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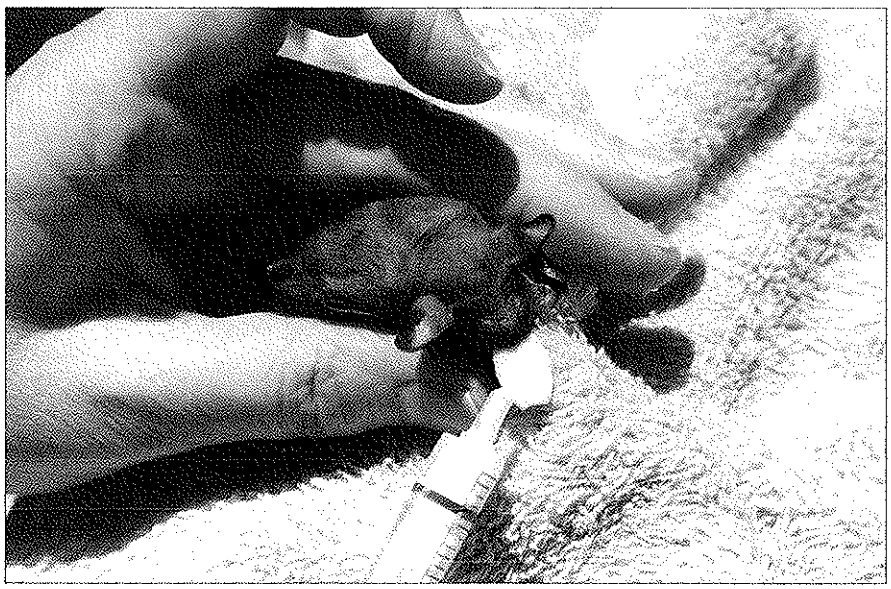
Field Anesthesia of American Mink Using Halothane ... Fundraising on the Internet ...

and much more

ABOUT THE JOURNAL . . .

THE JOURNAL OF WILDLIFE REHABILITATION is designed to provide useful information to wildlife rehabilitators and others involved in the care and treatment of native wild species, with the ultimate purpose of returning them to the wild. The *Journal* is published by the International Wildlife Rehabilitation Council (IWRC), which invites your comments on this edition. Through this quarterly publication, rehabilitation courses offered in numerous locations, and an annual conference, IWRC works to disseminate information and improve the quality of care provided to wildlife.

ON THE COVER: a hedgehog (*Erinaceus europaeus)* in the daytime, suggestive of ill health as it is foregoing its normal nocturnal habit (see page 13). [PHOTO: Toni Bunnell] BELOW: An orphaned big brown bat pup (*Eptesicus fuscus*), 13 days of age. *(NOTE: Gloves should be work when handling rabies vector species.)* [PHOTO: Sean Butler]



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EDITORIAL

What's on Your Mind?

"I received and devoured my journal."

"There is an energy and freshness in the overall tone that is really noticeable."

Those words are music to an editor's ears; they tell me we're definitely doing something right.

When I became editor of this journal almost two years ago, I was excited to be joining the IWRC team. During my interviews with Executive Director Mary Reynolds and then-President Marge Gibson, the word that kept coming up and that kept me interested was "education." Mary and Marge spoke eloquently of their vision for the journal and its key role in helping the IWRC provide members with solid, relevant information.

"I like [your] reaching out to 'para-rehabbers.' Many interested people have asked me if it was OK to join IWRC if they weren't actively rehabbing...."

For the past year-plus, the journal's editorial team has worked hard to implement some important changes in the journal, engaging in some ongoing behind-the-scenes work to make this publication as useful and engaging as possible. Some of the changes are small, simply intended to help you find the information you need more quickly—such as minor changes in layout that make charts and figures easier to read, or allow you to tell at a glance which articles can be quickly consumed, which will require a more leisurely and thoughtful read.

"The column Open Minds was very positive and has nudged me to make a phone call to a rescuer who brought in three fox squirrel babies after she cared for them for six days."

We've added whole new areas of information: columns that provide fresh ideas for educating, for working with the public, for understanding rehab-related laws, for providing the basics and well beyond to the animals in your care.

"We have lots of little frogs and toads on our property, so I'm peripherally interested, though I know little about them. The abstracts section is wonderful—I read a nice blurb on amphibians as environmental indicators. Sort of like the little gems you would see in Scientific American *or* Sky & Telescope."

Selected Abstracts can guide you to the latest scientific literature, either for your rehabilitation efforts, general knowledge, or as part of research (that may result in a paper submitted to the journal!). We know your time is precious, so when you manage to carve out an hour for reading, we suggest turning to a book featured in Conservation Classics.

"I especially like the variety the journal offers. The international flavor without dedicating the entire publication to other than U.S. activities was refreshing and seemed to include rather than tolerate or make pets of our non-U.S. counterparts."

We've reaffirmed some of the basics that have guided the journal for years, including a commitment to in-depth, meticulously researched, peer-reviewed papers. Our process can be lengthy, but it always results in a stronger, tighter article. We're also committed to living up to our organization's name and publishing a journal that is truly international in scope and content.

Finally, we've quadrupled our efforts to find and publish the best range of articles possible. This means we have a better mix of papers to choose from when planning each issue and allows us to publish timely and sometimes groundbreaking research and news.

"I read your article on MacDiet and was really interested in it since we have used cat food-based diets, but it has seemed to me that birds such as swallows really need a more insect- and higher-protein-based diet."

What is all this leading up to? Simply this: we'd like to include a Letters column in the journal, to provide another opportunity for readers to ask for elaboration or clarification from our authors, or to offer additional information or perspectives. Please direct general questions and comments to me via e-mail at runmuki@aol.com (see inside back cover for USPS address). If you're responding to one of our articles or columns, please contact the author. We'll run those letters—with author responses, when appropriate—that seem most beneficial to the greatest number of readers.

—Marianne Skoczek
Editor

Case Study: Care and Release of an Orphaned Big Brown Bat Pup (*Eptesicus fuscus*), Part I

by Edythe Butler

ABSTRACT: This is Part I of a three-part article on the rehabilitation and release of "Miss Peep," an orphaned big brown bat pup *(Eptesicus fuscus)* in Ottawa, Ontario, Canada. An adult female bat was noticed and rescued from a farmhouse veranda on 5 June 1999 due to the loud peeping of tiny twin pups clinging under her wings. Unfortunately, both the mother bat and male pup died shortly after intake. The female pup survived, was hand-reared, and was later released back at her natal maternity colony roost under the farmhouse eaves. The mother bat tested negative for rabies; necropsies concluded the mother likely died of a uterine infection and the male pup of septicemia. The surviving pup's first two weeks in care, and her early growth curve in comparison to that of wild, mother-raised pups and captive, mother-raised pups is described. A brief natural history of bats in general and big brown bats in particular is given, and health precautions for bat workers regarding rabies, histoplasmosis, and asthma or allergic reactions are outlined.

KEY WORDS: Microchiroptera, *Eptesicus fuscus,* big brown bat, bat pup, hand-rearing, growth and development, wildlife rehabilitation, health precautions

EDYTHE BUTLER is a home-based wildlife rehabilitator, licensed by the Ministry of Natural Resources in Ontario, Canada. She has rehabilitated small mammals since 1987 and works as a research assistant for a geriatric psychiatry program at a local hospital.

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Introduction

This is Part I of a three-part series on the rehabilitation and release of "Miss Peep," an orphaned big brown bat pup *(Eptesicus fuscus)* in Ottawa, Ontario, Canada. Part I presents intake circumstances for this newborn bat, reports on Peep's first 2 weeks in care when she was housed in an incubator and hand-fed milk formula, provides a brief natural history about bats in general and big brown bats in particular, and outlines health precautions for wildlife rehabilitators. Part II will cover the rehabilitation of this pup from 2 to 8 weeks of age, including weaning from formula to mealworms and transfer to a flight tent after first flight at 4 weeks of age. Three other big brown bats will also be introduced: a mother bat and her captive-raised twin youngsters. These were added to the flight tent to condition for release and to provide Peep with conspecific company. Part III will follow Peep and her tentmates for the last 3.5 weeks of flight training. The addition of a hack box in the flight tent and its use in the "soft" release back to Peep's natal maternity colony roost will be described. Postrelease tracking or marking options will be discussed, including the lightweight fluorescent fabric dots employed by the author. Release strategies used by wildlife rehabilitators for captive-reared insectivorous bat pups in North America will also be reviewed, and one divided hack box technique used in Europe will be described. No postrelease data was collected that documents for certain that Peep survived in the wild, but a few observations allow for optimism.

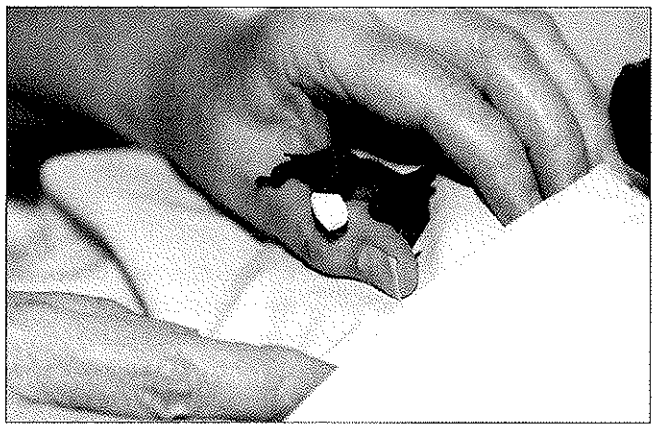
Statement of the Problem

Meeting Miss Peep: Intake

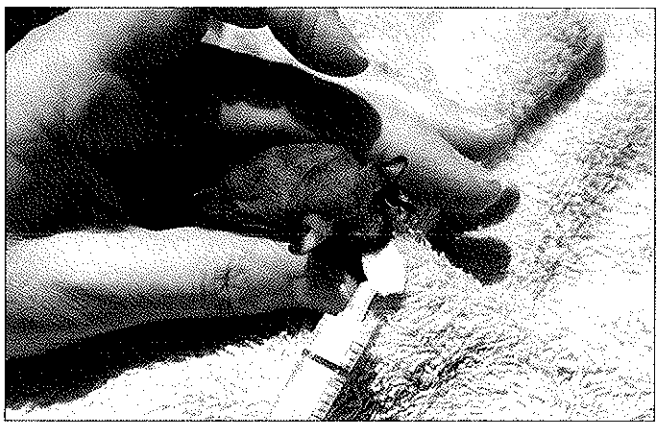
"The Bat" by Ruth Pitters (cited in Robertson 1990, 51)
[begins with fears about bats . . .]
"[this] lightless, unholy, eldrich thing. . .
looking dirty, clammy, cold"
[but once the injured bat is picked up it is . . .]
"warm as milk, clean as a flower, smooth as silk,
[with] chestnut down and crepy wings,
And O a little one that clings."

Persistent high-pitched peeping alerted Sally Baillie to the plight of a downed bat on her farmhouse veranda near Ottawa, Ontario, on Saturday, 5 June 1999. After discovering the source of the distress calls—two tiny newborn pups, clinging under their mother's wings—Baillie immediately transferred the trio to bat rehabilitator Selena Walker. Unfortunately, the mother bat died a couple of hours later. Testing was negative for rabies, and the necropsy, performed at the Canadian Cooperative Wildlife Health Centre in Guelph, Ontario, concluded death was likely due to a uterine infection. The two 3.6 g pups stayed with their mother for the last hours of her life, apparently nursing. After retrieving the pups from the mother's body, Walker arranged to transfer them to the author, a wildlife rehabilitator with experience raising very young infant wildlife. About an hour later she met the author at the door with a hand cupped over the pups where they hung on her shirt. The moment she lifted her hand, they set up a loud peeping. Only after they were settled in a small temporary incubator did they quiet briefly, and were then loaded into the author's car, along with the following supplies:

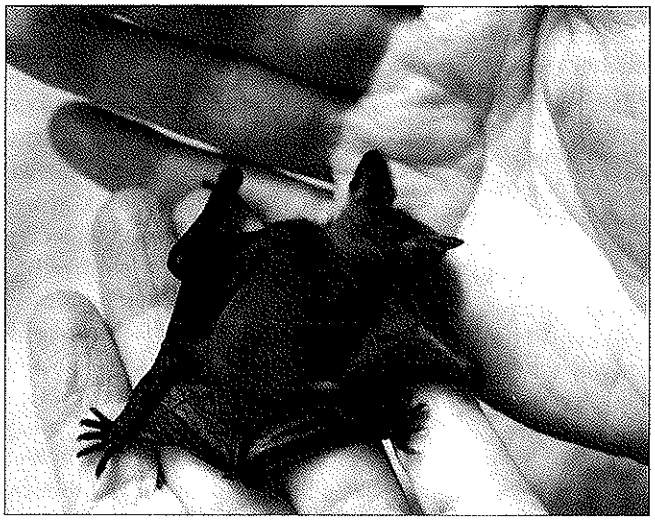
- Gastrolyte® rehydration solution
- eye-shadow applicator wands with foam tips (to use as a feeding tool)



FRANCES TROTTIER



SEAN BUTLER



JASON LUTES

FIGURE 1 (top left): Peep at 8 days of age, 14 June 1999, with her foam eye-shadow applicator tip. She now weighs 7.3 g, double her birth weight of 3.6 g. Her eyes opened on day 4. FIGURE 2 (above): Peep at 13 days of age, 18 June 1999, lightly furred and weighing 9.9 g. She soon gives up her foam tip and takes formula directly from the syringe. FIGURE 3 (left): Peep at 13 days of age, 18 June 1999, weighing 9.9 g. She now wants to stretch and walk around a little after her feeds. She is still housed in an incubator and fed 5 times a day.

PLEASE NOTE: ***Peep was admitted into care the day she was born, and her mother tested negative for rabies. The author did not wear gloves to handle this animal. Whether or not the animal's rabies status is known, this should not be taken as a recommendation to others (see Health Precautions, p.9).***

- Mother's Helper™ puppy milk replacer (Lambert Kay)
- two large plastic Rubbermaid® storage bins and a water-submersible aquarium heater to make an incubator (Graboski 1995)
- bat care manuals (Barnard 1991; Lollar and French 1998)

The loud peeping soon resumed, and continued unabated for the 20 minute drive to the author's home. Big brown bat pups born to captive females have been noted to call loudly if separated from their mother, and these two were no exception (Walker 1999, pers. comm.). They demanded close body contact—not just warmth—or they threatened, it seemed, to expend all their energy peeping!

By 11 P.M. both pups had readily accepted the oral rehydration solution. They were fed using a small nipple pushed onto a fine curve-tipped dental irrigation syringe while they hung, head down, over the author's thumb. The author watched them feed under a magnifying glass since it was difficult to see otherwise, holding her hand on a hot-water bottle, with a light cotton cloth over that hand like a tent to keep the pups warm. The incubator had warmed to 32°C (90°F) by then, but the minute the pups were put down they peeped incessantly, so the author held them between rehydration feedings overnight. They took rehydration again at 1 A.M., but the male pup died before the next feed at 3 A.M. Necropsy revealed that he died of septicemia. The little female, Peep, however, survived the night, went on to grow into a healthy bat, and was released back at the Baillie farm on 25 August 1999.

Methods

Raising Miss Peep: Care and Development

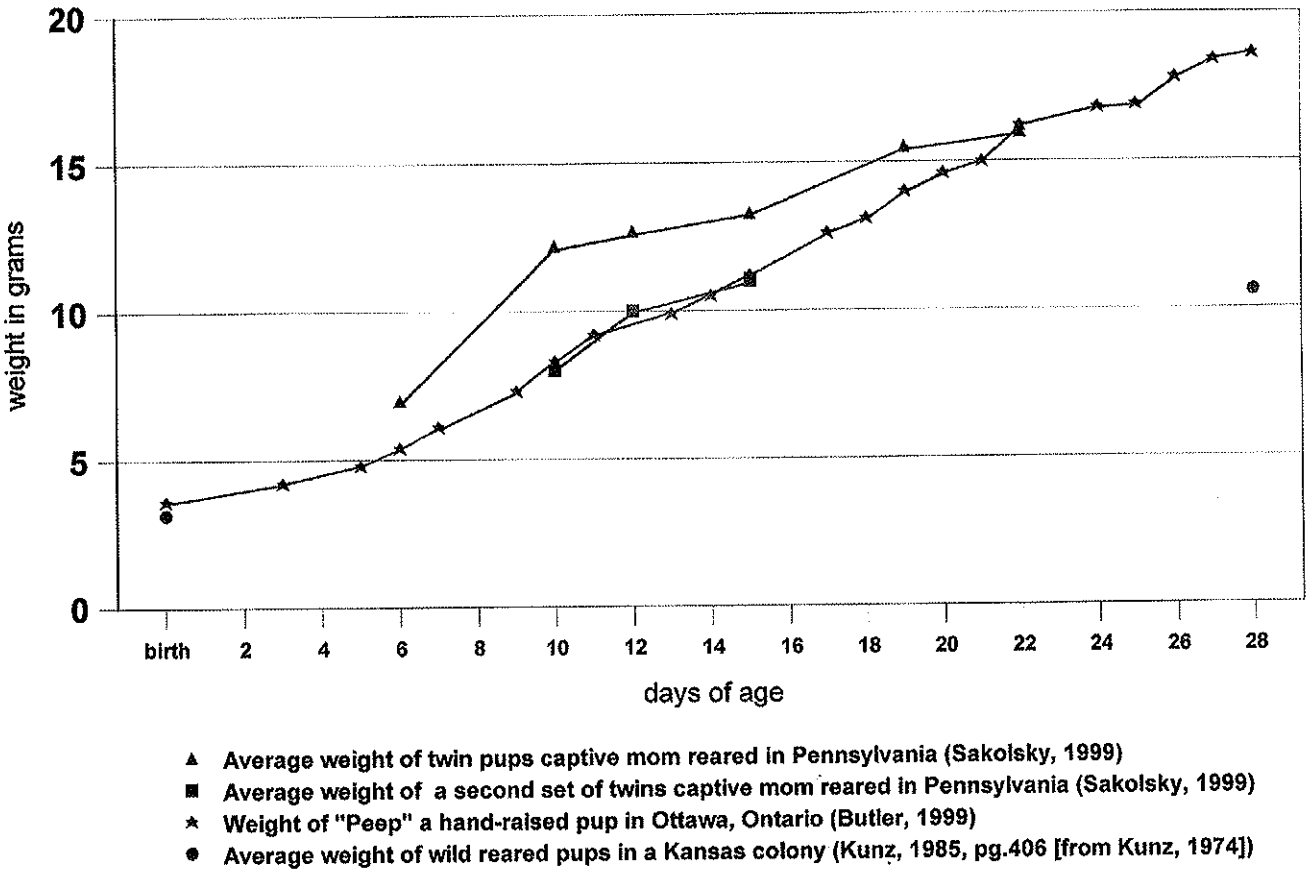
Birth to Two Weeks of Age (5 June–19 June 1999)

Arthur Whitaker, writing in the *Naturalist* in 1905, (cited in Robertson 1990, 8) describes the birth of a bat:

> As soon as ever the head of the baby bat protruded it commenced to squeak lustily. The young one was quite free in about four minutes time, and worked its way under the shoulder of its mother, and so round on to her back, where it clung quite exposed, head downwards. . . .The mother seemed little worse for the ordeal she had gone through, but busied herself with washing and brushing her fur all over for a long time afterwards, taking no notice of 'baby,' who kept on squeaking shrilly all the while.

The newborn Peep and her twin stayed firmly attached to their mother for the last hours of her life, and could only be plucked off when they released their hold after the mother bat died. During their first night in care they peeped continuously if put down. Not until about 2 P.M. the next day, when Peep was about 24 hours old, did a combination of

FIGURE 4. EARLY GROWTH CURVE FOR BIG BROWN BAT PUPS (EPTESICUS FUSCUS) BIRTH TO 4 WEEKS OF AGE



food (half-strength formula by then), a fake fur pouch to hang in, and the addition of a hot-water bottle under the pouch in the already toasty 32°C (90°F) incubator settle her, and the peeping subsided. Body temperature for big brown bats is published as 38°C (100.6°F) (White 1993) or 32–36°C (90–97°F) (Marcum 1997). Roost temperatures measured in one big brown bat maternity colony in Massachusetts averaged 32°C (90°F) as a maximum and 26°C (82°F) as a minimum when outside temperatures averaged 28°C (82°F) maximum and 16°C (61°F) minimum (Burnett and Kunz 1982).

Peep's initial diet consisted of Mother's Helper™ puppy powder, mixed as recommended by Lollar (pers. comm. 1999) and French (pers. comm. 1999): 1 part powder + 2 parts water, with 1 drop Avitron® and 2 drops Avimin® added to each 35 ml of prepared formula. Marcum's *Rehabilitation of North American Wild Mammals Feeding and Nutrition* (1997) also lists Mother's Helper™ puppy formula mixed to this ratio as one of several options for bat pups.

Several different formulas have been reported successful in the rehabilitation of insectivorous bat pups, and two or three have been used with success by rehabilitators who raised many individual bats of a diversity of species over a period of 10 years or more. Formula choice is currently a controversial issue among experienced bat workers. This paper reports only the formula used to raise one big brown bat pup (Peep). The author believes orphaned insectivorous bat pups will benefit from a careful analysis of the formulas presently in use.

Peep's weight gains in those first 2 weeks, when she was fed only formula, convinced the author that the pup received adequate nutrition (Figure 4), despite concerns that the formula was too dilute. Lollar has mentioned anecdotal reports of soft bones (metabolic bone disorder) in bat pups raised on the canned liquid (premixed) Mother's Helper™ puppy formula (2000, pers. comm.). The author speculates this is because the canned liquid does not provide enough nutrition. It is even more dilute than the mix used for Peep.

The Mother's Helper™ formula was introduced gradually, and Peep was up to full-strength formula by the second day in care. She took readily to being fed from a foam eyeshadow applicator tip, removed from the wand (Lollar 1994 [cited in Lollar and French 1998]). Once she was nursing the foam, a drop or two more formula could be added to it from a syringe. She often latched on and would not let go at the end of the feeding, taking the foam back to the incubator with her. The author found this a little worrisome; however, the foam tip was invariably spit out by the next feed. Other bat

workers have had success delivering tiny droplets of formula to bat pups from 1 cc syringes fitted with small Catac nipples (Sakolsky 1999, pers. comm.); a nipple made from red rubber tubing (Sovereign catheter, #8 French) snipped off and pushed onto a syringe (Barnard 1991; Lollar and French 1998); or even licked, a drop at a time, from the palm of the caregiver's hand (Barnard 1991).

Peep was fed six times a day for the first week, and stimulated to urinate and defecate at each feed. She tended to overeat somewhat at each feed, and the author indulged this behavior due to concern that the formula was too dilute. Peep tolerated this feeding regime well, with no bloat or diarrhea noted.

By the second week Peep was down to five feedings a day. On day 14, when she first started eating mealworm viscera, she went to four feedings per day and also gave up her foam tip, choosing to simply lick the formula from the end of a syringe (Table 1). She made steady gains in weight, and by day 9 had doubled her birth weight. By day 14 she weighed 10.5 g, almost triple her birth weight. She started getting light fuzz by day 5, but this was only visible under a magnifying glass; to the naked eye she didn't appear to have a covering of fur until she was 10–12 days old. Before she was well furred, she looked like a miniature dusky-colored monkey, and her shoulder bone structure, particularly the shoulder blades, looked human. Bat torsos are flattened like ours, wide and not very deep, unlike a dog or cat's narrow deep chest.

Big brown bat pups are born naked and with their eyes closed. Generally, in microbat species eyes open about day 3–4 (Hill 1984), and Peep's opened on day 4. The time eyes open can vary between microbat species, however, and there may be exceptions even within a species. Big brown bat pups born in captivity have opened their eyes on day 7–8 (Walker 1999, pers. comm.); Mexican free-tail bats (*Tadarida brasiliensis*) are noted to have their eyes open at birth (Lollar 1994 [cited in Lollar and French 1998]); and Eastern red bats (*Lasiurus borealis*) are reported to begin opening their eyes on day 10 or 11 (French [cited in Lollar and French 1998]).

The newborn Peep guarded her wings closely folded against her body. However, when 3 days old—and still a closed-eyes infant—having lost the formula-saturated foam tip, she tried a "bat hulk" move to recapture it by hopping on it and scooping it toward her face using partially extended wing and tail membranes.

In big brown bats the two mammary glands are located as in primates, although nearer the armpit. The nursing infant is cradled against the mother's body, wrapped snugly under her wing. As a very young pup, Peep was able to orient herself to the author's body; if left to her own devices, after her feeds she would migrate to the upper chest and under the arm to snuggle. The author started to wear t-shirts with a pocket for Peep to hang in for a few minutes after feeds, while the incubator and feeding supplies were cleaned. Peep chose this tactile reassurance less and less as she matured, and seldom after she weaned and was housed in a flight tent in the company of other bats.

Peep was admitted into care the day she was born. Her mother tested negative for rabies, and the author chose not to wear gloves to handle this pup. However, regardless of whether an animal's rabies status is known or not, gloves are always recommended for handling bats, and the author's choice in this case should not be taken as a recommendation to others (see Health Precautions, p. 9). Following good wildlife rehabilitation practice, with the exception of her primary caretaker and the conspecifics she was later housed with, Peep was isolated from direct contact with humans, domestic animals, and other wildlife in care.

After the first 24 hours, Peep was relatively quiet between feeds, although she responded to the sound of the author's voice with intermittent peeps. No longer prolonged incessant peeping, these calls were more like conversation: "Is that you?" she seemed to be saying, followed by a pause to listen.

Thomson (1980 [cited in Fenton 1985]), studying little brown bats (*Myotis lucifugus*) found that very young pups tended to call continuously when left by their mothers, while older but unweaned infants still called, but not continuously. Bat pups do not have to learn these calls; they use them minutes after birth. However, a mother big brown bat must become attuned to her infant's call in order to selectively nurse her own pup (Rasmuson and Barclay 1992).

Mother bats can fly with the young attached, but do not carry them while they hunt since flight maneuverability would be impeded (Fenton 1983). They leave the maternity roost at dusk to forage but return during the night to nurse, and in most situations observed in the wild, mothers do recognize and selectively nurse their own young (Racey 1982). Fenton (1985) allows that insectivorous bats occasionally nurse young other than their own, however, and in a rehabilitation setting a big brown bat mother of twins was noted nursing a younger set of twins on one occasion (Sakolsky 1999, pers. comm.).

Big brown bats communicate mostly by vocalizations and scent cues (Fenton 1985). Even once Peep was weaned and in a flight tent, she often responded to the author's speaking her name with what sounded like very soft S's. She also proved sensitive to the author's scent and once reacted with aversion when picked up for a feed while the author was wearing the same shirt that she had worn to transfer a squirrel to a new cage. The pararhinal glands located on each side of the muzzle of big brown bats vary in size seasonally and may have some role in bat domestic scent life (Fenton 1983). That vocalization plays a major role in mother-infant bonding was demonstrated by Gould (1971 [cited in Fenton 1985]), who found that female big brown bats ignored silent or abnormally vocalizing young.

Discussion

General Information about Bats

There are almost 1000 species of bats on planet Earth, and although most live in the tropics, bats are found on every continent except Antarctica. The U.S. hosts 45 species (Lollar and French 1998), and in Canada 19 species occur regularly (Fenton 1988).

TABLE 1. "MISS PEEP," A HAND-RAISED BIG BROWN BAT PUP (*EPTESICUS FUSCUS*) CARE SUMMARY: BIRTH TO TWO WEEKS OF AGE, 5 JUNE–19 JUNE 1999

Age (weeks)	Age (days)	Weight (grams)	Comment	Feedings
0	birth	3.6	The twin newborn pups stayed firmly attached to their mother until she died at 8 P.M. on 5 June. They were then given oral rehydration every 2 hours overnight and held by the caregiver since if they were put down even in a warm incubator, they peeped nonstop. The male pup died at about 3 A.M. on 6 June.	11 P.M. rehydration **(A)** offered from a small nipple on a fine curve-tipped dental irrigation syringe, with feeding viewed under a magnifying glass.
	1		After 3 more feeds with rehydration, formula **(B)** is gradually introduced to the surviving pup, "Peep," fed from a foam eye-shadow applicator tip **(C)**. Pup is housed in a fake fur pouch in a cloth-lined nest in an incubator **(D)** set at 32°C (90°F).	1, 3, & 5 A.M.: rehydration 8 & 11 A.M.: 1/4 formula + 3/4 rehydration 2 & 5 P.M.: 1/2 formula + 1/2 rehydration 8 & 11 P.M.: 3/4 formula + 1/4 rehydration
	2		Full-strength formula fed 6x/day. Eyes open on day 4.	2, 6, & 10 A.M. and 2, 6, & 10 P.M. formula
1	7	6.1	Down to 5 feedings/day. Lightly furred by 10–12 days of age.	4, 8, & 12 A.M. and 6 & 10 P.M.: formula
2	14	10.5	Down to 4 feedings/day, fed from a 1 cc syringe; mealworm viscera is introduced at 3 of 4 feeds, starting with 2 and working up to 8 per feed.	6 & 12 A.M. and 6 & 10 P.M.: 2–8 mealworm innards **(E)** + formula

A = Gastrolyte® (Rhone-Poulenc Rorer)

B = Mother's Helper™ puppy powder, with 1 drop Avitron® + 2 drops Avimin® (Lambert Kay) added to every 35 ml of prepared formula (Lollar and French 1988)

C = small, high-density foam eye-shadow applicator tip removed from the wand (Lollar 1994)

D = incubator (Graboski 1995)

E = mealworm viscera are squished from decapitated mealworms into the pup's mouth (Barnard 1991)

Like all mammals, bats give birth to live young and feed them milk, but unlike any other mammal, bats fly. Echolocation, lightly referred to as their "sixth sense" (Ransome 1990), allows insectivorous bats to locate prey in the dark, often on the wing, by emitting ultrasonic calls and listening for the echoes that reflect back.

Bats may be more closely related to primates than to other small mammals such as rodents. Currently all bats are placed in a single order, the Chiroptera, with two suborders referred to as *megabats* (175 species) and *microbats* (~790 species), ranging in size from the 1.5–2 g bumblebee bat (arguably the smallest mammal), to the 1 kg flying fox (Altringham 1996). Traditional thinking holds that these two suborders are *monophyletic*, meaning the most recent ancestor shared by both would also be classified as a bat. Some controversy exists, however, and John Altringham (1996) proposes two possibilities: that (a) microbats and megabats are monophyletic, and primates are a sister group, or (b)

megabats and primates are monophyletic, and microbats are a sister group.

General Information about Big Brown Bats

Big brown bats *(Eptesicus fuscus)* are one of North America's most familiar bat species. They are insectivorous microbats of the family Vespertilionidae, which has approximately 283 species. Members of this family are found almost everywhere in the world (Fenton 1983). Big brown bats have shiny dark brown fur, lighter on the underside, and wing membranes and ears that are not furred and almost black. The wings are folds of skin enclosing blood vessels, some connective tissue, and muscle, supported by arm, hand, and hugely elongated finger bones. Wing membranes are relatively similar to a plastic sandwich bag in thickness, strength, and elasticity; although they appear fragile (Studier 1972 [cited in Hill 1984]), tears tend to heal quickly (Fenton 1983; Lollar and French 1998).

Silhouetted against the sky at dusk, big brown bats appear larger than they are, since they need a relatively large wingspan of 32–39 cm (12–15 in) to support their weight in flight. In fact, adults measure only 8–13 cm (3–5 in) from nose to base of tail, and have a forearm measurement of 41–52 mm (1.6–2 in). Adult females measured at a maternity colony in Massachusetts had forearms averaging 45.8 mm. Newborn pups in that colony had an average forearm of 16.8 mm, and achieved near-adult forearm growth, averaging 45.2 mm, by the time they fledged at 4 weeks of age. These pups averaged 3.3 g at birth, and 12.0 g by week 4 (Burnett and Kunz 1982). Although the published adult weight range for this species in Canada is 12.1–23.6 g (van Zyll de Jong 1985), some seen in Ottawa tip the scale at 30+ g. Adult females studied at a colony in Kansas from 1968–1970 gained an average of 9.6 g during pregnancy, going from about 17 g at arousal from hibernation, to 25–31+ g just prior to giving birth in June. The pups averaged 3.2 g at birth, ranging from 2.7–3.6 g (Kunz 1974). In eastern North America, big brown bats bear twins, whereas those in western North America usually have a single pup (Barbour and Davis 1969 [cited by Tuttle and Stevenson 1982]). The newborn Peep and her twin seemed so tiny at 3.6 g, but relative to their mother's size, they were huge. Bat pups weigh 15–30% of their mother's postpartum body mass (Wimsatt 1945 [cited by Fenton 1998]).

Insectivorous bats are unusually long-lived for such small animals. The longevity record in the wild for a banded big brown bat is 19 years from time of banding (Paradiso and Greenhall 1967 [cited in Tuttle and Stevenson 1982]), and one captive big brown male, taken into care as a young pup, was reported to be 22.5 years old in 1998 (Lollar and French 1998).

Nursery colonies start to disperse in mid-August and mating begins in late August with insemination (continuing during brief periodic arousals over winter). In an unusual reproductive strategy, however, fertilization is postponed about 156 days (Wimsatt 1944 [cited in Fenton 1985]). This allows gestation to begin immediately following emergence in the spring, providing the most time for pups to grow and gain fat reserves for the next winter's hibernation (Kunz 1974). Sperm is stored in the female reproductive tract over winter and in spring fertilizes two to seven ova, although resorption reduces the number of developing embryos to one or two (Wimsatt 1945 [cited in Racey 1982).

Hibernation sites in Ontario include mines, caves, and sometimes buildings, and big brown bats generally remain there as long as these sites stay between 10° and -9°C (50–15.8°F) (Fenton 1983). By arousal in April, they have lost 25% of their body weight, and their fat reserves are severely depleted (Fenton 1983). Females leave the hibernation sites before males and congregate back at traditional maternity roosts, usually less than 40 km (25 miles) away.

Interestingly, two maternity colonies of big brown bats studied in southwestern Alberta contained mostly females and young, but of the 80–120 adults, 20–30 were males. The age distribution of males was similar to that of females; these were not just young of the previous year (Wilkinson and Barclay 1997). Sexual maturity for big brown bats is reached at about 4 months for males, and 4–16 months for females. Although some female pups are sexually mature in their first autumn, yearling females have a lower pregnancy rate than older females (Christian 1956 [cited in Tuttle and Stevenson 1982]); Schowalter 1979 [cited in Racey 1982]).

In Ontario big brown bats usually birth in June, after a gestation that appears to last about 60 days. Female big brown bats in maternity colonies share the thermoregulatory costs while nursing young, so "synchrony of parturition" (i.e., all birthing about the same time) is important (Tuttle and Stevenson 1982). In most mammals the length of gestation is fixed. For bats, however, it can vary depending on food supply and weather; even when not hibernating, bats use torpor to survive short inclement periods and conserve energy. Once pregnant, if females enter short periods of torpor, fetal growth is slowed and gestation lengthened (Racey 1972 and 1973 [cited in Racey 1982]). Pregnant bats enter torpor rarely, only when foraging is poor, presumably because a longer gestation leaves less time for mothers and pups to prepare for the next winter (Grinevitch et al. 1995). Interestingly, females aroused from hibernation in January and kept at room temperature with sufficient food (as sometimes happens with winter intakes to a rehabilitation situation) may ovulate, become pregnant, and birth months ahead of the natural schedule (Fenton 1983).

Insectivorous bats eat at least 30% of their body weight in insects each night they are active; in nursing mothers that amount can exceed 50% (Fenton 1983). Male and female big brown bats have been noted to forage for similar lengths of time, and a study in southwestern Alberta concluded that the areas in which males foraged were likely lower quality or necessitated longer commuting distances, thus requiring males to forage for as long as females (Wilkinson and Barclay 1997). Female bats have the extra demands of pregnancy and lactation, and pups grow very rapidly. Most growth is completed on mother's milk before first flight at 3–4 weeks of age (Burnett and Kunz 1982; Kunz and Anthony 1982). Big brown bats in southwestern Alberta foraged for an average of 3.6 hours nightly during the reproductive period in 1992, and 2.5 hours in 1993 when ambient temperatures were lower (Wilkinson and Barclay 1997). Another insectivorous bat

(Pipistrellus pipistrellus) was noted to fly from 2.5–5 hours each night it was active during summer in northeast Scotland, at the northern edge of its range (Swift 1980 [cited in Racey 1982]).

In flight, bats burn energy at the same rate as an active shrew or flying hummingbird (Fenton 1983). Five adult big brown bats in a lab setting had resting heart rates of 420–490 beats/minute, that shot up to 970–1097 beats/minute during flight (Studier and Howell 1969). Heart rate in this species drops to 42–62 beats/minute during hibernation (Kallen 1977 [cited in Altringham 1996]).

During late autumn bats must build up a store of body fat for hibernation even though insect levels have dropped. Speakman and Rowland (1999) found that long-eared bats *(Plecotus auritus)* preferred roost temperatures about 32–35°C (90–95°F) in the summer, but in the fall they chose colder temperatures of about 10°C (50°F), where they entered torpor for an average of 14 hours a day. Since torpor conserves energy, this positively affected their weight, despite the fact that digestion is less efficient at that temperature.

Strong wind, decreased temperature, or severe drought can seriously decrease bats' ability to forage, although surprisingly they do forage in light to moderate rain (Tuttle and Stevenson 1982). One interesting phenomenon is that moonlight depresses bat activity. Fenton (1983) speculates that predators such as owls and hawks may hunt better in more light, or insects may be fewer on brighter nights.

Health Precautions for Wildlife Rehabilitators

Rabies

Information about rabies prevention and knowledge about rabies continues to grow and the best defense is to stay as current as possible (Constantine 1988). There is a wealth of reliable information available on the Internet. The Ontario Ministry of Natural Resources Rabies Research Unit maintains an excellent website, as do Bat Conservation International and the U.S. Centers for Disease Control. Most bats are healthy, and contribute to the world we share with them in many ways, but they can contract rabies, and about one in 1000 will become sick and die of rabies. In Ontario the number of bats testing positive for rabies has traditionally been low, with 17 cases reported in 1999 (MacInnes 2000). In nearby New York State, 3.3% of the bats submitted for testing in 1999 were positive for rabies (Trimarchi 2000).

Bat workers are strongly encouraged to

- have pre-exposure inoculation against rabies
- wear gloves and avoid being bitten (Note: Latex gloves are acceptable when working with nonbiters, such as infant bats. Thin leather gloves should be worn when handling older bats.)
- wash hands with soap and water after handling the animals

If bitten by (or exposed to saliva or nerve tissue of) an infected animal or an animal unavailable for testing, prompt treatment with rabies postexposure vaccine can protect humans against rabies. Treatment should be sought without delay because after a variable incubation period (time from contracting the virus to onset of illness) and once symptoms appear, the disease is fatal. Incubation periods vary considerably between species and individuals within a species, with 209 days being the longest recorded for a big brown bat (Bell, Moore, and Raymond 1969).

Histoplasmosis

Histoplasmosis is a disease caused by inhalation of airborne spores from of a fungus *(Histoplasma capsulatum)* that occurs naturally in soil enriched by bird or bat feces. The primary infection site is the lungs, but most human cases are asymptomatic or involve only flu-like symptoms, since the body's immune system usually overcomes the infection in a matter of days. However, a few people will develop serious respiratory illness. There is also reason to suspect that a tiny fraction of those who contract respiratory infection (even mild cases) can later develop an eye disease called Ocular Histoplasmosis Syndrome (OHS). The U.S. National Eye Institute maintains a website with information about OHS. Histoplasmosis is rare in Canada and in the far northern and western U.S. In the U.S., 90% of reported human cases come from the Ohio and Mississippi River Valleys, where warm, humid conditions favor fungal growth. People should avoid breathing dust in areas where there are animal droppings (Tuttle 1995; Constantine 1988). In a rehabilitation setting, feces buildup is minimal and the potential for exposure is therefore very small.

Asthma and Allergy

Occupational asthma has been reported caused by exposure to bats (Spiewak 1996). The patient, a scientist, was treated with a specific immunotherapy using bat allergen extracts (allergy shots) and after one year no longer had symptoms on contact with bats. Another case of asthma was triggered after a bat worker in England accidentally sprayed mealworm viscera into his eye. Within minutes, the eye was swollen shut despite immediate flushing with water. Since that time he has been unable to handle mealworms or captive bats fed mealworms (Brown 1999).

Upper-respiratory allergy and skin sensitivities, such as allergic dermatitis (eczema, hives) caused by contact with bats or the mealworms fed out to bats can also occur, although such allergic reactions are not common. Bat workers sensitive to these allergens sometimes take antihistamines and/or decongestants, along with wearing a smock, gloves, and mask when caring for bats or handling mealworms (Walker 1999, pers. comm.).

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Heartfelt thanks to the many wildlife rehabilitators who generously provided advice and moral support during the raising of "Miss Peep," most especially to friend and colleague Selena Walker, who delivered this newborn into my care and collaborated with me in the rehabilitation and release effort.

While I have rehabilitated orphaned mammals since 1987, Peep was my first bat pup. Susan Barnard's *Bats in Captivity* (1991, revised in 1995), and Amanda Lollar and Barbara French's *Captive Care and Medical Reference for the Rehabilitation of Insectivorous Bats* (1998) were invaluable references.

TABLE 2. PRODUCT SOURCES AND INTERNET SITES

Avitron® and Avimin®	Avian vitamin/ mineral supplements from Lambert Kay, a division of Carter-Wallace Inc. (Cranbury, New Jersey) Website: www.lambertkay.com; E-mail: info@lambertkay.com; Tel: 609-655-6293. Available at pet supply stores.
Bat Care Manuals	Susan Barnard's (1995) *Bats in Captivity* is available free online at www.lads.com/basicallybats. Amanda Lollar and Barbara French's (1998) *Captive Care and Medical Reference for the Rehabilitation of Insectivorous Bats* may be purchased through the Bat Conservation International website at http://batcon.org/main.html; from Bat World, Mineral Wells, Texas; or from the IWRC.
Feeding Nipples	Small feeding nipples are used pushed onto a 1 cc syringe. Catac nipples are available through the company's website: www.catac.co.uk. They can also be ordered directly from Catac products Ltd., Catac House, 1 Newnham Street, Bedford MK40 3JR; Tel (01234) 360116; Fax: (01234) 346406. These nipples are also available from supply companies, including UPCO, Tel: 1/800/254-8726; and JEFFERS, Tel: 1/800/533-3377. UPCO also carries "4 paws" nipples that fit feeding syringes. JEFFERS also carries a "mothering kit" of small nipples that fit feeding syringes.
Catheters	Red rubber catheters (such as those made by Sovereign, size #8 French) are used as a feeding nipple when snipped off and pushed onto a 1 cc syringe. Available at veterinary clinics.
Esbilac® and Zoologic® 33/40	Milk replacers from PetAg (Hampshire, Illinois), Tel: 1/800/323-0877. Available from supply companies, including UPCO, Tel: 1/800/254-8726; JEFFERS, Tel: 1/800/533-3377; KV Vet (Nebraska), Tel: 1/800/423-8211; Summit Pet Products (Maryland), Tel: 1/800/882-9410.
Foam Eye-Shadow Tip	The small high-density foam tip is used as a feeding tool when removed from the wand and saturated with formula. Available at drugstores and cosmetic departments.
Gastrolyte®	Oral rehydration solution from Rhone-Poulenc Rorer Inc. (Montreal, Quebec, Canada). Powder comes in small foil packets to be mixed with water making the rehydration solution (similar to Pedialyte). Available at drugstores.
Incubator (homemade)	Graboski (1995) water-based incubator design available on the Internet at www.iwrc-online.org/rehab/Incubators.htm. Aquarium heaters are available at pet supply stores. Hagen's mini thermal compact acquarium heater is available through www.pet-expo.com/fishheat.htm; Hagen, Tel: 508/339-9531.
Mother's Helper™	Puppy milk replacer from Lambert Kay, a division of Carter-Wallace Inc., (Cranbury, New Jersey). Website: www.lambertkay.com; E-mail: info@lambertkay.com Tel: 609/655-6293. Available at pet supply stores.
Necropsy	Canadian Cooperative Wildlife Health Centre, Guelph, Ontario. Tel: 519/823-8800, ext. 4556

TABLE 2. PRODUCT SOURCES AND INTERNET SITES *(continued)*

Ocular Histoplasmosis	Information is available on the Internet at the National Eye Institute website: www.nei.nih.gov/publications/histoplas.htm.
O-Ring Feeding Syringes	Used as a feeding tool with or without attaching a nipple. MedCare Products, Tel: 800/633-2273; BAXA, Tel: 1/800/525-9567 Most drug stores also sell oral syringes (made to give liquid medicine to human babies) that can be used as feeding tools.
Rabies Information	Current and updated information is available online at Ontario Ministry of Natural Resources website: www.gis.queensu.ca/RReporter/mnr.htm Bat Conservation International website: www.batcon.org U.S. Centers for Disease Control website: www.cdc.gov.ncidod/dvrd/rabies

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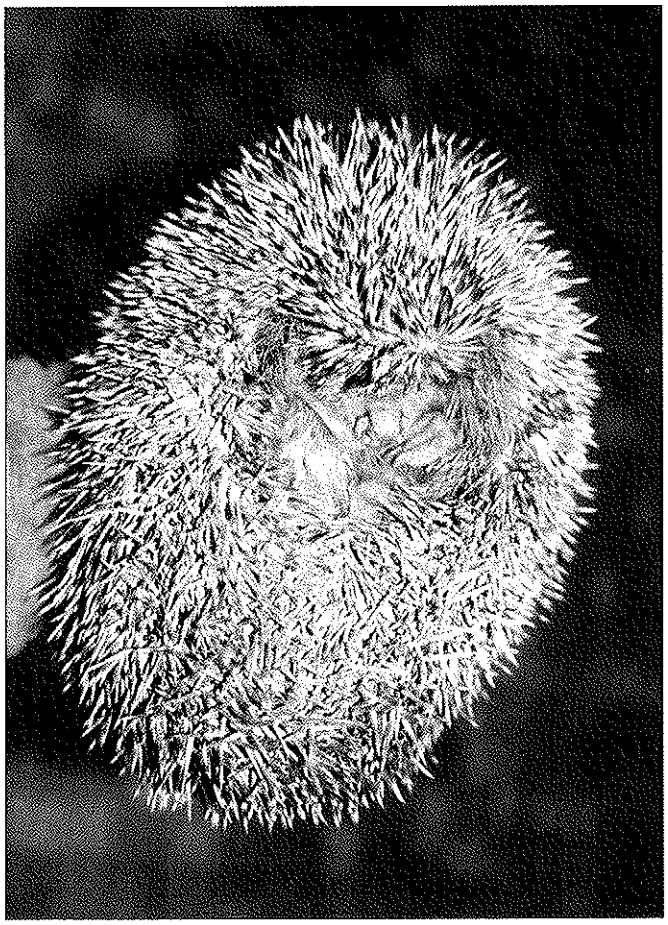
The Importance of Fecal Indices in Assessing Gastrointestinal Parasite Infestation and Bacterial Infection in the Hedgehog *(Erinaceus europaeus)*

by Toni Bunnell

Introduction

It is widely known that fecal characteristics can provide broad information on the condition of the animal of origin (Sykes and Durrant 1995). The European hedgehog (*Erinaceus europaeus)* is host to a wide variety of gut pathogens and parasites (Stocker 1987, Boag et al. 1988, Majeed et al. 1989, Reeve 1994, Robinson et al. 1999), the overburdening with which can significantly affect the fitness of the animal and also its suitability for release from a wildlife rehabilitation center.

As part of a hedgehog rehabilitation program based in York, England, and run solely by the author, routine screening of feces has been undertaken of displaced hedgehogs presented by the public. "Displaced," in this instance, refers to any animal found in an exposed position in daylight hours, such behavior often bringing it to the attention of the public. It should be noted that hedgehogs are nocturnal animals that remain hidden in nests during daylight hours. They tend only to be visible during the daytime when they are unable to retreat to their nest due to illness or injury. Hyperactive behavior, caused by a heavy parasite burden, also means that they tend to wander about during the daytime, forgoing their normal nocturnal habit. Data obtained from 168 hedgehogs suggests that overburdening by helminths, nematodes, flukes, protozoans, and specific bacteria produces characteristic changes in the gross morphology and texture of the feces. This can be of value in determining



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A hedgehog as it normally presents for treatment, namely, as an impenetrable ball of spines.

ABSTRACT: When presenting an ailing hedgehog for examination by a veterinarian it is advisable to, whenever possible, provide a fecal sample for scrutiny. This article presents a simple technique that allows assessment of aspects of hedgehog health from the overt appearance of the feces. Analysis, using this technique, will allow more appropriate treatment to be administered in the majority of cases where overburdening by gastrointestinal parasites and/or pathogens is producing ill health. The technique has widespread applications in veterinary work, wildlife rehabilitation, and field zoology.

KEY WORDS: hedgehog, *Erinaceus europaeus*, fecal indices, parasites, welfare assessment, rehabilitation, conservation

TONI BUNNELL began rehabilitating hedgehogs in 1990. Since then she has taken in an ever-increasing number of sick or injured animals, the number over the past three years (1998–2000) being 168. She takes most (90%) of the hedgehogs received by the York (England) RSPCA, releasing the survivors back to the wild with an 80% success rate. Bunnell received a BSc with honors in zoology from Cardiff University, South Wales; an MSc based on two years research into human gastrointestinal hormones from the Faculty of Medicine, University of Manchester; and a PhD from the Open University (Milton Keynes, England) on playful behavior in the polecat *(Mustela putorius)* in relation to family group activity. She lectures full-time in biological sciences at the University of Hull, England.

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TABLE 1. DIAGNOSIS OF GASTROINTESTINAL PATHOGENS AND PARASITES USING FECAL INDICES

TEXTURE OF FECES	COLOR OF FECES	PRESENCE OF BLOOD	OCCASIONAL ACCOMPANYING SYMPTOMS	MOST PROBABLE CAUSE
Stringy, semi-solid / loose / diarrhea	Light brown / green	Usually none, but can be present in cases of heavy infestation; usually seen as bleeding from the mouth	Appetite loss; weight loss, sometimes sudden in onset	Nematode infestation: *Crenosoma striatum*
Semi-solid / crumbly; undigested food present	Light brown	Usually none	Mediocre appetite; Very little/no weight gain or gradual weight loss	Nematode infestation: *Capillaria erinacei* or trematodes such as *Brachylaemus* spp.
Mostly normal, but sometimes slightly loose	Normal color (dependent on food eaten) with dark green segment at one end of stool	Usually none	Weight gain might be a little slower than expected	*Hymenolepis erinacei*
Diarrhea	Bright / very light green	Usually present; amount signifies degree of progression of the infestation/ damage to gut wall	Appetite loss	Protozoan infestation: *Isospora*, resulting in Coccidiosis
Diarrhea	Brown	Large amount of blood produced from mouth and anus due to hemorrhaging tissue	Extremely rapid weight loss leading to emaciated appearance, dehydration, collapse > death if not treated immediately	Bacterial infection: *Clostridium perfringens* or threadworms such as *Capillaria aerophila*
Diarrhea, very watery	Brown	Not usually	Extremely restless; often seen walking purposefully in the daylight, usually followed by collapse due to exhaustion and dehydration	Bacterial infection: *Escherichia coli*
Semi-solid / loose / diarrhea	Dark green	Occasionally	Appetite loss	Bacterial infection: *Salmonella* spp.
Dry, hard stools	Black / brown (color essentially determined by diet, but darker than normal)	None	Appetite loss and occasionally restless	Recent treatment for intestinal worms, which may have resulted in a blockage; food too dry

Note: Other conditions besides parasites can cause abnormal feces and bloody feces.

the suitability of particular treatment regimens for the animals concerned. It is of particular value in the case of the hedgehog, which normally presents for examination as a ball of impenetrable spines.

Methods and Materials

Displaced animals were presented at the York Animal Home, a branch of the Royal Society for the Prevention of Cruelty to Animals (RSPCA), by members of the public, between April 1998 and December 2000 and were subsequently taken to a sanctuary run by the author. The hedgehogs were either immobile due to injury or hypothermia, or found roaming about restlessly. Hedgehogs found foraging during the day tend, in the author's experience, to have a high gastrointestinal parasite load.

Routine screening of fecal samples was undertaken. Fresh feces were placed in suspension in distilled water, and the preparations examined using a light microscope (Gardner 1996). (A simple fecal smear obtained from a suspension is commonly used for hedgehogs and was recommended by the veterinarian consulted with regard to this study.) Slides were examined qualitatively and the presence of gut parasites recorded. The author assessed for adults, larvae, and eggs, all of which are generally detected using this method, with the exception of *Crenosoma striatum* adults, which are only seen in samples after a hedgehog has been treated with a wormer (Sykes and Durrant 1995). Parasite species were identified from photographs and descriptions supplied by Sykes and Durrant (1995), and with the assistance of the Minster Veterinary practice in York. During 1998 the feces of most animals arriving at the sanctuary were examined and monitored over a sequence of days, and any subsequent changes indicating a response to treatment were recorded. A reduction in number of gut parasites was taken to indicate a positive response to a particular treatment.

Results

The usual appearance of hedgehog feces is shown by Sykes and Durrant (1995) and Reeve (1994). Characteristically, hedgehogs with severe helminth, nematode, fluke, or protozoan burden, or greater than normal bacterial numbers, produce feces that differ markedly from the norm (Table 1) and Sykes and Durrant (1995). Most hedgehogs carry a parasite load that is asymptomatic in a healthy animal. To determine whether the parasite load for displaced hedgehogs was "higher than normal," comparisons were made between parasite (adults/larvae/eggs) numbers present in healthy animals with normal droppings and that demonstrated consistent weight gain, and those of ailing animals with abnormal droppings that showed either poor weight gain or a loss in weight. In addition, reference was made to the data on the "normal" parasite load for wild hedgehogs summarized in Reeves (1994).

Most of the hedgehogs in the present study responded well to propriety brand antihelminthics and antiprotozoan drugs (Table 2). Reduction of parasite burden is thus readily achieved and results in immediate weight gain, which hastens the release of the animals to the wild state (Bunnell, unpubl.).

Discussion

In the majority of displaced hedgehogs presented at wildlife sanctuaries, the nematodes *Crenosoma striatum*, *Capillaria erinacei*, and *Capillaria areophila* tend to be present (Reeve et al. 1999), the former two being the most prevalent (Boag et al. 1988). Infestation with these nematodes is age-related, with very few juveniles and even fewer nestlings showing signs of harboring *Crenosoma* spp. or *Capillaria* spp. (Majeed et al. 1989). The findings of Majeed et al. (1989) also suggest that hedgehogs acquire *Crenosoma* spp. infestation more rapidly than they do *Capillaria* spp. They noted that this was an unexpected finding, since *Crenosoma* spp. is believed to require an intermediate host, while *Capillaria* spp. can be obtained by direct transmission.

In animals with digestive problems of any kind and/or appetite loss, it is essential to maintain fluid balance. This can be done by administration of Lectade, an oral rehydration electrolyte preparation for dogs and cats. The mixture must be prepared according to the manufacturer's specifications and then diluted 1 in 10 in warm water. The further dilution is necessary for hedgehogs, as the original dilution is too concentrated and will precipitate further dehydration of the animal (Sykes and Durrant 1995).

Following a period of appetite loss/digestive disturbance, an animal can be encouraged to eat again by oral administration of Esbilac®, a milk substitute for puppies. Esbilac®, is easily digestible and prevents further weight loss while the animal is recovering its appetite. As always, care must be taken to hold the animal in as upright a position as possible while giving fluids orally. Oral administration of fluids involved releasing one drop of fluid at a time into the mouth, using a 1 ml syringe. This helps to prevent fluid from entering the airway and either choking the animal or precipitating inhalation pneumonia.

Following treatment of parasite/pathogen infestation with propriety brand drugs, successfully rehabilitated animals were released to the wild. Studies carried out by Morris et al. (1993) and Morris and Warwick (1994) concluded that rehabilitated adult hedgehogs probably cope well with release.

Conclusion

In all of the 168 hedgehogs observed (with the exception of orphaned babies brought immediately to the sanctuary after being found displaced from their nest), the following examples of gastrointestinal parasites and pathogens were recorded:

Nematode:	most commonly *Crenosoma striatum*, but occasionally *Capillaria erinacei*
Tapeworm:	*Hymenolepis erinacei*
Protozoan:	most commonly *Isospora* spp.
Bacteria:	most commonly *Escherichia coli*, but also on occasion *Clostridium perfringens* and *Salmonella* spp.

The widespread prevalence of the parasites/pathogens listed in Table 1 indicates the importance of dealing with any infestation and/or infection affecting the alimentary canal of hedgehogs as soon as possible. Even in circumstances when such organisms are not the main reason for the animal being found out during daylight hours, an immediate reduction in numbers of nematodes and other parasites/pathogens will enable the hedgehog to use its resources to combat the presenting ailment or injury.

It is obviously vital to provide any displaced hedgehog with the best chances of recovery. Early recognition of overburdening and subsequent treatment of intestinal parasites/pathogens will hasten this process.

TABLE 2. TREATMENT REGIMENS FOR GASTROINTESTINAL PATHOGENS AND PARASITES

PATHOGEN / PARASITE	MOST APPROPRIATE SAFE TREATMENT	PRECAUTIONARY MEASURES
Nematode infestation: *Crenosoma striatum* or *Capillaria erinacei*	Telmin® (mebendazole) oral 50 mg/500 g hedgehog, daily for 5 days. Panacur® (fenbendazole) can also be given orally (110 mg/500 g animal at 1 week interval or divided over 5 days).	Watch for hard, dry feces, which sometimes develop following worming treatment due to blockage caused by dead worms in the gut. Treatment by giving orally 0.3–0.5 ml evening primrose oil/pediatric liquid paraffin.
Trematode infestation: *Brachylaemus* spp.	Praziquantel injection	
Cestode infestation: *Hymenolepis erinacei*	Panacur® as above or Drontal® (praziquantel) (1/8 cat tablet/500 g animal). Praziquantel injection also effective.	Watch for hard, dry feces, which sometimes develop following worming treatment due to blockage caused by dead worms in the gut. Treat by giving orally 0.3–0.5 ml evening primrose oil/pediatric liquid paraffin.
Protozoan infestation: *Isospora* > Coccidiosis	Bimalong® (sulfanethoxypyridazine) subcutaneous injection, 0.04 ml/500 g animal/day for 5 days.	
Bacterial infection: *Clostridium perfringens*	Baytril antibiotic injection in the first instance followed by twice daily orally: 0.5 ml/500 g animal. Septrin® (trimethoprim): alternative antibiotic (oral) if Baytril® fails to work.	As with all cases of diarrhea, watch for dehydration. Treat by regular oral administration of Lectade, an oral rehydration preparation.
Bacterial infection: *Escherichia coli*	Baytril® antibiotic injection in the first instance followed by twice daily orally: 0.5 ml/500 g animal. Septrin® (trimethoprim): alternative antibitoic (oral) if Baytril® fails to work.	As with all cases of diarrhea, watch for dehydration. Treat by regular oral administration of Lectade, an oral rehydration preparation.
Bacterial infection: *Salmonella* spp.	Baytril® antibiotic injection in the first instance followed by twice daily orally: 0.5 ml/500 g animal. Septrin® (trimethoprim): alternative antibitoic (oral) if Baytril® fails to work.	As with all cases of diarrhea, watch for dehydration. Treat by regular oral administration of Lectade, an oral rehydration preparation.

* Panacur® (fenbendazole) is generally effective against intestinal nematodes, flukes, tapeworms, and the lungworm *Capillaria erinacei.* It is, however, not so effective against the lungworm *Crenosoma striatum.* In addition, the effectiveness of Panacur® is reported to have decreased generally in England in recent times. This appears to be due to resistance to the drug, which may have built up in rural areas due to the administering of Panacur® to sheep, and its subsequent entry into the water table. Panacur® can be used in the first instance when treating parasites referred to in Table 1, but if no immediate improvement is seen it is better then to treat with Telmin® (mebendazole).

** Praziquantel is contained in Droncit® and Drontal®. It can be administered in the form of Drontal® tablets, either by sprinkling over the food or by giving orally, dissolved in water. However, animals with a heavy burden of gut parasites have often suffered damage to the intestinal wall, which delays or prevents satisfactory absorption of praziquantel into the blood. In such animals, a subcutaneous injection of praziquantel is the preferred option as the drug accesses the blood more readily and generally brings about rapid restoration of normal eating habits and resultant weight gain.

*** Recent observations suggest that antibiotics such as Baytril® (enrofloxcin) are metabolized very rapidly by the liver in small mammals and, as such, removed from the blood system and no longer available to the tissues. It is therefore recommended to give Baytril® twice daily at the same dosage as previously (i.e., 0.5 ml/500 g hedgehog twice a day instead of once a day).



TONI BUNNELL

A hedgehog active in daytime, suggestive of ill health as it is forgoing its normal nocturnal habit.

Many displaced hedgehogs presented to veterinarians are assessed and treated immediately upon arrival at wildlife rehabilitation centers and, in the United Kingdom, RSPCA animal homes. It is suggested that any feces produced by the animal be made available to the veterinarian to enable a more thorough assessment to be made. The technique described in this article is both time- and cost-effective, is reliable, and can markedly improve the chance of hedgehog survival.

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Field Anesthesia of American Mink *(Mustela vison)* Using Halothane

by Serge Larivière, Lyle R. Walton, and John A. Virgl

ABSTRACT: Incidental to muskrat (*Ondatra zibethicus*) capture-recapture operations in southcentral Saskatchewan, Canada, American mink (*Mustela vison*) were captured and immobilized using halothane. Thirteen trials were performed on nine mink (seven male, two female). An initial dose of 4 ml provided complete anesthesia after 105 s (SD = 37 s, N = 7). Once anesthetized, stand-up posture and complete recovery occurred after a mean (SD) of 123 s (56 s) and 175 s (69 s), respectively. Multiple applications yielded longer and more variable induction times (311 ± 109 s), but similar stand-up (136 ± 80 s) and recovery times (182 ± 83 s). Halothane provided rapid (<2 min) induction on calm mink, but all animals experienced traumatic anesthesia and recovery. One case involving multiple applications resulted in the death of one animal. The authors conclude that single applications of halothane may be used for anesthesia of American mink for short (<2 min) periods, but that the difficult recovery of immobilized mink precludes the overall acceptability of this agent.

KEYWORDS: American mink, *Mustela vison*, anesthesia, halothane, immobilization

Halothane gas is commonly used for the immobilization of weasels (*Mustela erminea*) (Murphy and Dowding 1994), martens (*Martes americana*), (Herman et al. 1982), and striped skunks (*Mephitis mephitis*) (Larivière and Messier 1996). Its advantages include speed of induction and recovery, and ease in anesthesia procedures (Blanchette 1989). Because of its qualities as an anesthetic, it has gained popularity and is now widely used by researchers working on muskrats (*Ondatra zibethicus*) (e.g., Blanchette 1989; Marinelli and Messier 1993; Virgl and Messier 1996). In many areas of its distribution, the muskrat is sympatric with the American mink. Because both species are semi-aquatic and are typically associated with permanent or semipermanent bodies of water, researchers working on muskrats often capture American mink incidentally during live-trapping operations (e.g., Virgl and Messier 1996). Researchers capturing mink incidentally may be tempted to use halothane, even though the safety of this agent on mink has not been reported. Herein, the authors report on the use of halothane gas for the field anesthesia of American mink.

From August to October 1994, American mink were captured incidentally to an extensive muskrat mark-recapture program conducted on Indi Marsh (51°41'N, 106°31'W) in southcentral Saskatchewan (Virgl and Messier 1996). Mesh-wire live traps (18 cm x 18 cm x 51 cm, Tomahawk Live Trap model 204) were covered with vegetation, baited with carrots, and checked daily. Mink captured accidentally were transferred to a transparent Plexiglass box (16 cm x 16 cm x 34 cm), which provided a closed environment for anesthesia.

Halothane (4 ml) was poured directly under the door of the Plexiglass handling box. Animals (all adults) were left undisturbed for 4 min, or until completely anesthetized (no reaction to toe pinching). Fully anesthetized mink were immediately removed from the Plexiglass box for handling. Handling procedures were limited to eartagging, sexing, and weighing, and animals were observed until fully recovered. Recovery was monitored for two stages: (1) stand-up posture (typically accompanied by noncoordinated movements), and (2) complete recovery (unimpaired locomotion, gait normal). Recovery characteristics were calculated from the time animals were removed from the Plexiglass box and hence no longer exposed to halothane.

Inadequately anesthetized mink were left in the Plexiglass box. Failure to detect any sign of anesthesia 4 min after the initial application of halothane led to a second application. This time interval was based on the authors' previous experience with striped skunks (Larivière and Messier 1996) and muskrats (Virgl and Messier 1996). Volume of the second application depended on the state of the animal: fully awake animals received a full dose (4 ml), but partly anesthetized animals received only a half dose (2 ml). All procedures were performed at the capture site.

Thirteen trials were performed on seven males (mean body mass = 1.16 kg, SD = 0.16) and two females (mean body mass = 0.76 kg, SD = 0.10). Of these, seven, four, and two trials involved use of a single, double, and triple application of halothane, respectively.

Single halothane applications (n = 7) provided complete anesthesia after 105 ± 37 s. Once anesthetized, American mink exhibited stand-up behavior and complete recovery after 123 ± 56 s and 175 ± 69 s, respectively (Table 1).

Ease of recovery from halothane anesthesia could not be quantified, but was most often qualified as traumatic. When compared with anesthesia of muskrats (Blanchette 1989; Virgl and Messier 1996) or striped skunks (Larivière and Messier

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1996), halothane anesthesia of mink was saltatory and difficult: anesthetized animals never experienced complete muscle relaxation, and breathing remained rapid and irregular throughout anesthesia. When recovering, animals often regained use of front limbs before hind limbs, and often dragged themselves in circles before recovering completely.

Multiple doses were applied in six cases, and resulted in longer induction times ($Z = -3.00$, n(single dose) = 7, n(multiple dose) = 6, $P<0.01$), but similar stand-up ($Z = -0.08$, n(single dose) = 7, n(multiple dose) = 5, $P = 0.99$) and recovery times ($Z = -0.33$, $P = 0.76$) compared to single-dose trials (Table 1). Furthermore, one male exposed to three applications (4 ml + 2 ml + 2 ml) became fully anesthetized after 472 s but never recovered, and subsequently died < 2 min after reaching complete anesthesia.

American mink have been anesthetized with numerous agents such as ketamine (Birks and Linn 1982), combinations of medetomidine-ketamine reversible with atipamezole (Arnemo and Søli 1992), ketamine-xylazine (Eagle et al. 1984), ketamine-midazolam (Wamberg et al. 1996), ketamine-acetylpromazine (Tomson 1987), ketamine-diazepam (Tomson 1987), and methoxy-flurane (Tomson 1987). In this study, single applications of halothane provided rapid induction of calm mink, but multiple doses led to the death of one male. Excited animals can develop life-threatening cardiac arrhythmias under halothane anesthesia (Sawyer 1982, 75), and excitement of mink captured in wire traps was often high. Possibly, the use of opaque traps and opaque handling boxes could yield lower stress levels and safer anesthesia in American mink, as was found for striped skunks (Larivière and Messier 1996). Also, the risk of overdose under open-drop application of halothane presumably increases with prolonged exposure. Maintenance of halothane anesthesia over periods exceeding ~5 min requires a small concentration of anesthetic (≈1.5%; Sawyer 1982, 75) with the use of accurate and bulky delivery systems (Herman et al. 1982). Field conditions may not allow researchers to carry and use cumbersome equipment and complex procedures.

Although only a small number of mink were mobilized, the difficult recovery of all mink and the death of one animal resulting from multiple applications of halothane prevent the authors from recommending this agent at the present time. If it is used, procedures should be restricted to single applications and short (<2 min) immobilization periods.

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Product Citations

Tomahawk Live Trap Company
(Model 204)
Tomahawk, WI
USA

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TABLE 1. HALOTHANE DOSES AND TIMES OF INDUCTION, STAND-UP POSTURE, AND COMPLETE RECOVERY FOR THE ANESTHESIA OF AMERICAN MINK IN SASKATCHEWAN, CANADA

	INDUCTION (SEC)			STAND-UP (SEC)			RECOVERY (SEC)		
Initial dose (mg)	Mean	SD	n	Mean	SD	n	Mean	SD	n
Single-dose trials (a)									
Males	116	38	5	147	48	5	202	62	5
Females	77	2	2	65	1	2	107	14	2
All Mink	105	37	7	123	56	7	175	69	7
Multiple-dose trials (b)	311	109	6	136	80	5	182	83	5

(a) Single doses consisted of 4 ml of halothane. Induction was measured from time of application until complete anesthesia (no response to mechanical stimuli). Stand-up and recovery were calculated from time of induction until first stand-up posture and unimpaired locomotion, respectively.

(b) Multiple-dose trials involved 2–3 separate applications. Mean quantity of halothane applied was 7.2 ± 1.6 ml.

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Fundraising on the Internet:

USING E-MAIL AND THE WEB TO ACQUIRE AND CULTIVATE DONORS

by Nick Allen

Fundraising on the Internet Is Coming of Age

While even the organizations most successful at raising money online—mainly groups like the Red Cross or CARE, that work on disasters such as Kosovo or Hurricane Mitch—still raise thirty times more offline than online, a wide range of groups are beginning to use e-mail and the World Wide Web to find new donors and cultivate the ones they have.

With more than fifty million Americans using the Internet every week—and many of them using their credit cards there, too—the audience is there. For Americans increasingly on the go and expecting access to everything all the time, the web is open when your office is not—24/7 across time zones and international boundaries.

Computer use is growing across class and race lines, and more and more people have access to computers through public libraries and schools, if not in their homes. High-speed DSL and cable modem access are being rolled out across the country, and nearly half of computer users already have at least a 56k modem.

How to Raise Money Online

A website and an e-mail newsletter program provide opportunities for education, advocacy, and information distribution, as well as marketing and fundraising. In fact, to be effective at fundraising, the site has to have content and involvement that also educate. Few people will come to your website just to make a donation or become a member. They'll come, or come back, because you involve them in your cause; give them information they want or need; provide them with some useful or interesting activity; engage them as an activist to send a fax, sign a petition, or register for an event; or to sign up for a free e-newsletter subscription.

There are at least seven ways to raise money online:

1. Make effective appeals on your website (and get people there to read them)
2. Make appeals in your e-mail newsletters (and get subscribers)
3. Get commissions from sales of books, CDs, clothes, etc., via one of the online shopping malls that share their affiliate commissions with nonprofits (e.g., iGive.com, greatergood.com, shopforchange.com)
4. Benefit from online auctions or other copromotions sponsored by major online players such as Amazon, E-Bay, and Yahoo
5. Get sponsors who donate to your organization in exchange for sponsoring content areas (seniornet.org) or advertising on your site or in your e-mail
6. Use e-mail for some solicitations to donors who joined via direct mail but have given you their e-mail addresses, too
7. Sell something, preferably something related to your mission

Each of these is discussed in more detail below.

What's Working?

Direct fundraising has been the most successful strategy so far, and probably will continue to be. Direct fundraising online includes getting people to join your organization through its website or asking for money through e-mail.

As you may have read, the American Red Cross raised more than $1.3 million around the recent Kosovo crisis through their website, plus another $28 million via conventional means. CARE raised $500,000 online in 1999, about $300,000 of it in response to the events in Kosovo. CARE raised about $55,000 in response to the flooding in Mozambique in early 2000. World Vision, Save the Children, and other brand-name crisis-relief organizations have had similar success with appeals relat-

ABSTRACT: The now almost ubiquitous presence and acceptance of the Internet offers nonprofit organizations new fundraising opportunities and options. These range from website and e-mail newsletter-based appeals to commissions from online shopping malls to new incentives for businesses that sponsor the organization. This article describes these growing opportunities and provides resources for further investigation.

KEY WORDS: Internet, website, fundraising, e-mail, donor, appeal, indirect fundraising

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A number of dot-coms exist to help nonprofits raise money through indirect fundraising. Supporters can shop online at hundreds of e-retailers that donate an average of 5 percent of the sale to your organization.

ing to high-visibility disasters. In the early days of the 2000 presidential election, Sen. John McCain's multimillion-dollar online fund raising success in the days following his New Hampshire primary victory underscored the Internet's ability to let donors respond by finding organizations and making instant gifts. When people got excited about McCain's victory, they could go to Yahoo, find his website, and make an instant credit card contribution. Before the web, they would have had to call directory assistance around the country in hopes of finding McCain's campaign, and then mail a check.

A wide variety of smaller national organizations that don't depend on crises are already beginning to raise money online. Rainforest Action Network (RAN), with a $2.7 million annual budget, raised $5,800 in December 1999 online, several times more than its monthly online average. Web visits have continued to increase and so should income.

Most successful organizations put attractive membership offers on their web homepages and throughout their websites and include a "Donate" or "Join" link on every page. The Internet is littered with contests and freebies, and many big organizations use the same premiums online as off—namely, T-shirts or tote bags. Of course, premiums are expensive, and sometimes donors who come in on premiums expect them every time they give. (The ideal premium would be downloadable, so that it could be fulfilled instantly and at little marginal cost, but most people now have all the screensavers they can handle.)

Fund appeals included in e-mail can also be effective, especially if the recipients are donors, or the appeal is really urgent, or both. An organization that works on a variety of causes e-mailed a segment of its donor file asking them to help with the Mozambique flooding disaster; they got an 8 percent response rate, with an average gift of nearly $100. While they might have gotten a similar response by mail, with e-mail they were able to contact donors when the issue was hottest and get most of the donations within twenty-four hours of the e-mail. And, of course, they saved the costs of printing and mailing the appeal.

In order to accept donations directly online, you can use a secure server at a web-hosting company, typically for an additional $10–$30 a month plus transaction fees. Some web-hosting companies are interland.com and verio.com. Or you can put a "Donate" button on your site from a service provider like entango.com or localvoice.com. These providers run secure servers, do all the transaction processing for you, and post the donor information in a password-protected database that you can download into your donor-tracking program. They typically charge 5 to 10 percent of each transaction.

Indirect fundraising is another avenue for raising funds online by joining up with dot-coms that are seeking to help nonprofits raise money online—and make profits for themselves, too. Online charity shopping malls such as greatergood.com, iGive.com, 4charity.com, and Working Assets' shopforchange.com invite nonprofits to encourage their supporters to shop online at Amazon, PETsMART.com, J. Crew, or hundreds of other e-retailers, and about 5 percent of the income from those sales will go to the charity. While most of these dot-coms won't release their results, iGive, the oldest, says it has distributed more than $750,000 to 8,000 nonprofits. That works out to an average of $93 a group, though iGive reports that a few have raised as much as $15,000. To sign up, just go to the sites and follow the directions.

Organizations that can drive thousands of people to shop online might be able to raise serious money some time, but for most groups this is unlikely to be an important revenue stream. In addition, when people visit your website you want to engage them in your work, not send them off shopping (even if you've got nothing against shopping). Questions to ask before you sign up for a dot-com offer: How much could we make? Does it fit our mission? How will our donors/members feel about it? Will we get donor/shopper names? Who controls the data?

Another indirect avenue for fundraising online is donation portals. These sites—such as 4charity.com, givenation.com, giveforchange.com, and AOL's nonprofit helping.org—allow visitors to search for a charity and make a donation online. Most of these dot-coms then charge about 10 percent for their handling (helping.org and 4charity.com charge no fee). In addition, organizations must pay the usual credit card fees of about 2.5 percent. If lots of donors find your organization

through a charity portal, that's gravy for you. You get on a list by registering at the site, though at some of them any user can give to any nonprofit.

But you probably don't want to direct your giving through another site; you want to keep people on your site.

Traffic

Traffic is critical in Internet fundraising, just as volume can be in direct mail. If you can't get enough people to see your message—in a banner ad, in your e-mail, on your website—it's hard to convince the less than 1 percent who will give. Alliances with higher traffic sites—as well as aggressive offline advertising and PR—are very useful. Major Internet sites will sometimes donate banner PSAs for nonprofits, and large local sites run by newspapers and TV stations, as well as corporate intranets, will sometimes do the same. Both World Wildlife Fund and Rainforest Action Network have partnered with ClickRewards, the online incentive program, to invite ClickRewards' millions of members, and their own, to get airline miles. A donor gets a certain number of reward miles depending on the size of her donation; the organization usually gets some of the miles free from ClickRewards and pays around two cents per mile for the rest. It's the same kind of deal you get when you sign up with MCI and get miles on United or other airlines. For RAN, this has brought in nearly 1,000 new members with an average gift of more than $45.

Integrating Internet, Mail, and Phone

Integration will be the watchword of fundraising this decade. In the same way that we might make a call telling donors to expect an important letter, you can e-mail your file—if you've aggressively gathered donors' e-mail addresses—telling them to watch the mail or wait for the call. (It better be good!) The first renewal effort might be conducted by e-mail, followed by the usual multiletter series, and eventually a phone call.

When a donor joins online, or even by phone or mail, you might consider e-mailing a welcome package instantly. It might contain the same information you normally mail, but some of it would be in the text of the e-mail, the rest on webpages linked from the e-mail. Sophisticated e-mail messaging systems create customized webpages on the fly, filling in the donor's information.

Customer Service

Internet buyers are getting used to great customer service from a few top vendors such as amazon.com, buy.com, and travel sites like expedia.com—and these sites are going to set the standard for online customer services for businesses and nonprofits alike. Following their model, you need to provide instant e-mail acknowledgment for gifts or any other online transactions. If you offer a premium, get it into the mail in a day or two, and notify the recipient by e-mail. If you invite web visitors to e-mail you, get back to them right away. And put up the e-mail addresses and phone numbers of the people users might want to reach so they can send your organization an e-mail in middle of the night if that's when they're visiting your site. Don't make them wait to call until Monday morning at 9!

Costs

Costs vary enormously, depending on what you are trying to do and how you want to do it. Building or rebuilding a website can cost from a few thousand dollars to $100,000. Setting up your site to accept credit card contributions costs only a few hundred if you use entango.com or others. E-mail newsletter services range from free ones like topica.com and groups.yahoo.com to sophisticated messaging systems hosted by Exactis (exactis.com) or Digital Impact (digitalimpact.com). Getting access to the database that you develop through your e-mail and websites and integrating those names with your existing database can cost plenty.

Five Things to Do Next

1. Get e-mail addresses and use them. E-mail remains the Internet's "killer app," so get addresses aggressively from your current donors and supporters and from everyone else you're in contact with. Then send out one or more e-mail newsletters about once a month; you can edit one for members, another for everyone else.
2. Invite visitors to your website's homepage to subscribe to a free e-newsletter, or to enter a contest and get free e-mail updates. Then e-mail them.
3. Ask for memberships or donations on your homepage and on content pages. Tie your asks to the page's content—remember that web visitors choose the pages they look at.
4. Integrate e-mail and web with mail, phone, and events.
5. Invest in the Internet. Now's the time to abandon your least productive programs and projects and use the money to invest in the Internet—where you'll be able to reach donors and constituents more effectively in the years to come.



MICROSOFT PUBLISHER 98



Parasite Identification Charts from IWRC!

Created by Dr. Gary Averbeck of the University of Minnesota, these charts are a must-have for any center or home-care rehabilitator involved in diagnostic testing for internal parasites.

I. IDENTIFICATION OF *GIARDIA* CYSTS

This 8-1/2"x 11" two-sided, laminated chart uses full-color photomicrographs to aid you in the identification of cysts and other structures commonly confused with *Giardia*. The zinc sulfate centrifugal flotation procedure is described on the reverse.

COST: $14/$15*

II. HELMINTH EGGS AND PROTOZOAN CYSTS

A single-sided 8-1/2" x 11" chart featuring color photomicrographs of eggs and cysts found in raptor feces and how they appear in different species.

COST: $10.50/$12*

III. HELMINTH EGG TYPES

One side of this 8-1/2" x 14" chart illustrates a number of the most commonly seen helminth egg types encountered in vertebrates. Each photo lists parasite name, host(s), and best diagnostic test. Directions for these tests are found on the reverse side.

COST: $16/$17*

3 CONVENIENT WAYS TO ORDER:

Call us at 707/864-1761
Fax us at 707/864-3106
E-mail us at iwrc@inreach.com

***Prices include handling and shipping within the United States/outside the United States.**
IWRC members receive a 10 percent discount.
California residents must add 7.375 percent sales tax

IWRC accepts *Mastercard, Visa, and Discover.* *Ask us for a copy of our publications catalog!*

SIMPLE SOLUTION

A Useful Enrichment Tool for Raccoons

by Linda S. Richter



PHOTOS: LINDA S. RICHTER

Anyone who has ever seen or rehabilitated raccoons has noticed that they pick the highest place to perch, either on a tree branch or in a cage. As raccoons are known to den together as a family unit, mother and kits, so do juveniles in our care.

Hammocks, as do nest boxes, offer the animals a place to hide, sleep, and bond with their siblings. Most importantly, they provide exercise. Hammocks are a challenge for raccoons. Their curious nature will push them to master the techniques of getting in and out of a moving object. They may do a reverse flop, balance on the edge, trampoline jump, or even hang by their back toes as they enter or leave the hammock.

In addition, because hammocks allow the air to move above and below the unit, they can help raccoons to keep cooler in warm weather. The hammock has just one drawback: it can be impossible to get the raccoons out of it when it's time to wash it!

This article presents step-by-step instructions for constructing an inexpensive raccoon hammock. (The estimated cost for one large hammock is less than U.S.$14.) Depending on how frequently it is washed and how abusive the raccoons are to it, this hammock will last between one and three years.

Hammock Materials

- Sewing machine with a regular foot and a zipper foot
- Beige thread
- Heavy-weight canvas: 13.21–13.72 dm (52–54 in), 15.24 dm (60 in), or 18.29 dm (72 in) wide (material softens after washing)
- 15.25 m (50 ft) package of 9 mm (3/16 in) diameter braided poly rope (cording)

Materials Needed to Install Hammock in Cage

- Hooks for the hammock: 4 double-end bolt snaps, 9.25 cm (3-15/16 in) or larger, which open at both ends
- Hooks for cage ceiling: 4 eye hooks, able to hold 27.22–36.28 kg (60–80 lb) each or more

Supply Sources

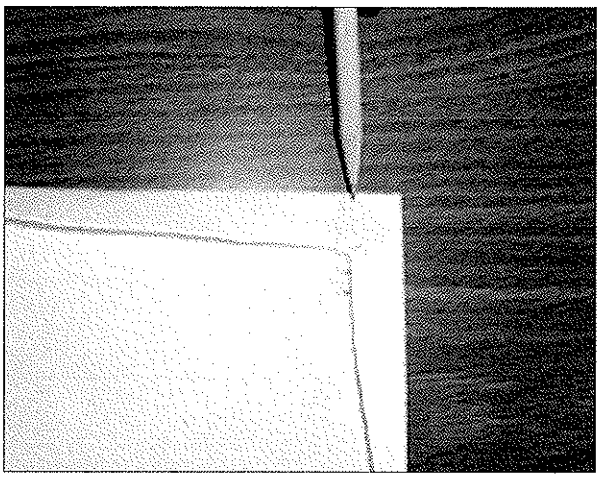
Material and thread: Available at any fabric store

Cording, double-end bolt snaps, and eyehook: Available at any hardware store (True Value, Home Depot)

Double-end bolt snap: KV Vet Supply (David City, Nebraska), Tel: 800/423-8211 Omaha Vaccine, (Omaha, Nebraska), Tel: 800/367-4444

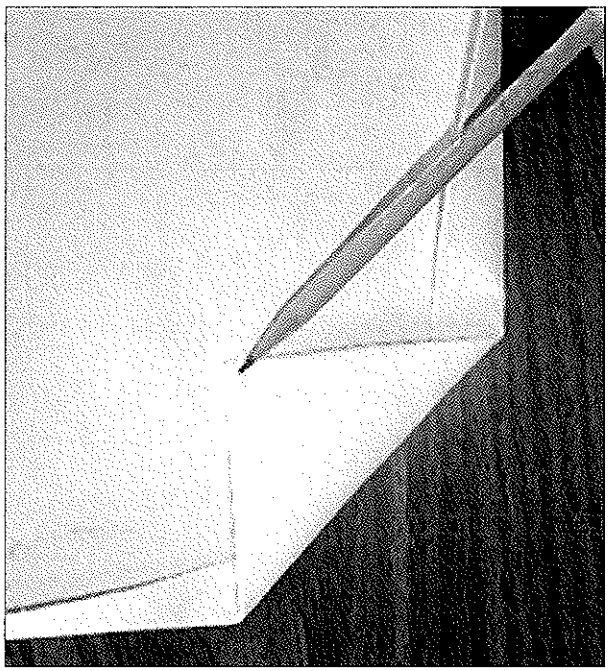
SEWING INSTRUCTIONS

(ALL PHOTOS ARE OF AN 20.32 CM X 25.4 CM [8 IN X 10 IN] SAMPLE HAMMOCK)



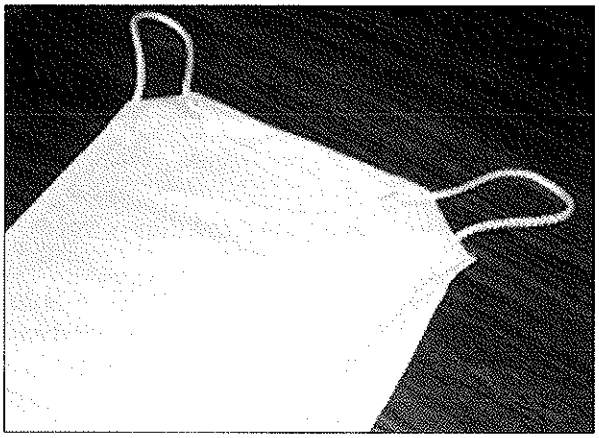
< 1

Cut canvas to the width and length desired. Turn the edges of the material over 1.9 cm (6/8 in) and crease with your fingernail. (Do not sew yet.)



2 >

Fold each corner in toward the center of the hammock to form a triangle. Turn the edges under and sew them down.

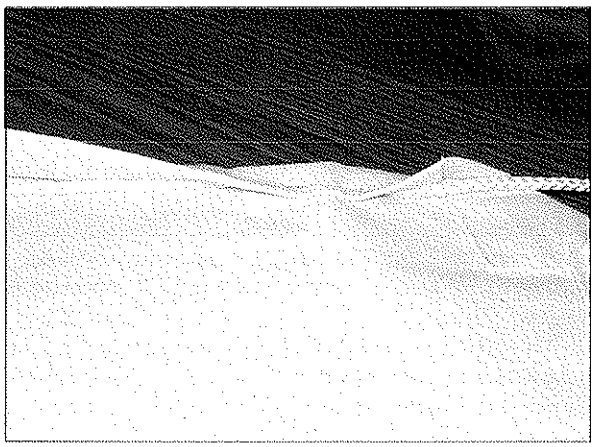


< 3

After sewing the triangles down, turn the edges over 6/8 in again and crease with your fingernail.

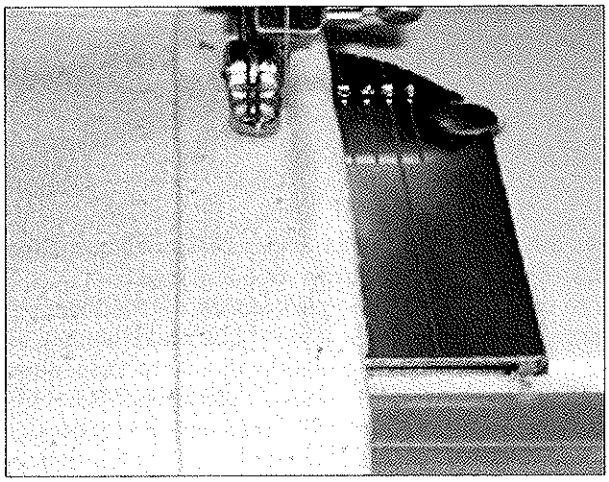
Next, lay the cording down against or in the crease. Notice the extra cording left at each corner. Remember that the raccoons will chew on it, so leave enough so that it can be retied.

Do not cut the cording until all seams are sewn down (Step # 5).



4 >

Fold material over cording, pin in place, and sew close to the folded edge. Make sure that the cording is against the creased edge. (Note that the material is sewn over the cording to create a tighter seam than would be possible had the material been sewn first and the cord then inserted into the resulting casing. The tigher seam prevents the cording from having too much play or slippage.)



< 5

Change the foot on your machine to the **zipper foot.** *Sew as close to the cording as possible—and only on the two length sides.* This holds the cording tightly in place to prevent the material from sliding when six to eight animals or three big fat ones pile into it! Once the sewing is completed, cut the cord and secure it with a double knot.

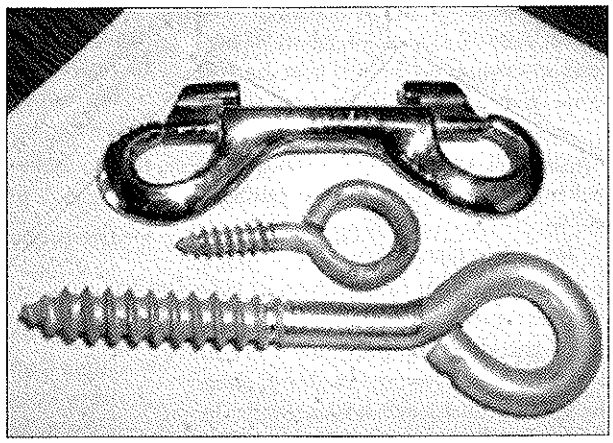
Whether hanging two hammocks above each other or a single one, the author adds 50.8 cm (20 in) of extra cording to each corner; loops it through the hammock cording; knots it; and adds the double end bolt snap. For smaller animals, you may need to add longer cording so the hammock can hang lower to your shelf, ensuring a shorter distant when they fall out.

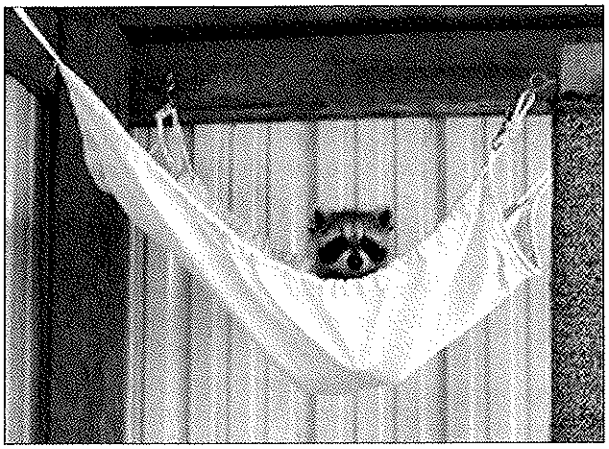
The raccoons will chew or untie the cording and play with it on the floor; be prepared to replace the extra cording frequently.

6 >

The author spaces her cage hooks 63.5 cm (25 in) apart in the ceiling for the width and 101.6 cm (40 in) for the length. Adjust spacing to fit the size of your cage.

Photograph to the right shows the small eyehook used by the author; use the larger size if needed. The double-end bolt snap is also shown; this holds the hammock to the eyehook.





< 7

The finished hammock, suspended with the bolts and hook. (*Avoid twisting the cording when hanging the hammock; the raccoons can get their paws caught in it.*) Smaller versions of this hammock may be made for squirrels or opossums; simply measure the cage size and adjust the hammock size accordingly. Fuzzy material such as imitation lamb's wool or barber may be substituted for canvas for these animals. JWR

TABLE 1. SIZES OF HAMMOCKS

	MATERIAL SIZE	FINISHED SIZE
Small	48.26 cm x 58.42 cm (19 in x 23 in)	40.64 cm x 50.8 cm (16 in x 20 in)
Medium	53.34 cm x 58.42 cm (21 in x 23 in)	45.72 cm x 50.8 cm (18 in x 20 in)
Large	58.42 cm x 71.12 cm (23 in x 28 in)	50.8 cm x 63.5 cm (20 in x 25 in)
X-Large	63.5 cm x 88.9 cm (25 in x 35 in)	55.88 cm x 81.28 cm (22 in x 32 in)

Linda S. Richter is founder and director of Halfway There Wildlife Rehab in Temperance, Michigan. She has had her state wildlife rehabilitation license for six years and works exclusively with mammals. She may be contacted via e-mail at aricht1@glasscity.net.

COLUMN

Operating Instructions

ORPHANED MAMMALS, PART I

by Nathalie Karvonen

Each year, wildlife hotlines are flooded with calls about "orphans,"many of which are not truly orphaned at all. The circumstances may be perfectly ordinary—as is often the case with fledgling birds or white-tailed deer fawns—but the caller doesn't recognize the situation as normal. Other "orphans" are temporarily separated from their mother (e.g., their nest may have been dislodged during a storm). With proper assessment and instructions to the caller, up to 50 percent of orphaned babies can be left alone or reunited with their mother.

Since "orphan" situations vary significantly with species, we'll begin by looking at protocols for tree squirrels and raccoons.

As with other calls, your first step is to gather as much information as possible. Let the caller tell their story, take notes, and then ask questions to fill in the gaps. Never assume *anything*, even the species the caller has identified. Often one of my first questions is, "What makes you think this little guy is a _____?" Help the caller convince you of the validity of each "fact" they provide. "The mother is dead on the road," may simply mean a dead adult of that species has been observed; that animal may not have any connection to the baby in question. Where was the baby found? Who found it? When? Were there other babies around? Was there a cat nearby? Does the caller know how long the baby has been out of the nest? Has anything unusual happened in the area recently, such as a tree pruned or cut down, trapping of adult wild animals, or a bad storm?

Ask the caller to describe the baby's physical condition in great detail. Do they see wounds or blood around the nose or mouth? Are the baby's eyes open? Does it appear to use all of its legs and its tail? Are there any "bugs" on the baby? Is the baby active or lethargic? Is it cold to the touch? Does the breathing seem normal or labored? Describe the skin turgor test, instruct the caller to do it on the back of their own hand, then ask them to do the same to the skin on the baby's upper back and describe the results to you.

If the baby is sick, injured, or has obviously been separated from its mother for a long time (i.e., is weak, skinny, dehydrated, or has a heavy ectoparasite burden), it should be admitted to your center for treatment ASAP. When babies are described as healthy, every attempt is generally made to reunite them with their mother. Some exceptions may include the following:

- the baby has been away from its mother for at least two days
- the origin of the baby is unknown (e.g., it has passed through several people and the original rescuer is unknown)
- there is a strong possibility a cat may have been in contact with the baby (If the baby is examined and no wounds are found you may be able to attempt to reunite it with the mother.)
- mother is known to be trapped and removed, or dead
- the area is not a safe place to leave the baby for the mother to find (e.g., the baby was found at a busy city intersection)

Handling of orphans by rescuers should only occur when absolutely necessary and with the appropriate protection, particularly when rabies vector species are involved. Infant diurnal tree squirrels should be left out during the day for the mother to retrieve. If found in the evening, ask the caller to put them outside as early as possible after daybreak. The caller should be given overnight care instructions—including how to keep the baby safe (indoors, away from predators), warm (with a supplemental heat source), and quiet—and advised why food and/or drink should not be offered. Instructions are reversed for nocturnal animals, such as flying squirrels and raccoons.

Babies left outside for their mother to retrieve should be placed as close as safely possible to where they were found, using an open-topped box with a heat source, preferably a heating pad set on low. Providing a heat source is crucial to the success of reuniting the family: mothers usually will not retrieve cold babies. Alternatively, a hot water bottle of some kind can be used as a heat source, but this is less desirable as the water will need to be changed frequently. If the nest/den is suspected to be in a tree, the container can be nailed or wired to the tree. People, especially children, and domestic pets should be kept well away from the area until the babies have been retrieved.

The mother should be given at least 8–12 hours to retrieve her offspring. The rescuer should not assume the mother has returned. A second attempt should be considered only if there is good reason to believe the mother is in the area, as she is less likely to retrieve the babies as more time passes. If babies are to be left out for a second day (or night), the rescuer should bring them to your center for evaluation and, if necessary, administration of fluids. Babies not retrieved within a reasonable amount of time will need to be admitted to your center.

With patience and careful instructions, you can help many rescuers reunite wayward babies with their mothers! JWR

Nathalie Karvonen is the executive director of Toronto Wildlife Centre. TWC operates a wildlife hotline service available to the public. Last year the hotline received more than 16,000 calls.

COLUMN

Open Minds

I CAN SPEAK FOR MYSELF!

by Kieran Lindsey

This is the kind of response I often hear from educators when I promote the idea of scripted presentations. You may have a similar response yourself—lots of educators are vehemently opposed to using scripts. Even those who have never used one.

I understand, honestly I do. The best educators are performers at heart, and they'll passionately defend their right to free speech. You may view a script as a straitjacket, a shackle, and imagine yourself bound stiffly to the podium, mindlessly reciting words worn ragged with repetition.

"You can't put what I do into a script!" you protest. "I give each audience a unique experience, and besides, everyone *loves* my programs." Maybe so. After all, there *are* natural born speakers—people who can deliver a polished and coherent program on any given subject completely off the cuff. But what happens when you're not available? One problem with personality-dependent education programs is lack of consistency. Every audience deserves a quality presentation, not only those lucky enough to have Sally Superspeaker scheduled as their guest.

I touched on the second problem in an earlier column. Audiences are satisfied as long as we show them a good time. We have a higher purpose in mind, however: delivering a message. Unfortunately, charismatic speakers can lose sight of the message in their pursuit of a good performance. Scripts keep speakers on track.

If you're still resisting the idea of using scripts, maybe it's because you and I have different ideas of what scripted presentations are like. I'll bet you're thinking of some indifferent professor from your school days, droning out a lecture dry as chalk dust. Ah, but that's *formal education*, remember? Trust me. I've just spent five columns trying to convince you the rules are different for *informal education*. I'm not about to start breaking those rules now for the sake of a script.

Using a script doesn't excuse you from the first rule of interpretive communication: *Informal education is pleasurable*. While entertainment isn't the primary goal, it is one of the essential components of effective interpretation. The chalk-dust syndrome can be avoided using a few simple techniques.

Don't say cheese just yet. Assemble reference materials and draft the script before choosing visual aids. While there's always some give and take, visuals should support the script, not the other way around. Adding visual elements will make the presentation even better, but a strong script can stand alone. (This can be a life saver in the case of an equipment failure.)

Remember the theme. As we learned earlier, themes help an audience to digest and retain information. In addition, using a theme statement helps you make decisions about what to include in your talk and, even more important, what to leave out. Oral presentations should reveal the theme at the beginning of the talk and reinforce it at the end.

Write for the ear. Scripts should be written as if the speaker is having a conversation with the audience, not lecturing them. To accomplish this, imagine you're speaking instead of writing. Some people find a tape recorder helpful during this part of the process. Outline in hand, simply begin speaking normally: use broken or incomplete sentences if you like; vary the emphasis and tone; include prolonged pauses to add dramatic effect to the spoken word. Do whatever works.

Before your very eyes. When slides are used in a nonscripted presentation, there's a tendency to simply describe each picture as it appears. Called *referencing*, this quickly becomes tedious for the listener even when the speaker is animated and enthusiastic: *"Here's a grey squirrel, commonly seen in urban environments.... And here is a fox squirrel, also very common. Both of these squirrels are arboreal.... Here you see a flying squirrel—they're nocturnal.... Oh, here he is landing on a tree. They don't actually fly, you know. They glide.... Next we have...."*

Unless your audience is blind, or the illustration complex, they don't need you to tell them what they can see for themselves. People naturally try to relate what you are saying to what they see. That's why you seldom need to reference your visual aids in the script. If you're talking about wolverines as you show a slide of an animal, rest assured most audience members will assume its a wolverine, even if they've never seen one before.

Put it in writing. Once you are happy with the content of your talk, it's time to put it down on paper. You'll need to provide vocal directions to any speaker presenting this program to achieve consistent quality. Underlining, *italicizing*, CAPITALIZING, or **highlighting** different parts of the text can indicate variations in emphasis and inflection. Suggest pauses with an ellipsis (...) and longer pauses with a double ellipsis (.....). And don't forget to indicate when the speaker should move on to the next slide or a different visual aid.

Using a script doesn't mean you have to memorize the talk and parrot it back to the audience word for word. Rather than limit your ability to communicate with an audience, scripts free you to give the audience your very best without the risk of losing the message you've been sent to convey. They simply help you make the most of every opportunity to present that message. Like the U.S. Postal Service, scripts deliver for you! JWR

Kieran Lindsey is the former director of the TWRC Wildlife Shelter in Houston, Texas; a wildlife biologist; and president of Natural Assets Consulting. Send your comments and questions to IWRClindsey@aol.com, *or to P.O. Box 1443, Cedar Crest, NM 87008–1443, USA.*

gested by animals. Fats yield about 9 kcal/g. These are useful numbers, but when applying them to dietary analysis it is crucial to understand *what the animal* in question *is capable of digesting.*

For example, alfalfa pellets are highly digestible by adult rabbits because they have intestinal flora that digest cellulose. Alfalfa is not bioavailable to raccoons, which do not have gut flora with cellulase. Baby songbirds possess goodly amounts of proteases, but only low levels of lipases and carbohydrases. Therefore, feeding them dog food containing high levels of corn and fat, and only 20% protein, means that only about 20% of their food is bioavailable to them.

On the other hand, adult animals that do have plenty of lipases also often need to have the fat in their diets limited, because it supplies more than twice the calories of the other macronutrients. Animals not expending a lot of energy that are on high-fat diets may either become obese (from too many kcal) or undernourished (from too little protein and other nutrients), or both.

Illness, particularly if the animal has been starving or has a gastrointestinal tract infection, results in greatly reduced ability to break down every kind of major nutrient. Recovery diets should consist of partially or completely predigested nutrients—i.e., subunits of the macromolecules, rather than whole, undigested major nutrients. These are termed *elemental* diets, and examples include products such as Vital HN™ (Ross Laboratories). Another possibility is to add digestive enzymes, available from veterinarians, to normal foods and incubate them at room temperature for some time before feeding.

Any diet must be tailored to the animal's digestive abilities. For example, sucrose (table sugar) should never be fed to certain songbirds, because they lack sucrase. Carnivores have little capacity to digest sugars or to regulate their levels in the blood, so any administration of dextrose or other sugars should be informed by carnivores' (including insectivores') particular needs.

Seasonality in the diets of omnivores also requires attention. Most digestive enzymes in adults are at least somewhat "inducible"; that is, they are produced in response to foods eaten. If an omnivore is brought into captivity during the winter, it is likely eating foods that are relatively high in starch and fat, such as seeds, nuts, and dry-fleshy fruits. Its digestive enzymes are induced for this diet. Feeding it moist fruits and meat (high in sugar and protein, respectively) is likely to result in indigestion.

Changes in diet should always be made gradually. An animal brought into captivity must be given the type of diet it has been eating in the wild, with any changes introduced slowly. When it is released, it must have been eating in captivity what will be available to it in the season and location of its return to the wild.

Food should always be as varied and interesting, in content and presentation, as we can make it. An enriched environment, in which the animal is stimulated and challenged, both physically and mentally, minimizes stress and enhances well-being. It also better prepares the animal for release.

In formulating and/or providing food for captive animals, we must inform ourselves fully of the animal's digestive abilities and metabolic requirements. These abilities and requirements depend on species, age, season, and health.

As is true for all aspects of wildlife rehabilitation, we must learn everything possible about an animal's nutritional needs, in order to give it the care that it requires and deserves. JWR

Clarification: In the last Food for Thought column, in which the topic was calcium, a phrase was omitted in the Example. The first sentence should have said, "The label for Brand X kitten food says that it is 1.3% calcium and 0.96% phosphorus *on a dry weight basis.*" We thank Diane Winn for alerting us to this omission.

The authors welcome feedback and suggestions for future topics. Please feel free to contact them.

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Janine Perlman, PhD, *is an avian rehabilitator and has conducted laboratory research in biochemistry and molecular genetics for twenty years. She can be contacted at jpandjf@ix.netcom.com.*

COLUMN

By the Book

by Rob Lee, Special Agent, United States Fish & Wildlife Service

QUESTION:

Assuming that all the proper reports and applications have been filed in a timely manner, is it illegal to continue rehabilitating migratory birds if a permittee has not received notice of permit renewal by the expiration of the permit? by the time the "baby season" begins?

ANSWER:

There is always some lag time between the time you submit a report or application and when the permit office can respond. This time varies depending on when you submit your paperwork. Permit offices have their own version of "baby season." Initial start-up should not begin until you have written or verbal approval from your Permit Administrator (PA). However, we all know that you are applying because people have already started dropping birds on your porch.

Renewals are a little different. Renewal and reporting dates are usually 31 January. Most PAs will begin issuing renewals in February, but it may take until May or June to complete the process. Providing there are no pending enforcement or administrative actions against you, you should continue rehabilitation and education while you wait for a response, even if your permit expires during this time. The uncertainty may be unnerving, so I suggest you send the reports and applications by Certified or Return Receipt mail or some other way that notifies you that the package was delivered. The extra cost will be worth the peace of mind.

You should also develop a method to communicate with your PAs that is efficient for them. Be sure to get their e-mail address: this is the least intrusive way to ask questions and relay information—and it is free. A great website that provides information and blank applications is http://permits.fws.gov. There is a link that has all PA e-mail addresses.

QUESTION:

During the "baby season" many young people volunteer to work with permitted and subpermitted rehabilitators in caring for the great influx of displaced young wild animals. Does it violate the Migratory Bird Treaty Act to accept the volunteer offers of responsible young people younger than 18 years of age?

ANSWER:

Volunteers who handle migratory birds should be listed as subpermittees on your permit. I understand that PAs will not list a subpermittee unless they are at least 18. This is a policy established by PAs and is not a law or regulation. If you have a mature and dedicated volunteer younger than 18 who is crucial to your operation, contact your PA and ask that they review a request to consider a qualified younger person for subpermittee status. All volunteers, regardless of age, should be under the direct supervision of a permittee or subpermittee while handling migratory birds until they are added to your permit.

...If those under 18 are under the supervision of permitted or subpermitted adults may they:

a) Clean facilities and keep records?

Of course!

b) Routinely clean and feed avian nestlings (the routine being ~ every 30 minutes)?

This kind of training while under supervision is critical to operating a rehab center. Refer to 50 CFR13.25(b): "Except as otherwise stated on the face of the permit, any person who is under the direct control of the permittee, or who is employed by or under contract to the permittee for purposes authorized by the permit, may carry out the activity authorized by the permit, as an agent for the permittee." Document the training and experience and submit it with your request to add them to your permit.

c) Take avian nestlings home with them for care?

Permits are issued to people and places. Migratory birds may be kept only at places authorized by your permit. They may not be taken home by anyone unless their home is authorized by your permit. If home care is necessary for your operation, get those homes approved by your PA.

QUESTION:

In some areas of the country rehabilitators have arranged central locations to which living displaced wild animals can be delivered by the public. They are subsequently distributed to rehabilitators. These locations vary from "store-front" drop-off sites to humane society offices and city and state agencies.

a) Are people who volunteer to transport birds from these locations to a source of care (never actually opening the transport box) required to obtain rehabilitation permits?

No, again refer to 50CFR13.25(b). However, these people should carry a copy of your permit with them while transporting migratory birds. Some PAs look at issuing transport permits for this purpose. This seems unnecessary from a law enforcement perspective; however, as the permittee, you are responsible for the actions of everyone who acts under the authority of your permit.

b) When adding volunteers to a list of participants on file in the regional office of the USFWS is it necessary for the permittee to wait for written confirmation for each individual added?

Unpermitted volunteers should work under close supervision until added to your permit.

c) What is the proper length of time to wait for response from the USFWS before making another request?

Response time is frequently 30–90 days. This may seem unreasonable, but PAs have little help and they administer a variety of permit types and thousands of permittees. Again, it is imperative to establish a good rapport with your PA so these issues can be resolved.

d) If written confirmation of a permit application is not acted upon in the proper time, what is the proper next step to pursue in the process of getting the attention of the USFWS?

If you reach an impasse with your PA, contact his or her supervisor. Most regions have established a Permit Supervisor position, but not all are filled yet.

Rob Lee has been a special agent for the United States Fish & Wildlife Service (USFWS) for fourteen years. Prior to that he served as a refuge manager with USFWS for eight years. He is a certified wildlife biologist and has a master's degree in biological science from California State University, Sacramento. Comments and questions for Rob Lee may be sent to runmuki@aol.com.

YOU'LL HAVE A BALL

AT THE

IWRC 2001 Annual Conference

NEAR

Orlando, Florida

(Lake Buena Vista, Florida)

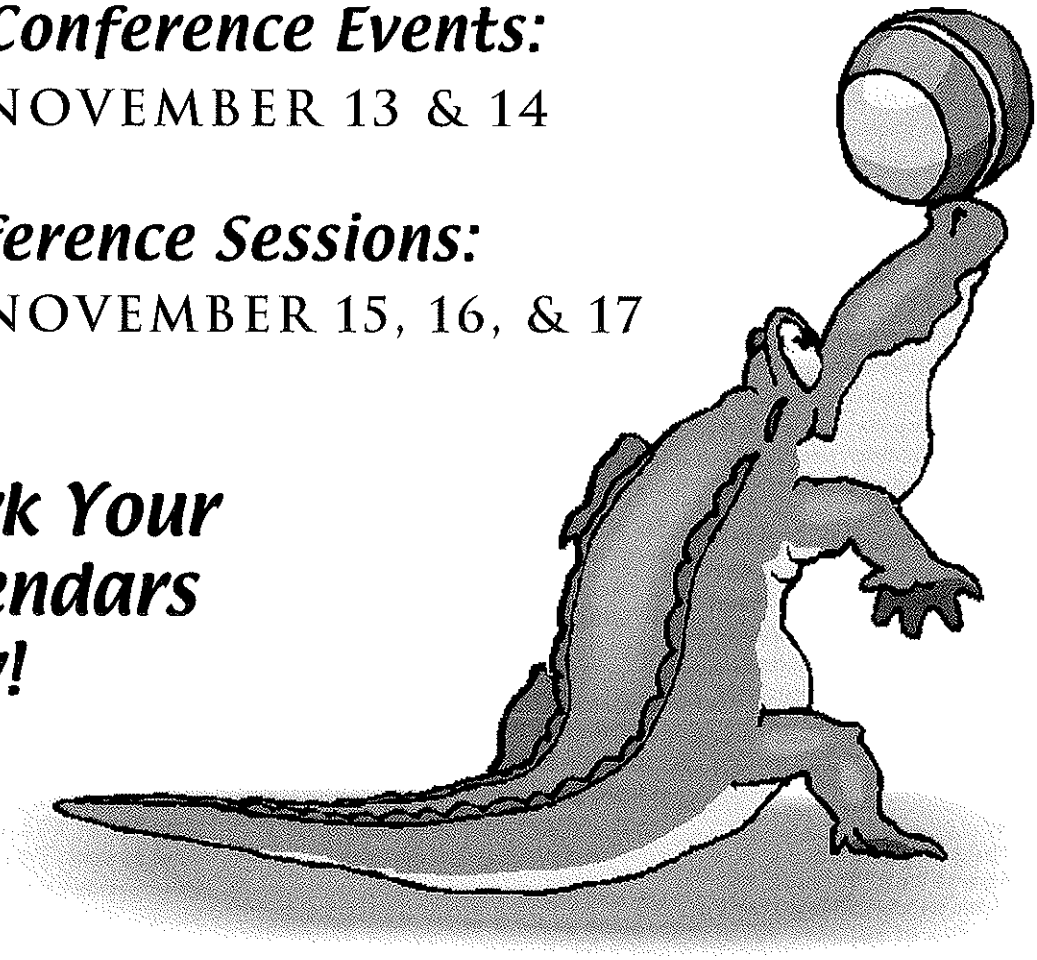
Pre-Conference Events:

NOVEMBER 13 & 14

Conference Sessions:

NOVEMBER 15, 16, & 17

Mark Your Calendars Now!



Conservation Classics: *Ishmael: An Adventure of the Mind and Spirit*

by Daniel Quinn
Reviewed by Joe MacLeod

New York: Bantam/Turner Books, 1995
263 pp; $14.95 U.S.
ISBN: 0-553-37540-7

Once in a while, a book comes along that is so different, so unusual, and so revolutionary that it just might change you forever. Beware! *Ishmael* can be such a book. If it does not change your life, it will surely give you pause for a great deal of thought.

When Daniel Quinn wrote *Ishmael*, he knew what he wanted to say—he had said it many times and in many rewrites before he was satisfied. For Quinn, it was a thirteen-year "vision quest," a personal soul-searching wherein he tried to explain how our culture got to be the way it is. He was unsure, however, if anyone wanted to listen.

Ted Turner made it very clear that the world was ready to listen, and in 1991 bestowed on *Ishmael* the Turner Tomorrow Fellowship award for "creative and positive solutions to global problems," an award that launched *Ishmael* into the stratosphere, and garnered it a considerable cult following. The book is now an underground best-seller that even has its own website.

Ishmael is nothing less that the story of our species, or at least the story that evolved from that time ten thousand years ago in the Fertile Crescent (an area that is now, ironically, desert in Iraq) when *Homo sapiens sapiens* discovered what Quinn calls "totalitarian" farming—our present-day method of farming that encourages the destruction of all competition or, as Quinn puts it, the conversion of "the planet's biomass into human mass." Our culture, in its formative years then, developed into one that would leave no prisoners, and stop at nothing to achieve the "one right way to live."

A story like *Ishmael*, in and of itself, would make an excellent romp through secular anthropology. However, it is Quinn's telling that is fascinating: the story is told through the eyes of Alan Lomax, a disgruntled writer, wandering aimlessly through the world after the terrible disappointment of the late sixties—when the promises of a new way, a new order, and a new vision attracted young people from all over the world, young people who would collectively be known as "hippies." Alan is attracted to a newspaper ad: "Teacher seeks pupil. Must have a strong desire to save the world. Apply in person." Alan, in his post-sixties cynicism (the story is set in the mid-eighties,) sets out to prove that this is just another charlatan. From there the story takes such a unique twist, on such an unlikely—though inspired—premise, that it is quite difficult to put it down.

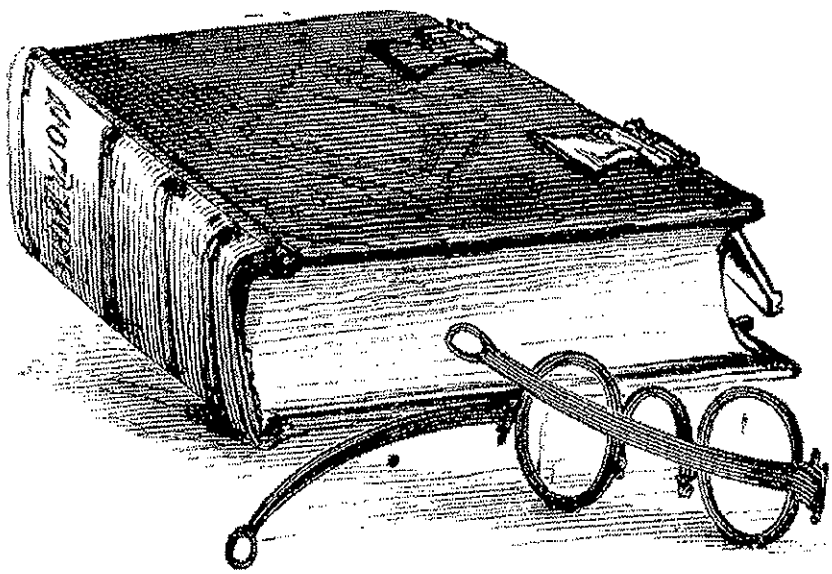
Quinn's writing style is powerful. Although his technique of using repetition to punctuate his ideas can be annoying at times, it is small price to pay for a riveting writing style, a passion for subject matter, and ideas that are revolutionary yet so blatantly obvious. After *Ishmael*, it is difficult to go back. It is difficult to ever again think of Mother Culture in the same way—after you actually hear her whisper in your ear and know that what she is whispering is the siren song of our planet.

However, help is on the way. The success of *Ishmael* has led to other powerful books by Quinn: *My Ishmael*, *The Story of B*, *Providence*, and his most recent offering, *Beyond Civilization*, all following more or less the same theme: the effect of our culture on our planet.

Ishmael is essential reading—it is the book against which all others will have to be judged. Jim Britell, from the *Whole Earth Review* wrote, "From now on I will divide the books I have read into two categories: the ones I read before *Ishmael*, and those read after." It does have that kind of effect on one, and truthfully deserves a place among the great sociological classics like *1984*, *Animal Farm*, and *Lord of the Flies*. JWR

Reviewer Joe MacLeod serves on the IWRC's board of directors.

Conservation Classics is intended to provide our readers with suggestions for building a collection of must-have wildlife and ecology reference books.



Living on the Wind:
Across the Hemisphere with Migratory Birds
by Scott Weidensaul

North Point Press, 2000
432 pp; U.S.$15 (paperback)
ISBN 0-86547-591-1

Scott Weidensaul, a bird bander from the Appalachian Mountains in Pennsylvania, has written a well-researched book on bird migration that also includes the history, ecology, hazards, and a heartfelt insight into the difficulties that all migratory birds face. He not only explains the birds' complex seasonal movements, but *why*—and much more.

The book starts in the Beringia part of Alaska and takes the reader east, west, and south with individual species, explaining their remarkable journeys to their "winter" or nonbreeding destinations. Weidensaul explains how their diets and habits change to adapt to their environment. Then he brings us back north with different species.

I was most touched by the perils, both natural and unnatural, that the birds encounter on their migration. That they survive at all is remarkable. Much of this information is potentially useful to rehabilitators.

Weidensaul obviously loves and understands migratory birds, and he has a superb writing style. I am glad he took the time to share his knowledge. This book is the best bird book that I have read in a long time. Get it and read it!

Reviewer Gloria McFarland lives on a tiny sanctuary in northern New Mexico.

JWR

Grantsmanship...Taming the Beast
by Neva N. Harden

Albuquerque: Horizon Communications, 2000
40 pp; U.S.$12.95 (+ $2.50 S+H)
ISBN: 0-913945-60-9

Writing grants can be a daunting process even for those with experience. For first-timers, it can be downright terrifying. Books like Neva N. Harden's *Grantsmanship...Taming the Beast* can help newcomers to the grant-writing world take the first step.

According to Harden, good planning and careful preparation are the keys to writing a successful proposal. *Grantsmanship* stresses the importance of doing your homework *before* you start writing; this includes determining if your organization meets the grantmaker's requirements and having a clear, coherent idea of your project.

Harden takes the reader through the basics: where to go for grants, sifting through grant guidelines, taking an idea from need to concept to project, and putting it all down on paper. The section on developing the proposal gives readers a good understanding of the various parts of a proposal, what each section should include, and how the finished proposal should look before submission.

Perhaps the most useful sections of *Grantsmanship* are the definitions, checklists, and examples that help move the reader through the process. These tools include laundry lists of points to consider before preparing a proposal, necessary supporting documentation, definitions of types of foundation grants, and how to learn from rejection.

This book is intended for novices to the grant-writing process, specifically those working for nonprofit organizations. Harden's writing style is unintimidating, although at times it is too informal, with side comments that distract more than they add levity. But the book is a basic, easy-to-read tool to move the inexperienced grant writer past the initial confusion that often results after looking through a foundation directory.

Reviewer Kristy Wicker is a grant writer at Little River Zoo in Norman, Oklahoma.

(This book is available from Horizon Communications, 2710 San Diego S.E., Albuquerque, NM 87106, USA.)

JWR

Down & Dirty Birding
by Joey Slinger

New York: Simon & Schuster, 1996
239 pp; U.S.$12
ISBN: 0-684-80459-X

Sure, rehabilitators are a little... different. But we all know who the *true* oddballs of the tree-hugging crowd are: birders. Joey Slinger, columnist for the *Toronto Star* and a hardened birdwatcher himself, seems to agree. *Down & Dirty Birding* is an irreverent and hilarious guide to looking, acting, and talking the part of a knowledgeable expert on avian life.

The biggest pitfall to bird-watching, as anyone who birds will tell you, is that you really need to know a lot about birds before you can start learning about birds. Take field guides: the primary reason someone refers to a field guide is to identify an unknown bird. But unless you know what bird you're looking at, it's practically impossible to find it in a field guide—right? According to Slinger:

> Identifying a bird is easy. All you have to do is look it up in your field guide. It is the looking up that is hard. You see a bird you have never seen before.... The laws of bird-watching now come into play. Law One: You have only seen the bird for two-tenths of a second. Law Two: It will take you twenty minutes (or maybe two hours; anyway, too long) to find it in the book. And then, unless it is something unmistakable like a Great Kiskadee, or enormous like an American White Pelican, you won't be even slightly sure that what the book shows and what you saw are the same thing.

So forget about recommending those "First Guides" or beginning birder flash cards to any fledgling birder with whom you may cross paths.

Slinger's tongue-in-cheek approach will put nervous novices at ease, but don't let that fool you—this book is packed with information, much of it accurate. It's all here:

- what to wear
- what equipment to buy
- how to look and talk like an expert
- how to recognize real experts and avoid them
- how to steer clear of people who think bird-watching is better than sex

...as well as how birds sleep without falling out of trees, and—most important of all—how birds, you know, do it. Which is the real reason you'll want to recommend *Down & Dirty Birding* to all of your birding friends.

Reviewed by Kieran Lindsey.

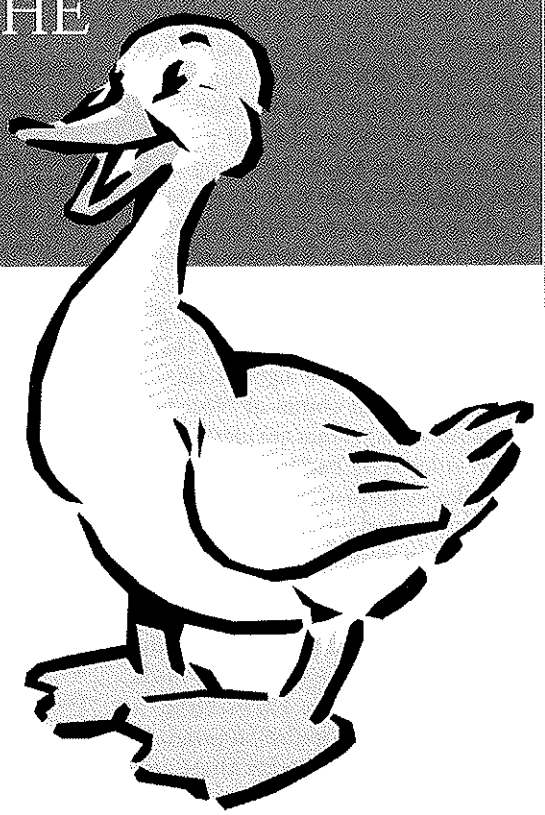
JWR

DITTO

A REPRODUCEABLE PUBLIC SERVICE ANNOUNCEMENT

This space for your organization's name, address, and phone number.

PLEASE DON'T FEED THE DUCKS



Reducing the population of domestic ducks in our ponds is the only way to ensure the health of resident birds.

Limiting the food supply is not cruel and will lead to healthier domestic and wild waterfowl.

Design by WildWorks
Cedar Crest, NM, USA

Domestic ducks (including Muscovy, Pekin, and domestic mallard-crosses) are found at many local ponds. Most are descendants of pet ducks that were released or escaped from their owners. Domestic ducks can quickly overpopulate an area, causing a decline in the native bird population and increasing the chance of disease.

Because of large quantities of food handed out by well-intentioned people, ducks living in urban and suburban ponds multiply rapidly. Populations tend to increase exponentially, and as long as there is room and food, this trend will continue. Feces from large numbers of ducks and from uneaten food cause pollution in small bodies of water.

Avian botulism, caused by an organism that thrives in warm, polluted water, kills many ducks in crowded ponds every year. Botulism affects not only ducks and geese, but shorebirds, gulls, raptors, and songbirds that visit the polluted ponds. Duck plague, an often-fatal disease, spreads easily through bird-to-bird or bird-to-environment contact, affecting ducks, geese, and swans.

If ducks are not fed by people they will eat more natural foods such as aquatic vegetation, insects, and mollusks. The water will remain cleaner. Limiting the food supply is not cruel and will lead to healthier domestic *and* wild waterfowl.

Human-Raised Cranes Fly to Wisconsin

Scientists who donned bird costumes to guide a flock of fledgling sandhill cranes south for the winter were relieved to find the birds made it home at the swampy Necedah National Wildlife Refuge in central Wisconsin on their own. Last summer trainers at Necedah wore bird costumes and used hand puppets in an attempt to teach the young birds wild-crane habits and to follow a buzzing ultralight plane to Florida in October on the longest human-led bird migration ever.

Two months after the cranes debarked from Florida and 775 km (1250 miles) later, they were sighted amid a flock of two dozen cranes at Necedah. (The hand-raised cranes are identifiable by their colored leg bands.) The experiment followed similarly successful efforts to raise, train, and use ultralight aircraft to guide migratory flocks of orphaned swans and Canada geese. The next step is to duplicate these techniques to establish a migratory flock of the endangered whooping crane. After the birds were hunted to near extinction, a whooping crane repopulation program was established, and today there are approximately 250 whooping cranes. The last migratory flock winters in the hurricane-prone Aransas National Wildlife Refuge near Corpus Christi, Texas, and summer in Canada's Northwest Territories.

Research Collaborators Sought

Doctoral candidate Joe Phelps is seeking feather samples from indigo buntings, gray catbirds, Arcadian flycatchers, and eastern phoebes for a study of natal dispersal. Birds of any age are suitable for providing samples, which should consist of the second secondary feather from each wing (or the closest available secondary if some are missing). Each sample of two feathers should be placed in an envelope and labeled with the species, age (as accurately as is known), location collected, date collected, band number if bird was banded, and name and phone number of collector.

Samples can be collected though the end of the summer and then sent all at once, if preferred. To participate, or for more information, contact Joe Phelps, Purdue University, 1200 Forest Products Building, West Lafayette, IN 47907–1200; jphelps@fnr.purdue.edu; 765/ 497-1629.

Loss of Habitat Fuels Urban Lion Problem

According to a National Wildlife Federation (NWF) study, the mountain lion has lost half its habitat across the West. Development has pushed the mountain lion out or forced animals to hang around and feed off smaller animals like raccoons and skunks, the study said. The problem is particularly acute along the western edges of Colorado's larger cities such as Denver, Boulder, and Colorado Springs.

The state Wildlife Department in Colorado Springs averages nearly two calls per week regarding cases in which the lions have either been sighted or their tracks detected. Cases of conflict between people and lions are rare, but as recently as 1998 a lion attacked a hiker in Roxborough State Park. The year before, a lion killed a 12-year-old boy in Rocky Mountain National Park.

With the mountain lion's habitat shrinking, more encounters can be expected, the NWF study said.

Elephant Relocation Planned

South Africa plans to relocate 1000 elephants to Mozambique in the biggest transfer of wildlife since thousands of animals were moved for Zimbabwe's Kariba dam in the 1960s. The elephants will be transferred from the Kruger National Park to an area in neighboring Mozambique known as Coutada 16, which is slated to become part of a 35,000 sq km (13,510 sq mile) transfrontier park that also straddles a region of Zimbabwe.

The operation will begin later this year and take three years to complete. It will cost around 20 million rand ($2.46 million U.S.).

The cross-border transfer will ease pressure on Kruger's 9000-plus elephant population, which many scientists say has reached its capacity given the available habitat in the Israel-sized park. Kruger periodically relocates elephants to other game parks and reserves in South Africa but has been unable to do so at a pace that outstrips the animals' population growth in the park.

Notice

The phone number for Accountants for the Public Interest listed in the winter 2000 issue of the *Journal of Wildlife Rehabilitation* (News Briefs, p. 36) has been changed. The new number is 410/837-6533. The editors thank Carol Burgess for bringing this to our attention.

WANTED

Seeking a full-time WILDLIFE REHABILITATOR for the Cape Wildlife Center, dedicated to the veterinary and rehabilitative care of injured, ill, and orphaned New England wildlife. On-site veterinarian; open year round; average 1200 animals per year: 60% aves, 35% mammals, 5% reptiles.

Applicant must have 3 years experience as a licensed wildlife rehabilitator, possess superior supervisory skills and an energetic demeanor, and enjoy working in a team atmosphere.

Send resume and 3 letters of reference to:

Dr. Rachel Blackmer
HSUS Cape Wildlife Center
185 Meadow Lane
W. Banstable, MA 02668
fax: (508) 362-0268

AVIAN

Foot Damage in Gadwalls at Mono Lake, California

Joseph R. Jehl Jr.
J. Field Ornith. 2001. 72(2)

Gadwalls (*Anas strepera*) hatched at Mono Lake, California, exhibit two types of severe foot damage, one manifested by the formation of hard white nodules on the plantar surface, the other by necrosis, which results in deformed and eroded webs and, in extreme cases, loss of podotheca and toes. Unknown in gadwalls elsewhere or in other waterbirds at Mono Lake, these conditions may be evident in ducklings only three weeks old. They presumably stem from infections incurred after ducklings abrade their feet on the harsh lake substrate. The causative agent(s) is unknown.

Efficacy of Praziquantel in Treating Natural Schistosome Infections in Common Mergansers

C. L. Blankespoor et al.
J. Parasit. 2001. 87(2)

Fifty-one common mergansers were captured on Douglas Lake, Michigan, and their avian schistosome loads were determined by fecal examination. Each bird was given a single dose of 0, 40, or 200 mg/kg of body weight of praziquantel and released. All birds were recaptured within 10 days of drug administration to determine post-treatment schistosome loads. Only the highest dose of praziquantel was found to significantly reduce avian schistosome loads. The potential use of praziquantel in swimmer's itch control programs is discussed.

MAMMALS

Fungal Dermatitis in Captive Pinnipeds

Christal G. Pollock et al.
J. Zoo. and Wildlife Med. 2001. 31(3)

Fungal dermatitis was diagnosed in two captive grey seals (*Halichoerus grypus*) and four harbor seals (*Phoca vitulina*) between 1992 and 1994. *Trichophyton mentagrophytes*, *Malassezia* spp., and *Yarrowia* (*Candida*) *lipolytica* were isolated. Erythematous, thickened, alopecic skin lesions were present on the face and on the flippers, particularly around the nail bed. The two most important environmental factors associated with development of fungal dermatitis appeared to be excessive chlorination of pool water and warm water temperature.

Evaluation of Anthelmintic Activity in Captive Wild Ruminants by Fecal Egg Reduction Tests and a Larval Development Assay

Kerry E. Young, Thomas M. Craig, and James M. Jensen
J. Zoo. and Wildlife Med. 2001. 31(3)

The effectiveness of anthelminthics was evaluated in four herds of captive ruminants—wapiti (*Cervus elaphus*), Armenian red sheep (*Ovis orientalis*), giraffe (*Giraffa camelopardalis*), and pronghorn (*Antilocapra americana*)—by the use of fecal egg reduction tests (FERTs) and a commercial larval development assay (LDA) designed to evaluate susceptibility or resistance of nematodes to anthelminthics. *Haemonchus* sp. was the predominant nematode in the red sheep, giraffe, and pronghorn herds; *Ostertagia* sp. and *Trichostrongylus* sp. were predominant in the wapiti. The LDA data indicated susceptibility by the worms to benzimidazoles except in the red sheep flock, which showed a high level of resistance. High levels of resistance to levamisole were seen in the worm populations from the wapiti and red sheep, moderate resistance in the pronghorn herd, and susceptibility in the giraffe herd. Worms were susceptible in all four herds to a combination of benzimidazole/levamisole. There was suspected avermectin resistance by *Trichostrongylus* sp. in the wapiti herd and by *Haemonchus* sp. in the giraffe. The FERTs agreed with the LDA in showing the *Haemonchus* in the giraffe was susceptible to fenbendazole and had suspected resistance to ivermectin, whereas *Haemonchus* in the red sheep and pronghorn were susceptible to ivermectin. There was correlation between the tests evaluating anthelmintics. The LDA is useful as a screening test in the selection of an anthelminthic for use in grazing ruminants, but the effectiveness of a drug in a host species may depend as much on the dose used, and the method of administration, as it does on the parasite's sensitivity to the anthelminthic.

HERPETILES

Taste Discrimination in a Lizard (*Anolis carolinensis*, Polychrotidae)

Kathrin F. Stanger-Hall et al.
Copeia. 2001. 101(2)

The question of whether lizards possess a sense of taste and are able to use it to discriminate between prey items has long been debated. This study provides evidence that some lizards do use gustation to discriminate between prey items. In laboratory choice experiments, the lizard *Anolis carolinensis* discriminated between untreated crickets and crickets treated with either dextrose/aspartame powder (produces sweet sensation in humans) or quinine hydrochloride (QHCl) solution or powder (bitter sensation in humans). Although some lizards showed a strong preference for crickets treated with dextrose/aspartame powder, all lizards generally avoided prey items treated with QHCl. This avoidance is not affected when access to the vomeronasal organ is blocked. During this study, lizards readily associated taste with color.

Rates of Water Loss and Estimates of Survival Time under Varying Humidity in Juvenile Snapping Turtles (*Chelydra serpentina*)

Michael S. Finkler
Copeia. 101(2): 2001

Juvenile snapping turtles may be highly susceptible to dehydration during overland movement because of their aquatic nature and large surface area to volume ratio. The present study examined the influence of body size and relative humidity on rates of evaporative water loss and estimates of survival time. Larger hatchlings had higher rates of evaporative water loss but longer survival times resulting from their greater absolute water contents. Rates of evaporative water loss decreased and estimated survival times increased with increasing relative humidity. The findings suggest that evaporative water loss may be an important factor influencing survivorship and behavior during overland movements of juvenile snapping turtles.

TAIL END

by Astrid MacLeod

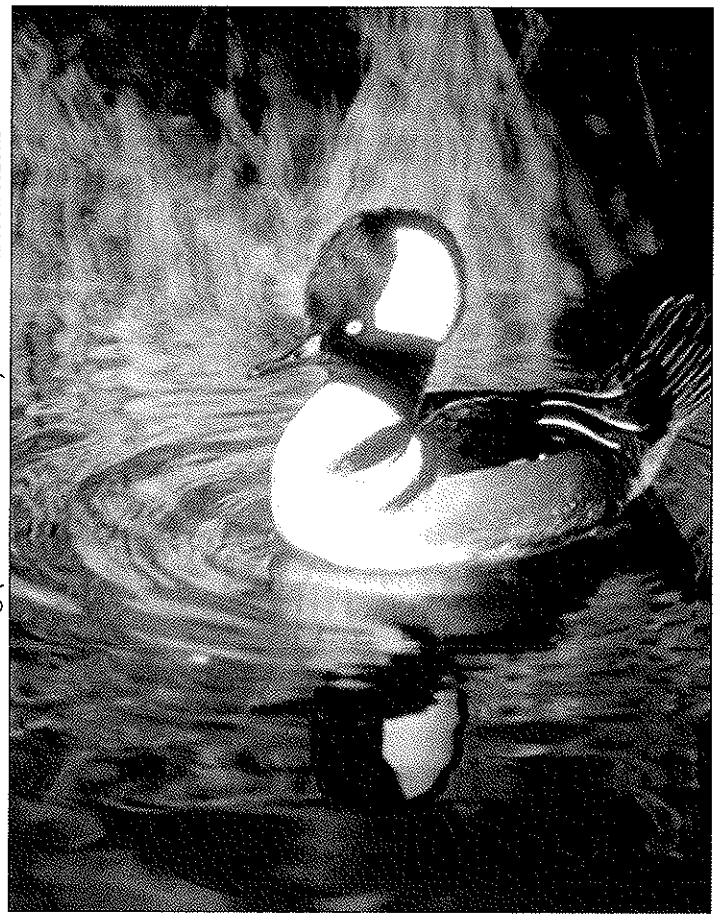


PHOTO: HOODED MERGANSER (*LOPHODYTES CUCULLATUS*) ©1997 THE LEARNING COMPANY, INC.

Frank could no longer hide the truth—compliments on his flashy new plumage *had* gone to his head.

INSTRUCTIONS FOR AUTHORS

POLICY: Original manuscripts concerning any aspect of wildlife rehabilitation are welcome. Articles on topics including administration, law, education, veterinary medicine, animal husbandry, and public relations as they relate to wildlife rehabilitation are all invited. Book reviews are also welcome. Submissions are not confined to the continent of North America.

Associate editors and anonymous reviewers judge each submitted manuscript on appropriate subject matter, originality, accuracy, conciseness, clarity, and contribution to existing literature. Concurrent submission to other peer-reviewed journals may preclude publication in the *Journal of Wildlife Rehabilitation (JWR)*. All authors of each original article published receive either a $30 honorarium or a one-year individual membership or renewal. IWRC retains copyright on all original articles published in *JWR*, but will grant permission to reprint articles upon request, with credit given to IWRC.

MANUSCRIPT: Copy should be typewritten and double-spaced. Include the name of each author, addresses, phone numbers, e-mail addresses, a one-paragraph biography for each author, an abstract, and several keywords. Templates have been developed for the following categories of submissions: Species paper (i.e., Rehab Notes), case study, technique, research paper, and review; authors may request a copy of one or all of these templates from the Editor or the IWRC office before developing work for submission in *JWR*.

SUBMISSIONS: All submissions should be accompanied by a cover letter stating the intent of the author(s) to submit the manuscript exclusively for publication in *JWR*. Double space throughout, with 1 inch margins. The author(s) should keep at least one copy of the manuscript.

ELECTRONIC SUBMISSIONS: Electronic submissions (PC or Macintosh platforms) are preferred but not required. The manuscript should be attached to the submission letter and sent to ALL of the following:

Marianne Skoczek, Editor
runmuki@aol.com

Penny Elliston, Publications Committee Chair
epe@nmia.com

IWRC Office
iwrc@inreach.com

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