the negative effects of maladaptive behaviors

Some behaviors become maladaptive when selective pressures change, usually because of human intervention, and animals are no longer able to assess (perception) the change or respond appropriately to it (e.g., traffic collisions or collisions with overhead wires, ingestion of anthropogenic debris, disorientation caused by artificial lights). If a species can survive long enough and the behavior has heritable variation, these maladaptive traits can disappear through natural selection[13], and the species may persist with modified cognitive capabilities of adaptive value in the new environment [for specific examples, see supplement].

To minimize the negative effect of these maladaptive responses, various techniques have been applied or suggested; all take into consideration animal perception, learning, information processing, and decision making: construction of under road passages for terrestrial vertebrates, establishment of buffer zones to reduce contact between animals and people (i.e., vehicles, motorized tour boats, tourists), and intermittently lighted signals triggered by passing animals[14-18].

Concluding remarks

Animal cognition has indeed played an important role in animal rehabilitation and captive breeding for reintroductions. Some of the paradigms currently explored by cognitive ethologists could further influence conservation efforts in significant ways, for example, phenotypic plasticity in learning and animal adaptability to changing environments (i.e., animals learn to assess new landscapes, new prey, new predators), visual and vocal communication (i.e., signaling, dialect formation in increasingly isolated metapopulations), spatial orientation and navigation (memory in food-storing birds), foraging and search-image formation in constantly evolving prey or habitat (e.g., virtual behavioral ecology), hierarchy learning, social learning and social facilitation[1,2,24-27].

Animals have numerous cognitive capabilities: they have evolved mechanisms to discriminate, recognize, and evaluate habitats, resources and individuals; animals track the position, social behavior and foraging success of conspecifics, group them by age, sex, reproductive status, genetic relatedness and dominance rank, as well as infer relationships among individuals in a socio-sexual context. The extent to which these capabilities are being influenced or disrupted by current habitat fragmentation and degradation or even larger-scale environmental problems (i.e., global warming, ozone depletion, pollution) deserves closer analysis. Animal cognition, therefore, could help us identify, understand and restore some of these disruptions.

Supplement: Examples of maladaptive behaviors

*Mortality due to traffic collisions in Florida Scrub-Jays (*Aphelocoma coerulescens*) is particularly high in immigrant (naïve) birds that colonize and establish territories in habitats along roads[19]. Excessive tameness and curiosity shown by released California Condors toward humans and urbanized areas have contributed to mortality due to collisions with overhead wires[5]. Traffic collisions are responsible for increased mortality in at least ten species of European ungulates[16]. Simple human traffic has induced diurnal animals and their predators to become nocturnal in Sumatran rain forests, where poachers are active during daylight[20]. Road construction in Central Amazonian Brazil affects movement patterns of understory birds in mixed-species flocks; the birds are unable to adapt to the formation of abrupt edges inside their territories and avoid crossing the roads to visit areas where foraging was frequent before the clearing[21]. Foraging behavior (time spent with prey at kill sites) and survival of Amur tigers (*Panthera tigris altica*) have been affected by road construction and human disturbance on and near the Sikhote-Alin State Biosphere, Zapovednik, Russia. Tigers disturbed at kills spent less time at kill sites and consumed less meat from each kill than undisturbed tigers do. Adult and cub mortality is greatest in areas with primary roads[22]. Ingestion of anthropogenic debris by terrestrial and aquatic species has been documented extensively. California Condors exhibit high mortality caused by lead poisoning resulting from ingestion of bullet fragments in carcasses[5]. Reduced nutrient gain from diets diluted by consumption of debris is a common problem among post-hatchling and juvenile loggerhead sea turtles[23].*

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Publications: Conservation Behavior

J. Cully Nordby and the ABS-Conservation Committee have compiled a list of review and conceptually based publications on the interface of conservation and behavioral biology. For an electronic version of this list, visit http://www.animalbehavior.org/ABS/Conservation/index.html

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Feature Article

Conservation Behavior in Borneo's Logged Forests

By Jason Munshi-South*

Most of Borneo's wildlife is not found within pristine protected jurisdictions, but instead exists within production forests. These vast logged areas can play a significant role in conservation but until recently have not been a priority for researchers. Understanding foraging and breeding behaviors in logged forests will help explain why species either persist or go extinct after habitat degradation. Conservation behaviorist Jason Munshi-South is studying the evolution of monogamy in the Large Treeshrew,* Tupaia tana*, in both primary and logged forests in Sabah, Malaysia (NE Borneo). Munshi-South is examining body condition, reproduction, territoriality, and extra-pair paternity among treeshrews in the two habitats.

Protected areas are vital to wildlife conservation, especially for species that require large, contiguous areas of undisturbed habitat. However, political, economic, and demographic pressures limit the amount of pristine habitat that can be protected from human disturbance. Take the case of Borneo, the world's third largest island and a significant reservoir of biodiversity, as well as a leading supplier of tropical timber[1]. Of the three nations that comprise Borneo, only the tiny sultanate of Brunei protects a significant percentage of the area under their control (20%). Overall, only 6% of Borneo enjoys legal protection[2], and protected areas in Indonesian Borneo continue to be severely degraded[3]. Despite this lack of protection, much of Borneo remains forested, including nearly 60% of the Malaysian state of Sabah[4].

Even though most of Sabah's remaining forests have been selectively logged, they still contain most of the vertebrate species found in primary forests. These vast logged areas should play a significant role in conservation efforts, but until recently they have not been a priority for researchers. Controversy has sometimes surrounded conservation in logged areas, due to fears that research showing the ability of species to persist or even thrive after logging may be used as an excuse for further degradation. These fears have not materialized, and the conservation community now widely recognizes the need to develop conservation schemes that balance timber production and wildlife preservation[5]. Furthermore, the limited success of expensive translocation and captive breeding programs makes conservation of endangered species within logged forests an attractive alternative[6].

Most studies conducted in Sabah have found that vertebrate species occur in selectively logged forests, but what are the long-term prospects for these populations? Detailed demographic and behavioral studies are needed to identify and predict when populations are at risk of extinction. Logged forests also present the additional benefit of "unnatural experiments," allowing comparisons of the behavior of individuals in contrasting environments. Animal behaviorists can contribute to knowledge and conservation of vertebrates in logged forests in many ways, two of which have already been applied in Borneo:

Foraging Behavior: Selective logging reduces the abundance of some food sources while increasing others. Surrogate measures of behavioral plasticity, such as dietary flexibility, may be powerful predictors of persistence of many taxonomic groups in disturbed habitats. Mousedeer in Sabah fare more poorly in logged forests than other frugivorous ungulates or primates, most likely because of an inability to shift to a browsing foraging strategy[7]. Additionally, carnivorous civet species decline more drastically after logging than frugivore-omnivore species[8]. Maintaining body condition in altered habitats depends not only on individuals adapting to altered food availability, but also shifting the amount of energy devoted to foraging. Primate species in peninsular Malaysia spend less time foraging and more time resting after logging, presumably to conserve energy when faced with a reduction in preferred, high-calorie food sources[9]. In contrast, omnivorous sun bears and Malay civets show no differences in activity levels or home range sizes in logged vs. primary forests[10,11]. Optimal foraging models represent another potential behavioral predictor of extinction due to logging.

Breeding Behavior: Species that are capable of exhibiting a broader diversity of social or mating behavior in different habitats may be better equipped to persist in logged forests. For example, monogamous and weakly polygynous mammals in West Africa were found to be more prone to extinction than species with males that maintain large harems[12]. Monogamous species or populations may suffer disproportionately from Allee effects due to changes in abundance of breeding females brought on by demographic stochasticity. Sex ratio distortion may also change patterns of sexual interactions in logged forests. Nearly 60% of Sabah's orangutans live in logged forests[13], where local populations periodically experience overcrowding as orangutans move away from logging activities in adjacent areas. These populations can quickly become male-biased because females are much less likely to move away from logging areas than males[14]. Although behavioral studies have not been completed, this male crowding may increase the incidences of male harassment, forced copulation, and infanticide within the population. These behaviors could have long-term negative impacts on orangutan population growth in logged forests.

The examples above were specifically designed to examine vertebrate responses to logging, but behaviorists can contribute to the conservation of wildlife in logged forests in a number of ways (below). Baseline behavioral data from unlogged habitats is often not available. Working on a species affected by logging in other areas, whether endangered or not, can provide useful information. Studying behavior in multiple populations in different habitats can help conservation biologists predict when populations are likely to decline after habitat disturbance. Comparing the behavior of individuals in populations in logged and primary forests can also help untangle the ecological factors influencing the evolution of behavior. In this article, I discuss how my own research takes advantage of the "unnatural experiment" provided by logging to examine the evolution of monogamy in Bornean treeshrews.

Logging and Monogamy in the Large Treeshrew

In Autumn 2000, I was a new graduate student at the University of Maryland looking for a suitable dissertation project. I wanted to study the ecological basis of mating behavior and had the vague notion that I wanted to work on mammals in a tropical ecosystem. My first proposal, a field study of reproductive skew in the Dhole, a social canid found in India and Southeast Asia, fell through due to logistical problems. A few months later I read an article about treeshrews in *Natural History* magazine that was promoting a

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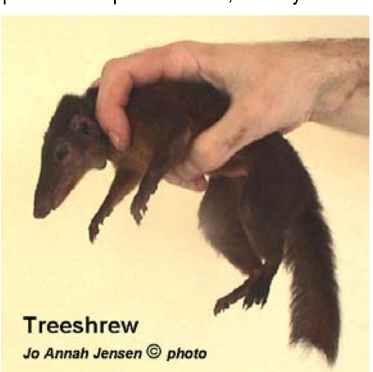
new book, *Tupai: A Field Study of Bornean Treeshrews,* by Dr. Louise Emmons. After ordering the book and reading it in a single night, I scheduled an appointment with Emmons (serendipitously she was just a subway ride away) to talk about treeshrew mating behavior. After that conversation I set about convincing my advisors and funding agencies that studying treeshrews in Borneo was worth pursuing.

After eight months writing grant proposals, coordinating research permits, and lining up local collaborators, I arrived at the Danum Valley Field Centre in Northeast Borneo. Initially aiming to study mating behavior in two species in multiple habitats, I quickly realized the folly of attempting to work on more than one species in more than one place. During the first field season I limited my observations to the Large Treeshrew (*Tupaia tana*) because it is the most abundant in primary rainforest and potentially most interesting; I postponed work in different habitats for a year. My field work, conducted from August to December in 2002-4, addressed the questions: Why did social monogamy evolve in treeshrews? Are treeshrews genetically monogamous? Do treeshrews exhibit different territorial or mating behavior in logged forests vs. primary forests?

Treeshrews as model species to study behavior in logged forests

Treeshrews (Mammalia, Scandentia) are small, diurnal mammals found throughout the Indomalayan region, but more species occur on Borneo than the rest of the Asian continent combined. Treeshrews received much interest from biologists when they were classified as primitive primates, but research has declined since they were grouped in their own order. The IUCN lists one Bornean treeshrew as endangered and all species are protected by CITES Appendix 2 regulations. This latter classification is due mainly to a lack of information on the conservation status of most taxa. Two previous assessments of treeshrews in logged forests suggest that all species are present after logging but at lower abundance and in different proportions[15,16].

Preliminary studies indicate that unlike 95% of mammals, all treeshrew species exhibit monogamous mating behavior. Mammalian males typically provide little parental care, so they can usually maximize their fitness by attempting to mate with the largest number of females. Molecular markers have revealed that even putatively monogamous mammals breed polygynously in certain ecological situations, prompting behaviorists to distinguish social monogamy (living in an exclusive male-female pair) from genetic monogamy (actually breeding with one partner). Emmons[15] recorded a pattern of territorial behavior consistent with social monogamy in six treeshrew species: a single adult male-female pair living on a joint territory that each defends against same-sex conspecifics. However, the Large Treeshrew deviates slightly from this pattern in that territorial boundaries often overlap with neighboring territories.



Social monogamy in the Large Treeshrew

Four main explanations for the evolution of social monogamy in mammals have been proposed[17], all of which may be influenced by the ecological changes brought by logging. The first two involve protection provided by the male for his mate and/or offspring. If the male provides extra vigilance against predators or infanticidal males, then it may benefit the female to limit her reproductive opportunities to that one male. Thirdly, if the male provides extra food on the territory that he defends, then she may also benefit by limiting herself to that territory. Fourthly, treeshrews may be monogamous simply because females are too spread out. Female treeshrews defend very large territories for their body size, and thus males may find it difficult to defend more than one female territory.

Male treeshrews are unlikely to provide much benefit against infanticide; the unique absentee maternal care system of treeshrews makes it improbable that other males will know the location of the natal nest. Females leave their pups in a tree cavity and only visit them once every 48 hours for a vigorous period of suckling. Because male and female treeshrews seem to be equally vigilant against heterospecific predators, males might not be especially important for predator detection. Similarly, males and females defend territories of the same size, so males probably cannot offer additional food to females or offspring. The question remains: are females too spread out for males to defend more than one female (fourth hypothesis, above)?

To address this specific question, I monitored a *T. tana* population in a ¼ square kilometer of primary rainforest over three years. Most of the adults at the site could be captured during each field season, along with several of their offspring. Each adult was sedated, weighed, measured, checked for reproductive status, permanently marked with a microchip under the skin, and fitted with a radio collar. After releasing the animals with their radio collars, my field assistants and I tracked every animal for three days, from just before dawn until sunset. These data on each animal's territory and daily movements allowed me to examine the spatial relationships between males and females within the population.

Large Treeshrews at Danum generally conformed to the pattern of social monogamy found in other studies of tupaiids. However, I recorded two males in 2004 defending territories that encompassed more than one female territory, even though their territories were not larger than other males. These results suggest that overdispersion of females may not be an adequate explanation of social monogamy in treeshrews. Currently I am working on a model based on daily movements and treeshrew reproductive biology to explain why most males do not defend more than one female or rove around the forest looking for additional mates rather than defending a territory.

It is still unclear whether socially monogamous treeshrew pairs actually breed with each other. I sampled a small amount of tissue from the ear of all treeshrew captured during the study with the purpose of using microsatellites to determine the parentage of each offspring within the population. The lab work has not been completed, but I suspect that, like many supposedly monogamous mammals, treeshrews are not as monogamous as they seem.

The fate of treeshrews in logged forests

The final aspect of my research concerns the fate of treeshrews in logged forests. I am examining three aspects of treeshrew breeding biology in these degraded habitats: body condition, territory sizes, and extra-pair paternity.

Overall fleshy fruit production is often lower in logged forests than in primary forests. Fruit trees destroyed by logging may be replaced by pioneer species such as *Macaranga* sp. that produce fruits of little value to terrestrial vertebrates. If fruit production is hindered by logging, then I predicted that treeshrews would exhibit worse body condition in logged forests. Lower fruit and/or invertebrate density in logged forest may also force *T. tana* to defend larger territories in logged forests to meet the energetic requirements for reproduction. If female territories are smaller in primary vs. logged forest

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(lower female dispersion) then the rate of encountering receptive females should also be higher for males in primary forest. To examine these predictions, I trapped and radio tracked treeshrews during 2003-4 in a logged area about an hour's drive from the primary forest site. If the 'female overdispersion' hypothesis explains monogamy in treeshrews, then larger female territories in logged forest should result in social monogamy and a low rate of extra-pair paternity. Alternatively, smaller female territories in logged forest should result in social polygyny (as observed for two males in primary forest) and a higher rate of extra-pair paternity.

The work in logged forest has been plagued with difficulties from the beginning. The capture rate was low during 2003, possibly because of the large amount of fruit falling from the trees during trapping. Radio tracking and other data were obtained from only a few adults. Additionally, this logged site is right in the center of the range of Sabah's elephant population. These elephants frequently feed on the grasses and shrubs that grow in disturbed areas and use logging roads as shortcuts between foraging sites, resulting in many more elephants at the logged site than in the primary forest. My small mammal traps and fruitfall nets were repeatedly destroyed by marauding proboscideans.

Promising findings

Results are emerging despite these difficulties. Treeshrews in logged forest were larger and in better condition than animals in primary forest. Additionally, a much higher percentage of juveniles were captured in logged forest than in primary forest, suggesting that the ecological conditions in logged forest may be quite favorable for the Large Treeshrew and an endangered Borneo endemic that I have also trapped in large numbers, the Large-footed Treeshrew (*Tupaia longipes*). In 2003 the elephants did not destroy all of the fruit nets and thus allowed me to measure much higher fruit production in logged vs. primary forest. Higher fruit production after logging may offset the effects of lower invertebrate diversity and abundance, allowing treeshrews to increase their reproductive output. It is currently unknown whether increased fruiting is only a short-term response to logging. Treeshrews in logged forest did not defend significantly smaller or larger territories, but all males were socially monogamous. The DNA work still needs to be completed before we determine if the increased body size and reproductive output of treeshrews in logged forests results in a greater incidence of extra-pair paternity in logged vs. primary forest.

Future behavioral research in logged areas will benefit from a comparative, model-building approach and should seek to examine multiple species and habitats simultaneously. Unfortunately, animal behaviorists, especially those working in the tropics, often work by themselves and lack the funding for large numbers of trained field assistants. Collaborative efforts using standardized protocols for collection of behavioral data, along with studies of the changes in forest structure and dynamics, are needed to move this vital area of research forward.

* 2004 recipient of the Animal Behavior Society E.O. Wilson Conservation Award; Department of Biology, University of Maryland, College Park, USA, south@umd.edu

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Funding opportunities

Debra M. Shier and the ABS-Conservation Committee have compiled a list of institutions that would consider funding research proposals from conservation behaviorists. To access this data base, visit ***www.animalbehavior.org/ABS/Conservation/ccfunding.html***

Animal Behavior Society Annual Meeting 6-10 August 2005

The **2005 Animal Behavior Society Annual Meeting** will be held at Snowbird Ski and Summer Resort in the mountains of eastern Utah, 45 minutes outside of Salt Lake City. This is a gorgeous Rocky Mountain site, located in a dry mountain canyon with both alpine tree line and the desert floor with easy driving distance. It is centrally located in the Rocky Mountain West, perfectly situated for a family vacation. Our venue will be classic conference center/resort meeting rooms, i.e. ballroom or flat seating. Most meeting rooms will be located in the Cliff Lodge, the same building which will hold most of the housing rooms. Sessions will be held in the Ballroom, which will seat 700 people.

Registration and Abstract Submission: Early registration and abstracts will be accepted via the conference registration and abstract web pages beginning April 4, 2005. Deadline for early registration and abstract submission is midnight on 1 June, 2005.

Craig Packer will deliver the ***Keynote Lecture***, discussing how his group has been using principles from behavioral ecology to study disease transmission in the Serengeti and to understand human-animal conflict throughout Tanzania. Sunday, 7 Aug 2005, 8:30 am.

Fellows Lectures will be given by John Wingfield (Monday, 8 Aug, 8:30 am: *Allostatic load and overload: behavioral strategies for coping in a changing environment*) and Joan Strassmann (Wednesday, 10 Aug, 8:30 am: *The importance of behavior in a genomic age*).

A ***symposium*** in honor of Don Griffin will include talks on ***Cognition*** (James Gould, Ben & Lynnette Hart, Bernd Heinrich, Irene Pepperberg, Gordon Burghardt, Colin Allen, Roger Fouts, Marc Bekoff), ***Bats*** (Jim Simmons), and ***Bird Migration*** (Ron Larkin).

Award

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Fisher's research focuses on a natural hybrid zone of two swordtail fishes, *Xiphophorus birchmanni* and *X. malinche* in the Huasteca region of the eastern Sierra Madre, Mexico. "Heidi's approach to science brings together the focused intensity of a former varsity rower and the public spirit of an Americorps veteran" says advisor **Gil Rosenthal**, professor at Boston University. "Fisher's research adds to a growing body of work showing that environmental disturbance can alter communication channels in ways that threaten biodiversity. What is distinctive -not to mention alarming– about Heidi's work is that she shows this isn't the case only in places that look obviously disturbed to us. Humic acids are a natural constituent of freshwaters but their levels increase as a result of organic waste discharge and deforestation. They're considered harmless by the Environmental Protection Agency. Yet environmental concentrations of humic acids can impair chemical communication to the extent that species are lost through hybridization. More elegantly controlled behavioral studies like Heidi's may tell us a lot about potential impacts that might be missed by a more conventional toxicology approach. Heidi's research resonates across a variety of scales. It suggests an important point in the study of animal communication, namely that the chemical environment is likely to exert strong selection on both chemical signals and chemoreception - particularly in aquatic creatures."

Along with colleagues and Non-governmental Organizations in the US and Mexico, Rosenthal's lab is working towards a blueprint for sustainable development in the Huasteca region, where many people depend directly on rivers for water and food. Rosenthal's work includes collaboration with the Movimiento Indígena Unión Sierra y Huasteca (MIUSH), a grass-roots group based in Calnali, and the Foundation for Education and Sustainable Development (FESD). According to Rosenthal, Fisher's work both identifies an insidious threat to biodiversity and provides a low-cost, transferable bioassay of contamination. "This study may impel environmental regulators worldwide to take a new look at the role of a wide range of seemingly 'harmless' substances."

Gil Rosenthal and graduate student Heidi Fisher working in the field

© Photo Francisco García de León

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The Conservation Behaviorist talked with Heidi Fisher about the E. O. Wilson Conservation Award; here is what she said:

What was your immediate reaction when learning you got the E.O. Wilson award?

I felt truly honored that my proposal was chosen, particularly since it is an award honoring E. O. Wilson, whose work has had a huge influence on my own.

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

It seems like there is often a divide between basic science research and conservation programs. I hope that the E.O. Wilson award will encourage other students to develop research projects that ask fundamental questions about animal behavior and apply the findings to conservation problems. I think an award for conservation research was a fantastic idea.

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

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. I believe that understanding how an organism interacts with its environment is critical to developing a successful conservation program.

How did you become interested in working in Communication breakdown and hybridization in *Xiphophorus* fishes?

I initially began working with another Xiphophorus *species, but then my advisor, Gil Rosenthal, introduced me to the* X. birchmanni/malinche *hybrid zone in the Huasteca region (Mexico). It is a fascinating system and although most of Gil's research had focused on visual communication, I was convinced that chemical communication was likely important as well. The hybrid zone was probably established within the last decade or two, and we knew that during that time, anthropogenic pressure on the Río Calnali has increased. After doing some background research and preliminary observations, I was finally able to run some experiments to understand if the hybridization and ecological changes were related. We're still far from answering that question, but future experiments will, hopefully, get us a bit closer.*

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

I'd like to continue in academics and develop a research program that is focused on animal behavior and evolutionary biology with an emphasis on conservation. Making my research accessible to the general public and working with local conservation groups is equally important to me.

The E. O. Wilson 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.

For additional information on this award contact the **Conservation Committee** *gpazymino@worcester.edu* or the **Student Research Grant Committee** *Hugh@servidor.unam.mx*

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2003 Volume 1 Number 1

Paz-y-Miño C., G. **Contribution of Animal Behavior Research to Conservation Biology**

"…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: 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..."

2003 Volume 1 Number 2

Alberts, A. **Kidnapping the Don Juans of Guantánamo**

"Temporary removal of dominant male rock iguanas (genus Cyclura*) and careful manipulation of a population's social structure could help conservation behaviorists reduce the effects of inbreeding. The technique may be most effective for small genetically-compromised endangered species that show strong polygyny, with a few dominant males monopolizing territories and females. After the 'Don Juans' are removed from their home ranges, new males take over their roles and females have access to a more diverse set of mates…"*


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Paz-y-Miño C., G. **Behavioral Unknowns: An Emerging Challenge for Conservation**

"In 1995, Norman Myers defined 'Environmental Unknowns' as those problems we had not even identified as yet but for which we were all accountable. Examples included climate change, mass extinctions, and ozone layer depletion… As data become available and environmental public awareness grows, new 'unknowns' are emerging. One such 'surprise' is the impact of global disruptions on the behavior of animals… 'Behavioral unknowns' are emerging at a time when ethological data are most needed for captive breeding of endangered species, reintroduction programs, and habitat restoration. Yet, despite Myers' previous warnings, we have been taken by surprise. For too long, we have omitted behavior from the list of 'things to be done' to keep our Planet running. Behaviorists have much to contribute to conservation."

2004 Volume 2 Number 1

McPhee, M. E. & Silverman, M. **Behavioral deficiencies and the reintroduction of animals into the wild**

"When captive-bred animals are released to re-establish or supplement a wild stock, reintroduced populations show behavioral deficiencies. Absence of anti-predator behavior, difficulty recognizing and finding food, and inadequate social skills, compromise the success of reintroductions. How many animals should be released to compensate for mortality caused by behavioral deficiencies? In this article, the authors discuss a method to estimate a "release ratio," a figure that considers the effects of behavioral deficiencies and can help us estimate the number of animals needed for successful reintroductions."

2004 Volume 2 Number 2

Swaisgood, R. R. **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 for conservation breeding."