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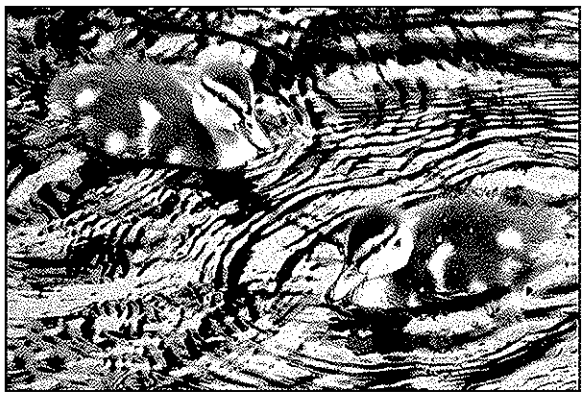
Procuring free state-of-the-art health care supplies ... A great horned owl success story ... Releasing visually impaired patients ... abstracts, news, book reviews, and more

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 issue. Through this 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:
Leopard (*Panthera pardus*). See page 15 for a report on a carbofuran poisoning case in India. [Photo: www.flickr.com/tropicaliving, used with permission]

BELOW:
Uninjured juvenile mallards (*Anas platyrhynchos*) constitute a large number of the summer admissions to rehabilitation facilities. [Photo: Danny de Veen, used with permission]



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EDITORIAL

Defining the Relationship of Wildlife Rehabilitators to Animal Welfare Interests

It may seem axiomatic that wildlife rehabilitation and animal welfare be taken as one and the same thing, and that any pretense to speak to the role rehabilitators might play in animal welfare simply an effort to talk over the apparent. And perhaps it is. Until your editor asked me to comment on the subject I had frankly never given it that much thought. But Kieran's interest in opening a broad dialogue about the role of rehabilitators in both conservation and welfare pursuits is a good idea, given recent developments. I'd like to offer a brief background here before telling you why I think that is so.

While the question of how animals should be treated by humans has deep historical roots, organized approaches to formalizing answers are fairly new. What we often term as animal "welfare" is really a vast field that includes concepts of animal "rights," and animal "protection" as well. Animal welfare started largely as a post–Civil War movement, focused traditionally on domestic (pet and farm) animals. Animal rights is a quite new social phenomenon, coming prominently into the public conscience in the 1970's along with the environmental movement. Animal protection remains even today poorly defined and discussed.

To me, animal welfare is a largely scientific pursuit that seeks to empirically identify conditions that could improve the lives of animals—better caging, for example—and which ceases to be concerned about an animal's life once consciousness and the ability to perceive (and suffer) no longer exists. Animal rights is a philosophical perspective that challenges us to think about what it means to be alive and aware and nonhuman. It has acquired a significant, practical day-to-day connotation in the public's mind as encompassing all conceptual as well as practical positive social approaches toward animals, although in reality it does not. Animal protection draws from both rights and welfare in what often seems a compromise position aimed at focusing on the more achievable objectives that can lead to the betterment of animal lives. Animal protection still cares about what happens to animals even after consciousness is lost, and asks very hard questions about why it needed to happen and the rationale behind many of the actions we take that have consequences for the billions of animals on this planet.

Where does wildlife rehabilitation fit within these schemes? The field is still fairly new and developing so rapidly that it seems at times more focused on how to manage the need for growth and acceptance by other wildlife professionals than on questioning what larger social role it might play. But challenges from some wildlife agencies are questioning whether or not wildlife rehabilitation should exist as a permitted activity at all. It is now time to take that on directly and forcibly defend wildlife rehabilitation against its detractors. Defining its relationship to the broader conservation and welfare interests that intersect with it would be a good first step in that direction.

—John Hadidian, PhD
Director, Urban Wildlife
Humane Society of the United States

Re: Clarifying the Certified Wildlife Rehabilitator™ Program

To the Editor:

I would like to congratulate the IWRC for providing a forum in the *Journal of Wildlife Rehabilitation* (V28N3) for differences of opinion to be discussed. It is a healthy and mature organization that recognizes the key role this plays in any association adapting to change.

The letter from the wildlife rehabilitators who believe too much emphasis is placed on certification by exam compared to first-hand experience highlights an underlying concern that needs to be addressed. I don't for a minute believe anyone rejects the idea of establishing high standards of care and levels of proficiency but the pre-occupation about "professionalism" within the IWRC seems to be more centered on the worry as to how rehabilitators are perceived by government agencies.

While IWRC rightfully points out that you do not become a registered nurse or a medical doctor or a dentist without education, training, and certification, it should be remembered that those professions lead to salaried positions. Few wildlife rehabilitators are paid to do what they do. In fact, most have to provide the funds as well as an endless amount of volunteer time to do it.

Many if not most of the animals helped by wildlife rehabilitators are orphaned young whose care involves nurturing and common sense—much like a good human parent provides. We didn't expect our parents to be skilled in necropsy and pharmacology. They depended on the family doctor, just as rehabilitators should depend on close working relationships with veterinarians.

I believe there needs to be a better balance in providing rehabilitators not only the opportunity to upgrade their skills but in representing their interests, whether it is in negotiating lower costs for formulas and medications or in advocating for them when they are treated unfairly by state or provincial and federal agencies, something that seems to be occurring with much greater frequency.

Today, almost all professional associations advocate for their membership. It is time for the IWRC to do so as well. Otherwise it will become an exclusive club with fewer and fewer members who are actually caring for wildlife even though, given extensive development and habitat loss, the need for wildlife rehabilitators has never been greater in North America.

—Donna DuBreuil
President
Ottawa-Carleton Wildlife Centre
Ottawa, Canada

IWRC Responds

Dear Donna,

I think it's important to reinforce here that the primary goal of the CWR program is to *improve animal care standards in our field.* There are many individuals and organizations working towards this same goal; each with their own strengths and resources. IWRC feels that through the promotion and requirement of continuing education (the main requirement for certification renewal), we can make the best use of our own strengths and resources in supporting this effort.

Of course, it is our sincere hope that the perception of rehabilitation and rehabilitators—by government agencies, veterinarians, biologists, the public, and the rehabilitation community—will improve as a result. We strongly believe improving the credibility of wildlife rehabilitation will increase our community's ability to be heard and respected by granting foundations, federal and state/provincial agencies, regulators, legislators and animal welfare advocates, thereby increasing the support available to wildlife rehabilitators. Although it may not be in the preferred style of some, this is advocacy on a big picture level—where we feel we can achieve the greatest impact with the resources we have available to us.

I appreciate your words of support for our efforts to provide a forum for discussion about this new program. Actually, your letter was one of the inspirations for a new column you'll find in this issue of the journal, *Certification: A Continuing Dialogue* (page 33). Look for more questions, comments and responses about the CWR program and certification in general in this and future issues.

Sincerely,

Jennifer Gursu
Executive Director
IWRC

The Editors encourage readers to respond to the articles, columns, and other items featured in the *Journal of Wildlife Rehabilitation*. Please direct general questions and comments to journal@iwrc-online.org. To respond to a specific article or column, please contact the author directly. Letters may be edited for clarity and length.

Admission Trends and Mortality Correlates for Mallard Ducklings at Wildlife Rehabilitation Facilities

by Anna Drake and David Fraser

Introduction

Mallards (*Anas platyrhynchos*) are the most abundant wild duck species in North America (Wilkins *et al* 2007; Drilling *et al* 2002). Compared to other duck species, mallards are highly tolerant of humans (Greer 1982) and are the most common waterfowl species in many suburban environments and parks (e.g., Heusmann and Burrell 1974). It is not surprising, then, that human encounters with mallards are frequent and that mallard ducklings are commonly brought to North American wildlife rehabilitation centers by members of the public.

Orphaned mallard ducklings make up 2.5 to 5% of the admissions to rehabilitation facilities in British Columbia (*derived from* Dubois 2003). One-week-old birds spend an average of 52 days in care before they grow their flight feathers and can be released, but many die in facilities before they reach this stage.

Mallards also experience high juvenile mortality rates in the wild. Field studies in North America generally estimate 30-day post-hatch survival to be below 60% (e.g. Maisonneuve *et al* 2000; Orthmyer and Balland 1990). Mortality rates are highest within the first week of hatching (Dzubin and Gollop 1972) and the majority of deaths occur within the first 14 days (Hoekman *et al* 2004; Talent *et al* 1983). Factors known to contribute to deaths in the wild include predation (90.7% of fatalities in one study, Mauser *et al* 1994), exposure in poor weather conditions (Kear 1965), and inadequate food (Cox *et al* 1998) which, in turn, is influenced by temperature (Cox *et al* 1998) and wetland availability (Krapu *et al* 2000). In rehabilitation, however, where these factors are removed or controlled, the number of deaths could potentially be much lower.

In fact, commercial mortality rates for domestic mallard ducklings are only about 5% within the first 6 weeks post-hatch (Pajor 2007). This notably low death rate may be associated with the uniform care ducklings receive, vaccination against common diseases, and efforts to minimize dehydration after hatching. In contrast, birds in rehabilitation do not receive uniform care before admission and may be subjected to high levels of stress before and during capture and through handling. Birds may also be deprived of food and water before and after capture or receive inappropriate foodstuffs. Additionally, wild ducklings are not protected from common diseases such as Duck Hepatitis Virus (DHV), and *Pseudomonas sp.* bacteria. Finally, temperature stress when the birds are transported to rehabilitation facilities may compound prior dehydration or energy deficits. If some of these factors are responsible for the higher mortality rates observed in rehabilitation, it should be possible to link duckling deaths to the treatment they have received before they arrived in the rehabilitator's care.

Rehabilitation facilities in British Columbia are required to keep records (case sheets) for animals in care (Dubois 2003). These records note the

IN YOUR PRACTICE: This study offers insights that can be used to improve triage methods and survival rates of neonate and juvenile birds of any precocial waterfowl species.

ABSTRACT: Juvenile mallards (*Anas platyrhynchos*) constitute a large number of summer admissions to rehabilitation facilities in British Columbia, Canada. Although heat and *ad lib* food and water are provided, deaths are common in the period between admission and release. An analysis of 1279 ducklings, representing 6 years of data from the 2 largest rehabilitation facilities in British Columbia, showed an average of 35% of ducklings die while in captive care; death rates are highest during the first week after admission. Logistic regression analyses showed that for ducklings admitted ≤ 5 h from capture, the risk of dying in care was higher if they were of low body weight at intake, especially if admitted with few siblings, possibly due to inability to maintain body temperature. Birds kept by finders for > 5 h were at greater risk regardless of body weight and brood size. Provision of food and/or water by finders was not related to survival for birds admitted within 24 h. Special attention can be given to birds identified as at-risk in order to reduce deaths while in care. Results suggest special care (warm conditions, palatable food and water) be provided to low weight ducklings, especially if admitted in small broods (< 5 birds), and to all birds kept > 5 h by finders.

KEY WORDS: mallard, duckling, *Anas platyrhynchos*, mortality correlates, wildlife rehabilitation

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characteristics for each animal admitted, including: species, age, cause of injury, general diagnoses, and final disposition (Dubois 2003). At some facilities, records include admission and disposition dates and a questionnaire completed by the individual who found the animal ("the finder") that describes what happened to the animal before it arrived in care. When pooled, these records can provide information on admission numbers and patterns over time, common pre-admission treatments and events, mortality rates, and common diagnoses.

The objective of this study was to combine mortality data with the information provided by the finder and by staff on the day of admission to identify important pre-admission effects on deaths of mallard ducklings. Knowledge about how pre-admission treatments relate to duckling survival may enable rehabilitators to identify ducklings that are at risk of dying in care, and allow care protocols to be adjusted accordingly. Statistics were also compiled on admission trends, why ducklings are brought into care, and how ducklings are handled by the individuals who find them.

Materials and Methods

Data were collected from the two largest rehabilitation facilities in British Columbia, Canada: the Wildlife Rescue Association of British Columbia (WRA) in Burnaby and the British Columbia Society for the Prevention of Cruelty to Animals Wild Animal Rescue Centre (BCSPCA WildARC) facility in Victoria.

Pre- and post-admission data from the WRA were collected from the original admission sheets for "uninjured ducklings" (as assessed by a staff person at admission), spanning 2001–2006. Data collection was limited to mallards admitted between April 1 and July 31 of each year, as this was the peak admission period.

"Brood" data, consisting of pre-admission information on groups of ducklings that were admitted together, was included when appropriate, along with "individual" data specific to each bird, such as admission weight and outcome. Individual data were recorded for birds that weighed < 60 g at admission, and brood data were recorded for broods that had a mean weight of < 60 g at admission, in order to exclude birds > 1 week of age (Lokemoen *et al* 1990). Most (94.7%) uninjured ducklings admitted to WRA fell below this weight. In total, 305 broods accounting for 937 individual ducklings were included in the final dataset.

Pre-admission data provided by the finder included: whether the ducklings received pre-admission food (y/n) and water (y/n), whether birds were handled "a lot" (y/n), how long ducklings were kept by the finder before being admitted, and the reason the animal had been captured. This information was less standardized and complete than information provided by staff and is likely to be less reliable.



MALLARDS (*ANAS PLATYRHYNCHOS*) PHOTO: B. REARDON, USED WITH PERMISSION

The treatment young mallards receive before they are handed over to rehabilitators affects how well they do in captive care.

Post-admission data were collected by a staff person or by an experienced volunteer. These data included: admission date, brood size (the number of birds admitted together, including those that were dead on arrival), individual weight (to the nearest gram), and survivorship (the date of death or the date of release).

Additional information on mortality was compiled using the electronic data records of a second facility, WildARC. Admission weights were not included in WildARC records; therefore, only uninjured birds described as "juveniles", "immature", or explicitly listed as being < 1 week old were included. This dataset contained 499 individuals that were admitted to WildARC from 1998–2004.

Descriptive Statistics

Data were compiled on the number of broods admitted per year, the pattern of admissions over the season, the amount of time a brood spent with the finder, and the reason why birds were admitted. The time broods spent with their finder was recorded in seven categories: (0) hatched at the center, (1) kept ≤ 1 h; (2) kept 1–5 h; (3) kept 5–12 h; (4) kept 12–24 h, including birds described as "kept overnight"; (5) kept ≥ 24 h or 1 day; (6) kept ≥ 1 week.

Reasons for capture were divided into categories shown in Table 1. Information on whether the broods were fed, watered, or handled was tabulated as 'yes' or 'no' responses. Correlations between pre-admission treatments and between treatments and admission weight were then calculated.

TABLE 1: REASONS FOR ADMISSION & PERCENTAGE OF BROODS ADMITTED, BY CATEGORY

Main Category	Subcategory	Description	%
Road-related	Alone on road	Ducklings found on road or sidewalk without a hen; finder had no knowledge of what had happened to the hen.	23.1
	Hen fled	The hen was seen crossing a road and then abandoning her ducklings when they were unable to mount the curb or because she was frightened by traffic or people.	4.4
	Hen hit by car	Hen hit while crossing road; surviving young collected.	9.8
			37.3%
Predation	Domestic	Ducklings were collected when attacked by dog or cat.	3.6
	Wild	Ducklings were collected when attacked by wild animal, mostly northwestern crows and bald eagles but occasionally coyotes and other mallards.	4.0
			7.6%
Trapped	Storm Drain	Ducklings were trapped in a storm drain, vertical pipe, manhole or sewer.	4.9
	Human-made water source	Ducklings were found alone in human-made ponds, pools or fountains, presumably unable to climb out.	2.7
	Structure	Ducklings were found trapped by human-made structures, including parking structures, warehouses, buildings, and fences.	4.9
			12.5%
Other	Hen injured	Ducklings and an injured hen were brought in together.	1.3
	Human interference	A person was seen deliberately taking a duckling from a brood or harassing broods such that the hen fled.	1.8
	Hen dead	The hen was found dead; cause was unknown	0.4
			3.5%
Unknown	Without hen	Ducklings were found without a hen in a situation other than the above, including backyards, parks, parking lots, and lumber-yards.	**39.1%**

Data based on 225 broods admitted to WRA April 1–July 31 of 2001–2006, for which reasons for admission were recorded.

From individual data, post-admission deaths were plotted against time in care using a "mortality subset" of the WRA and the WildARC data sets. This subset excluded all birds that were dead on arrival or euthanized in care, birds whose outcome was unknown, and, at WRA, 137 birds that were used in care protocol comparisons (which had very few deaths) in 2005 and 2006. The resulting data consisted of 795 individuals for WRA and 484 individuals for WildARC. Dates of admission and death were used to calculate "days survived in care". Birds that died on the day of admission were recorded as surviving 0 days, and those that died overnight were recorded as surviving 1 day. All descriptive statistics were tabulated in Microsoft Excel for Mac (2004, Version 11.2.3, Microsoft Corporation).

Mortality Correlates

Correlations between pre-admission factors and mortality in care were calculated from the above mortality

subset for WRA. The pre-admission factors tested were: whether birds received food and water, whether birds were handled, the amount of time birds spent with the finder, body weight at admission, brood size, and when in the breeding season the birds were admitted. Because the response variable was categorical and binary (died/survived) a multiple logistic regression analysis was used (Dohoo et. al 2003).

Analysis was done for birds that spent up to 24 h with the finder. Relatively few birds spent longer with the finder (36 birds from 14 broods) and these tended to be well established birds with a low mortality rate after admission. It is probable that when kept for > 24 h the vulnerable die while in the finder's care and only hardy survivors are admitted.

Separate analyses were run for deaths that occurred within the first 2 days after admission and for deaths that occurred on days 3–7. Preliminary tests had shown no correlation between deaths after the first week in care and any pre-admission factor so these later deaths were not analyzed.

For the mortality analyses, provision of food and water was expressed as a single categorical variable by classifying birds as: (0) given no food or water, (1) offered food and/or water. Time with the finder was reduced to three categories: birds kept ≤ 1 h, those kept 1–5 h, and those kept 5–24 h as this avoided very low sample size in some categories.

Each bird was considered to be an independent data point for the purposes of the analyses even though roughly half were admitted as members of a brood of 2 or more individuals. Birds admitted as broods are not truly statistically independent of each other given that they are likely related and share pre-admission treatment (although large variations in weight indicated possible brood mixing in some admission groups as has been observed in the wild by Mauser et. al (1994)). However, because the observed probability of mortality did not differ across broods, it was deemed acceptable to treat each bird as an independent data point. This conclusion was reached by looking at the models' dispersion values (Goodness-of-Fit Pearson χ^2/df) and finding that none were over- or under-dispersed (Schwarz 2006).

Important variables were identified by independently testing their relationship to mortality (Sall et. al 2001). Contributing variables and their interactions were then entered into a multiple logistic model, and a stepwise procedure (with P to enter or leave of 0.25) was used to identify the variable subset that best predicted the observed mortality. Backward-stepwise analysis was used to remove any remaining variables that did not notably contribute to the final models (P>0.10). The overall model evaluation, Goodness-of-fit measures, variable effects, and odds ratios for continuous variables were then recorded. Independent contrasts were run for categorical variables in order to accurately calculate their odds ratios (Schwarz 2006). Because deaths were common in the data set, the reported odds ratios overestimated the actual risk (Zhang and Yu 1998). Better estimates of risk ratios were calculated using the odds ratios and an approximation formula created by Zhang and Yu (1998).

All models showed a large overlap in predicted probability-of-death values for birds that did not die and those that did. Best probability cut-offs (such that false positives and false negatives were minimized) were determined using receiver operating characteristic (ROC) curves as described by Dohoo et. al (2003). As rehabilitators are more interested in accurately identifying birds at risk of death, the models' sensitivity was increased by shifting the probability threshold for identifying a bird as "predicted to die" down to the point where at least 75% of the observed deaths were predicted correctly. This shift reduces the specificity of the models (i.e., the accuracy of identifying birds "predicted to live") but errs on the side of caution. The predictive powers for each model are reported. All analyses were done using JMP Statistical Package (Version 6, 2005, SAS Institute Inc.).

Results

TABLE 2. NUMBER (AND PERCENTAGE) OF BROODS OF DIFFERENT SIZES ADMITTED TO WRA, 2001–2006

Birds per Brood	No. of Broods	% of Broods
1	157	51.5%
2	32	10.5%
3	19	6.2%
4	16	5.2%
5	22	7.2%
6	10	3.3%
7	14	4.6%
8	8	2.6%
9	11	3.6%
10	10	3.3%
11	3	1.0%
12	2	0.7%
13	1	0.3%
Total	**305**	**100.0%**

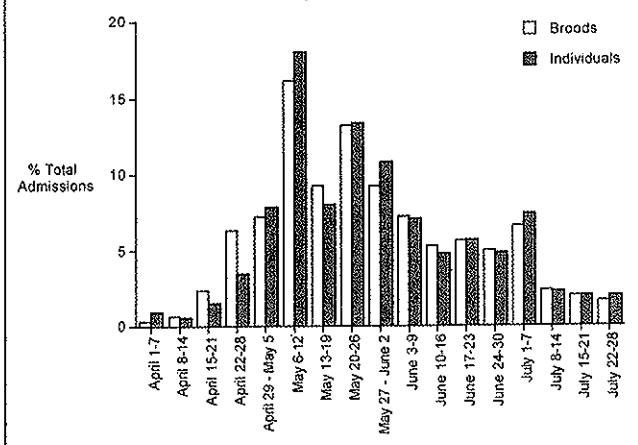


FIGURE 1. Distribution of mallard broods (open bars) and individual mallards (shaded bars) admitted during the 17 weeks from April 1–July 28. Each value shows the number of broods (or individuals) admitted each week, expressed as a percentage of the total number of broods (or individuals) admitted over the entire 17 weeks. Data are for the 305 broods and 937 individuals admitted to WRA 2001–2006.

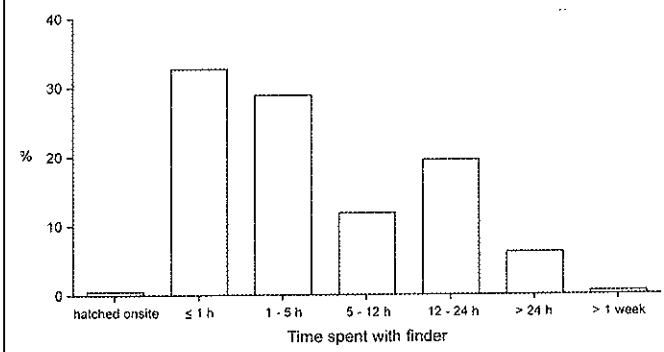


FIGURE 2. Percentage of broods divided according to the amount of time spent with the finder before being admitted to WRA (n= 211 broods)

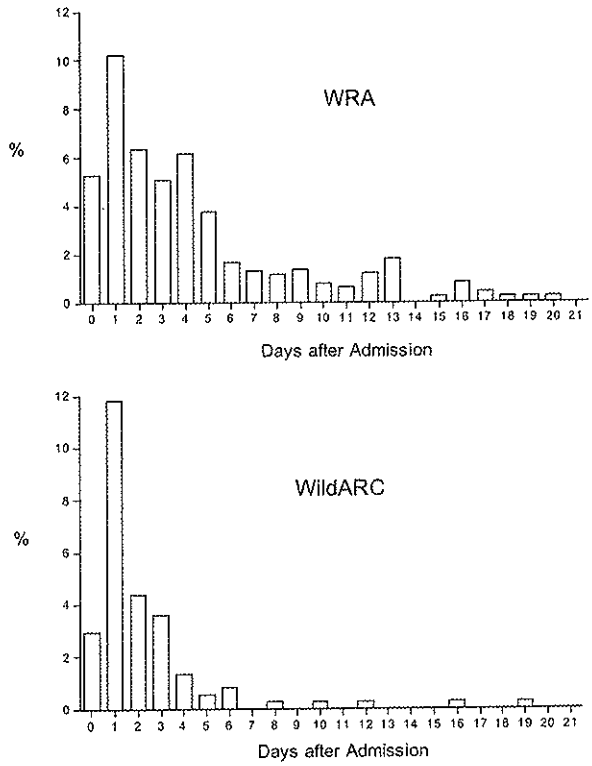


FIGURE 3. Adjusted percentage of ducklings that died during the first 3 weeks after admission. The bars show the number of birds that died on a given day, expressed as a percentage of the number of birds that survived to that day.

ABOVE: Wildlife Rescue Association of BC: 2001–2006 (n=795 birds, 313 deaths).

BELOW: BC SPCA WildARC: 1998–2004 (n=484 birds, 136 deaths).

Descriptive Statistics

WRA received an annual average of 156 ducklings from an average of 51 independent admissions (broods). This constituted 10.0% of the total individuals and 3.4% of the independent admissions brought to the WRA during the April 1–July 31 period.

Admission numbers rose exponentially through April, and more than half of all broods arrived in May. After this peak, there was a more gradual decline towards August (Figure 1). Roughly half of admissions (51.5 %) were single birds, although groups of 2–5 were relatively common. The largest single group admitted over the 6 years consisted of 13 ducklings (Table 2).

Half of the admissions were related to either roads (37.3%) or trapping in other human-made structures (12.5%) (Table 1). Predation (7.6%) and direct human interference (1.8%) were less common reasons cited for collecting birds.

The majority of broods were admitted within 5 h of being found (Figure 2). Most were not offered food or water, and fewer than half were described as handled "a lot" while in the custody of the finder. Broods that were given food were more likely to receive water: 29.2% were given both and 58.0% were given neither (Likelihood ratio χ^2 107.41, P< 0.0001, n=195). As would be expected, ducklings kept by the finder for a longer period of time were more likely to receive water and/or food. Of the broods that were brought to the center ≤ 5 h, only 17.1%

TABLE 3. FINAL LOGISTIC MODEL FOR PREDICTING DUCKLING DEATHS WITHIN 2 DAYS OF ADMISSION

Variables that contributed significantly were time with finder, brood size, admission weight, and the interaction of brood size and the time with finder. For each variable the table shows the odds ratio (OR) and statistical significance (P) as well as the test statistics.

Predictor	df	Wald $\chi 2$ (L-R $\chi 2$)	OR*	P
Time with finder (overall model test)	**2**	**35.27**	**.**	**<0.0001**
≤1 h vs. 1-5 h	1	(0.02)	0.94	0.88
≤5 h vs. 5-24 h	1	(37.55)	5.05	<0.0001
Brood size	**1**	**8.13**	**1.14**	**0.0043**
Admission weight	**1**	**3.19**	**1.06**	**0.0743**
Brood size x time with finder	**2**	**18.62**	**.**	**<0.0001**

**The odds ratio (OR) tests whether deaths are more likely to occur in one group than in another, with an OR of 1.0 indicating that there is no difference between two comparison groups. Reported OR values indicate that (1) birds admitted in ≤ 5 h were much more likely to survive than those admitted in 5–24 h, and (2) each extra brood member and each additional gram of body weight slightly increased the probability of survival. As described in the methods, the reported ORs overestimate actual risk. Risk ratios are reported in the text.*

TABLE 4. OBSERVED PERCENTAGE OF BIRDS THAT DIED WITHIN 2 DAYS, DIVIDED ACCORDING TO SIGNIFICANT PRE-ADMISSION FACTORS (N= 429)

Factor	n	% died
Time with finder		
≤ 1 h	146	12.3
1-5 h	158	13.9
5-24 h	119	39.5
Admission weight*		
< 28 g	96	31.2
≥ 28 g	327	17.4
Brood size: ≤ 5 h with finder		
1	62	24.2
2–3	34	29.4
4–6	88	11.4
7 or more	120	2.5
Brood size: 5-24 h with finder		
1	35	37.1
2–3	28	28.6
4–6	9	44.4
7 or more	47	46.8

** Mean hatch weight is reported to be 31.8 ± 3.4 g (mean ± SD) by Nelson (1993). Therefore, birds < 28g fall more than 1 SD below the mean hatch weight for the species.*

were offered water and 12.8% were offered food, but this increased to 66.7% offered water and 74.6% offered food for birds admitted within 5-24 h (Likelihood ratios: χ^2 65.00, P< 0.0001, n=176 for water; χ^2 102.34, P< 0.0001, n= 188 for food). The likelihood of being handled was not related to whether broods received food or water, or to the length of time in the finder's care.

Mean brood admission weight was slightly higher for birds that were fed or watered: birds that received food weighed about 1 g more than those that did not, and birds that received water weighed about 2 g more than those did not. Effects of feeding and watering, tested by Wilcoxon/K-W χ^2 approximations (*df*=1 and n=197 for feeding and n=184 for watering) showed P<0.05 for feeding and P<0.01 for watering. Weight showed no relationship with brood size or handling.

The mean survival of ducklings was 58.2% at WRA and 71.4% at WildARC. Deaths were much more common during the first few days after admission, with 15.0% and 14.3% of all ducklings dying on the day of, and the day after, admission at WRA and WildARC, respectively. At WRA, 86.1% of all deaths had occurred by the end of the first week in care, and 91.3% by the end of the second. WildARC mirrored this trend with 84.1% of deaths having occurred by the end of the first week in care and 86.4% by the end of the second week (Figure 3).

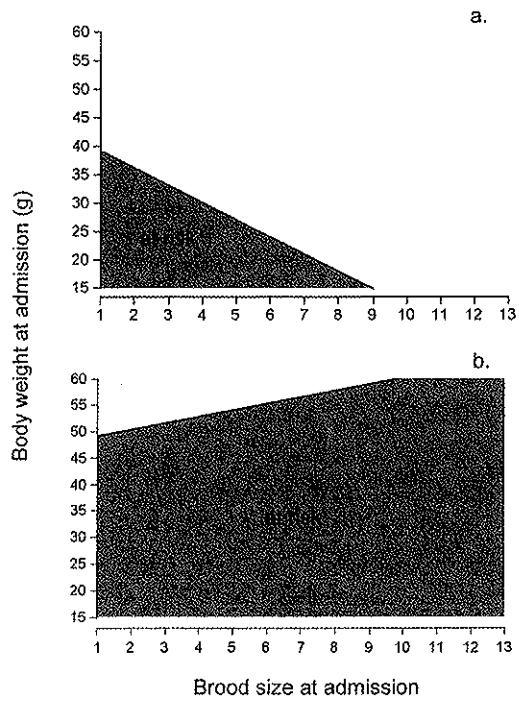


FIGURE 4. Predicted 2-day mortality thresholds for brood size, duckling body weight at admission, and time kept by the finder. Birds that fall into the shaded region of the graph are predicted to die in the model and should be considered at risk. a) Birds kept for ≤ 5 h, b) Birds kept for 5–24 h.

Mortality Correlates

Deaths within 2 Days

The final logistic model to predict deaths of ducklings within 2 days of admission included time with the finder, brood size, admission weight, and the interaction of brood size and time with the finder (Table 3). This model was statistically highly significant (χ^2 = 60.46, *df* = 6, P<0.0001, n=423), but explained a relatively small proportion of the variation (R^2(U) =0.14).

Birds admitted within 1 h of being found did not fare better than those admitted within 1–5 h, but both groups (i.e., birds admitted in ≤ 5 h) had twice the probability of survival relative to those admitted within 5–24 h (Table 4). There was a significant interaction between the time spent with the finder and brood size: large broods survived better than small broods when they were admitted in ≤ 5 h, whereas mortality was unrelated to brood size when ducklings were kept for 5–24 h (Table 4). Heavier birds tended to fare better than lighter animals regardless of other factors. Of the 96 birds that weighed < 28 g (more than 1 standard deviation below the mean hatching weight for mallards [Nelson 1993]) 31.2% died; of the 327 birds ≥ 28 g, 17.4% died.

The overall model was adjusted for sensitivity such that birds with a predicted probability of dying greater than 0.16 were considered to be "at risk." With this threshold, the model identified 81.6% of the 87 birds that died as at risk and identified 61.6% of the 336 birds that survived as not at risk. Mortality thresholds based on this model are presented as a function of admission weight and brood size for different times ducklings had spent with the finder (Figure 3). This figure offers a way of identifying, at admission, birds that are most at risk of dying within the first 2 days of care.

Deaths on Days 3–7

The final model for predicting duckling deaths on days 3–7 after admission contained the following variables: whether birds were given food or water, admission weight, and how long they were kept by the finder (Table 5). Again, the model was highly significant (χ^2 = 32.87, *df* 4, P<0.0001, n=310), but explained only a portion of the variation (R^2(U)=0.10).

Birds kept by the finder for ≤ 5 h had a 1.8 times greater probability of survival than those kept for 5–24 h. Higher admission weight was associated with increased likelihood of survival. Finally, birds that were given food and/or water had a 2.4 times greater probability of survival than those that were not (Table 6).

Discussion

Admission Trends

The peak admission period for the WRA coincides with the peak hatch period for mid-latitudes of the mallard breeding range (Drilling et al 2002). This pattern, coupled with the low mean weight of birds brought into care, suggests that the majority of ducklings are orphaned shortly after hatching, probably after leaving the nest (typically 13–16 h after hatching; Drilling et. al 2002) but before reaching water. The observation that the largest known source of admissions was road incidents offers support for this argument. However, in prairie wetlands hens may move their broods 2–3 times within the first week; hence it is possible that some broods may have been older when they were collected from roads (Dzus and Clark 1997). Periods of overland movement are considered a more dangerous time for mallard ducklings than periods spent on water as the risk of predation and of separation from the hen is thought to increase when broods are on the move (e.g. Ball et al 1975, Rotella and Ratti 1992, but see Dzus and Clark 1997 for conflicting results).

As road-related abandonment and entrapment appear to be the most common known reasons for admissions, they would be the most logical issues to address within a

TABLE 5. FINAL LOGISTIC MODEL FOR PREDICTING DUCKLING DEATHS THAT OCCURRED ON DAYS 3–7 AFTER ADMISSION

Variables that contributed significantly were whether birds were given food and/or water, admission weight, and time with finder. For each variable the table shows the odds ratio (OR) and statistical significance (P) as well as the test statistics.

Predictor	df	Wald $\chi 2$ (L-R $\chi 2$)	OR	P
Given food and/or water *(overall model test)*	**1**	**12.32**	**.**	**0.0004**
Food and/or water vs. nothing	1	(15.16)	5.13	<0.0001
Admission weight	**1**	**8.00**	**1.15**	**0.0047**
Time with finder *(overall model test)*	**2**	**6.68**	**.**	**0.0354**
≤1 h vs.1–5 h	1	(2.21)	0.60	0.14
≤5 h vs. 5–24 h	1	(4.54)	2.38	0.033

**As described in the methods, the reported ORs overestimate actual risk. Risk ratios are reported in the text.*

TABLE 6. OBSERVED PERCENTAGE OF BIRDS THAT DIED 3–7 DAYS AFTER ADMISSION, DIVIDED ACCORDING TO SIGNIFICANT PRE-ADMISSION FACTORS (N=314)

Factor	n	% died
Given food and/or water		
Yes	99	8.1
No	211	28.0
Admission weight		
< 28 g	60	28.3
≥ 28 g	250	20.0
Time with finder:		
Birds given food and/or water		
≤ 1 h	13	0.0
1–5 h	41	0.0
5–24 h	45	17.8
Time with finder:		
Birds not given food and/or water		
≤ 1 h	109	29.4
1–5 h	81	24.7
5–24 h	21	33.3

community. Road incidents are likely to be concentrated where roads divide nesting and pond sites. Birds may also be trapped repeatedly in specific areas such as public fountains. Having finders identify precise locations where birds are found on a detailed area map may locate such "hot spots" in the rehabilitator's area.

Landscape changes might be used in urban areas to discourage nesting in problem sites and/or to encourage nesting in more appropriate locations. Areas can be made less attractive to nesting mallards by reducing dense vegetation less than 1 m in height and removing overhanging, concealing cover (Drilling et. al 2002). The provision of artificial nest structures in areas with safe routes to water will encourage birds to choose these areas, as mallards readily use such structures when they are available (Drilling et. al 2002).

Artificial water bodies that consistently cause entrapment may be fitted with duckling ramps. Such ramps

have been used in Golden Gate Park, San Francisco, USA, and in Holland Point Park, Victoria, Canada. Ducklings seeking a way to mount roadside curbs will follow the road edge, which may be why they frequently fall through storm drain gratings. Reducing road crossings would, in turn, reduce this problem. Alternatively, drains fitted with finer gratings (even temporarily during the hatching season) would prevent ducklings from falling through, and modifications to small sections of curbs might allow ducklings to escape the roadbed.

Mortality Patterns and Correlates

Deaths were concentrated in the first few days after admission at both centers. This trend could indicate that: 1) many ducklings are in poor health at admission, 2) many ducklings are unable to adapt to the captive environment, or possibly 3) that DHV exists in the captive environment, as the virus causes early mortality but rarely affects ducklings after 4 weeks of age (Hess and Paré 2004). Post-mortem analysis is needed to determine whether DHV is a cause of early mortality.

The analysis of pre-admission factors identified several traits that were linked to survival at WRA. For birds brought to the center within the first 24 h of being found, rapid admission was associated with higher survival rates. In addition, large brood sizes improved the chances of survival when birds were brought into care rapidly. Large brood size also reduced the critical weight at which birds were considered at risk even though lighter birds fared worse than heavier ones overall. This beneficial effect of large brood size may be due to increased thermoregulation or decreased stress for larger groups. Small birds expend substantially more energy on thermoregulation than larger birds (Rhymer 1988) and, if birds are kept without heat by the finder, the body heat of brood mates may prevent an ultimately fatal loss of energy. Alternatively, larger groups are more likely to be housed as a single brood unit by the rehabilitator, which may limit social stress. Singletons and pairs are likely to be mixed with unrelated broods already in care and may experience aggressive interactions where lighter body sizes would place individuals at a disadvantage and result in increased deaths.

Overall, heavier birds were more likely to survive than lighter ones, probably because weight reflects both age and body condition. Birds that weighed less than 28 g likely had little in the way of energy reserves, given that the mean hatch-day weight of a mallard is 31.8 g (Nelson 1993). Mallards retain their yolk sac in their abdomen after hatching and this provides them with the energy needed to move overland from nest to water (Baldassarre and Bolen 2006). Ducklings rely on these energy reserves for the first 3 days after hatching (Sediger 1992) and, as a result, their weight may decline during this period. Two birds admitted to WRA weighed only 16 g at admission: a dramatic decline from expected hatch weight that suggests that some of the mallards admitted to WRA never fed in the wild.

Provision of food and water was confounded with time spent with the finder, in that birds kept 5–24 h were much more likely to have been fed and watered than birds kept for ≤ 5 h. This makes it difficult to separate any benefit of food and water from the disadvantage of being kept longer. By taking the effect of time with the finder into account, the multiple regression analyses showed that a) providing food and/or water had no effect on deaths within the first 2 days and b) for deaths on days 3–7, there was a significant benefit to having been fed and/or watered. However, given that inappropriate food is often provided and that birds may become wet and chilled when water is available, the safest policy would be to have birds brought in immediately. Where this is impossible, having the finder provide an appropriate foodstuff and water (in a container that will not tip and birds cannot climb into) seems beneficial even where birds are kept for short periods.

Implications for Wildlife Rehabilitation

Body weight and brood size are not within the rehabilitator's control, but special care can be given to birds that are considered "at risk" to reduce deaths. "At risk" birds include those that are of light admission weight, especially < 28 g. For birds admitted promptly (≤ 5 h), those admitted as singles or small broods of 2–4 are at risk, whereas normal sized birds in large broods have a high probability of survival. For birds kept > 5 h, risk is high regardless of brood size. Based on the above patterns, we assume that energy loss contributes to deaths in "at risk" birds. If this is the case, such birds should be housed at higher temperatures 32°C (90°F) being the maximum temperature suggested for domestic ducklings (Clauer and Skinner 1985) and provided with highly energetic and palatable food in order to encourage rapid feeding. Close attention should be paid to the practice of mixing small broods in case stress arising from aggression contributes to deaths. Finally, rapid admission of animals should continue to be encouraged as this is clearly beneficial.

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Malicious Carbofuran Poisoning of a Leopard (*Panthera pardus*) in Sandynallah Reserve Forest, India

by Ragothaman Venkataramanan, Chirukandoth Sreekumar and Nallusamy Kalaivanan

Introduction

Leopards (*Panthera pardus*) are the smallest of the big cats. Presently grouped under the "Least Concern" category of International Union for Conservation of Nature (IUCN), leopards are nonetheless threatened by loss of habitat, loss of prey and over hunting. Their ability to adapt to human presence has helped them survive the encroachment of settlements within their habitat. However, instances of human-wildlife conflict do occur, with loss of life to both. Leopards straying into human settlements also prey upon domestic animals (livestock as well as dogs), thus escalating the degree of conflict. In such instances, farmers are known to attempt to protect their animals by poisoning the leopards. A case of intentional poisoning of a leopard with carbofuran is reported here.

Carbofuran poisoning of wildlife

There are many published incidences of wildlife poisoning with carbofuran worldwide. Tataruch et al. (1998) described carbofuran poisoning in various wildlife species, including birds of prey, songbirds, and carnivores, in Austria. As in the present case, the incidents of poisoning occurred predominantly through baits consisting of parts of carcasses treated with granular carbofuran, thus proving intentional poisoning of predators. Kwyon et. al. (2004) identified carbofuran as one of the pesticides that caused poisoning in wild birds of Korea. Antonio et. al. (1996) detected poisoning of birds of prey and 11 foxes with carbofuran.

Toxicological analyses were carried out for wild and domestic animal poisoning over a period of 10 years in Spain by Guzman et al. (2003). They observed that 50% of the samples analysed showed evidence of intentional poisoning and carbofuran was one of the major causes identified.

Hernández and Margalida (2008) studied the incidence of pesticide poisoning of Cinereous vultures in Spain and found 98% of incidents to be intentional in nature. Carbofuran was one of the major pesticides used for poisoning and, as in the present case, most of the pesticide kills seemed to be related to illegal control of predators. Thin layer chromatography (TLC), the method used to detect carbofuran in this case, has been found to be a reliable one for semi- quantitative analysis by Moraes et al. (2003).

Case history and diagnosis

The carcasses of an adult male leopard and that of a half-eaten cow (hind quarters consumed) were found about 50 m apart in Sandynallah Reserve Forest, near Sholur village, Nilgiris district, Tamilnadu, India, which is a part of the Nilgiri Biosphere Reserve (Figure 1). A search of literature reveals that similar cases of deliberate poisoning had not been recorded nor reported in this region in recent years. Reddish brown granules were observed on the cow carcass and an empty "Furadan" container was recovered from a bush about 3 m from the cow carcass.

IN YOUR PRACTICE: Carbofuran is a pesticide that has been identified in both deliberate and secondary poisoning of a variety of wildlife species. It is marketed under several trade names, including Furadan and Curater. Although banned by the European Union, carbofuran is readily available elsewhere and is relatively inexpensive. This paper provides guidance on what to watch for during the necropsy of a suspected poisoning case.

ABSTRACT: The increase in human population and subsequent fragmentation of habitats has resulted in frequent human-wildlife conflicts. Here we report on the case of a leopard (*Panthera pardus*) found to have been intentionally poisoned with carbofuran, a carbamate and systemic insecticide used for agricultural purposes. The poisoning was diagnosed by detection of the chemical by thin layer chromatography (TLC) in samples of stomach contents, intestinal loop and liver from the leopard carcass, and muscle tissue sample from the cow carcass. The case history and lab analysis confirmed that mortality of the leopard was due to consumption of carbofuran. Instances of other poisonings of wild fauna with carbofuran in other parts of the world are also discussed.

KEY WORDS: human-wildlife conflict, leopard, Furadan, carbofuran, carbamate insecticide, malicious poisoning, Sandynallah Reserve Forest, pesticide abuse

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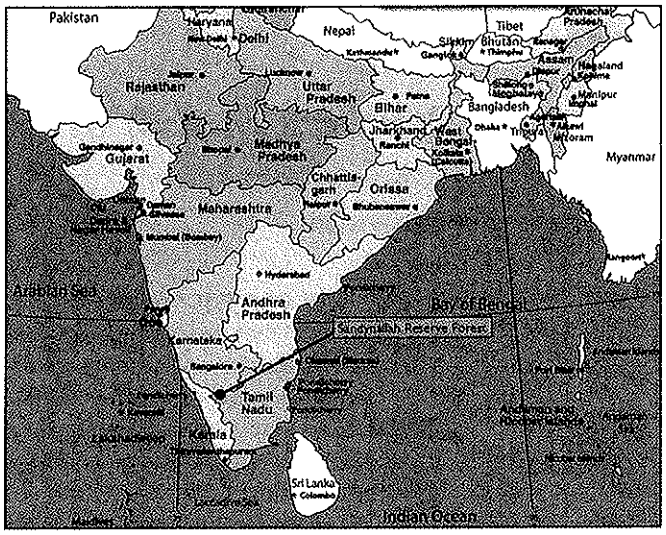


FIGURE 1. Location of Sandynallah Reserve Forest

The leopard was necropsied at the same place. Macroscopically, liver and kidney were congested and the stomach was filled with pieces of meat, skin, and hair of a reddish colour similar to that of the cow. Contents of stomach (about 100 g), intestinal loop, liver, kidney, and lungs from the leopard carcass and samples of muscle tissue from the cow carcass were placed in sealed plastic containers containing 200 ml saturated salt (NaCl) solution and sent to the Forensic Sciences Department, Regional Forensic Science Laboratory (RFSL), Government of Tamil Nadu, Coimbatore, India, for examination. The empty container cover recovered from the site was also sent along with the samples.

The samples were analysed for the presence of carbofuran using TLC. All the samples were extracted with chloroform and subjected to fractional distillation and evaporation in a water bath to obtain the sample concentrate. A benzene:chloroform:ethyl acetate (8:4:1) system was used for running the TLC and 2% Bentamine fast blue in 0.05N hydrochloric acid, followed by 10% alcoholic potassium hydroxide, were used as spray reagent The control solution was prepared using standard carbofuran, approved by Bureau of Indian Standard (BIS), and an orange-colored spot with RF value equal to that of control indicated presence of carbofuran.

Results and discussion

Carbofuran was detected in washings from the empty container cover retrieved by the cow carcass. Among with the samples sent for examination to RFSL, carbofuran was detected in the stomach contents, intestinal loop, and liver of the leopard, as well as in the muscle tissue of cow. However, the poison was not detected in the kidney or lung specimens.

The evidence recovered—presence of carbofuran in the leopard's stomach content, intestinal loop, and liver as well as in the muscle tissues of the cow carcass—suggests the leopard was poisoned by consuming the cow carcass. In this case, only congestion of the liver and kidney were observed. Pulmonary edema, cyanosis, agonal hemorrhages in the heart and other organs, lesions generally associated with carbofuran exposure, were absent. However, such lesions are not manifested in animals that die within a short period of time after exposure/consumption (Hatch 1982). The proximity of the leopard carcass to that of the cow also suggests that death may have been swift.

Carbofuran, a carbamate insecticide, is a powerful acetylcholinesterase inhibitor, which makes it highly toxic to mammals and birds. Among the carbamates, carbofuran is potentially more hazardous than most others, with an acute oral LD50 of 5–14mg/kg body weight (Hatch 1982; Srivastava and Dumka 2002). Carbofuran appears to be the agent of choice to target "nuisance" wildlife as it is readily available for agricultural use in the region (Gupta 1994).

Summary

Leopards are emerging as the dominant predators in many sanctuary areas in India, consequent to the decline in tiger populations. Human-leopard conflicts have risen with human encroachment into leopard habitat; in Pauri Gahrwal region, 140 humans have been killed by leopards since 1988 (Chauhan 2003). The burgeoning human population, especially in and around forest and sanctuary areas, and fragmentation of wildlife habitats will add to the number of conflicts between humans and leopards. Reports of intentional carbofuan poisoning in wildlife are not uncommon. As in the present case, the incidents of poisoning occurred predominantly through baits, consisting of parts of carcasses treated with granular carbofuran.

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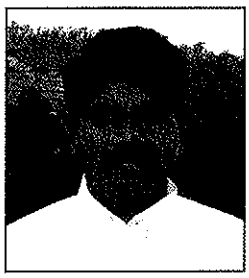
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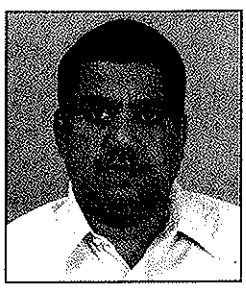
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Procuring Free State-of-the-Art Health Care Supplies for Wildlife Rehabilitation

by Ann Goody, Ana Apostol, Allison Marie Cleymaet, and Michelle Hagopian

Non-human animal wound care management can benefit immensely from state-of-the-art interactive dressings available on the human wound care market, yet the cost of these high-tech supplies is often prohibitive, especially when dealing with injured wildlife, unclaimed animals, and strays. Policies in human wound care management, however, are such that hundreds of thousands of dollars worth of unopened supplies are discarded yearly. The Three Ring Ranch Exotic Animal Sanctuary has found a simple and effective way to obtain cutting edge wound care technology at no cost. Wildlife rehabilitation, animal sanctuaries, and humane societies can easily replicate this method. The use of outdated materials on wild, feral, or stray animals would allow for the medical treatment of animals that otherwise would remain untreated.

A variety of published articles document the use of state-of-the-art human wound dressings in treating reptiles, mammals, and birds. In many cases, without these expensive dressings successful treatment of the presenting problems would not have been possible. In avian medicine, beak, head, and tail injuries have been effectively treated with hydrocolloid dressings such as DuoDERM® Extra Thin, hydrating gels such as Intrasite™ and Orabase®, and transparent semi-permeable films such as Opsite™ (Cousqueer 2007a). These interactive dressings decrease wound healing time, lessen the frequency of bandage changing, and conform well to a variety of avian morphologies, all important features of wound dressings when rapid rehabilitation and release is the primary objective.

There are many documented cases in which interactive dressings have been used to repair cracked shells in Chelonians. Older methods of shell repair include epoxy, fiberglass, and hoof or dental acrylic. While these techniques are still the best option in some cases, newer methods include artificial skin products such as Tegaderm™ or Opsite™ to promote and speed healing (Lewbart 2001). These transparent semi-permeable films have also been used extensively to facilitate non-surgical healing in a variety of other cases involving reptiles, including tumor excisions, bite wounds, and burn wounds (Cousquer 2007b, Fry 2007, LaBonde 2007).

Human wound dressings have broad use in mammalian applications. A study published in the *American Journal of Veterinary Research* found silicone dressings increase the rate and improve the quality of limb wound healing in horses as compared with more conventional dressings. The dressings inhibited the formation of exuberant granulation tissue while improving the quality of repairing tissue (Ducharme-Desjarlais et al. 2005). In a case involving severe fly strike on a giant lop rabbit, intensive lavage of the affected area was followed by the application of the hydrogel Intrasite™ to encourage debridement of necrotic tissue. The wound was then covered with Opsite™, a transparent semi-permeable dressing. This treatment protocol was repeated daily for the first few days, after which a more permanent dressing of Aquacel® and the

IN YOUR PRACTICE: Rehabilitators are generally aware of the potential for using medical supplies originally intended for use on humans in their own practice, but they may not know how to approach potential donors. The authors not only describe a number of "high-tech" wound dressings and their advantages for rehabilitation patients, they offer suggestions for building and maintaining donor relationships with hospitals and other medical supply sources.

ABSTRACT: Wildlife rehabilitation patients can benefit from the advances made in human health care, yet the technology can be cost prohibitive. This article discusses a sampling of high-tech wound dressings that can be used in various animal care applications. It also presents the simple and effective methodology for obtaining free medical supplies from acute care facilities.

KEY WORDS: wound care, dressings, medical supplies, free supplies, outdated supplies, expired supplies, animal sanctuary, humane society

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TABLE 1. EXAMPLES OF HUMAN DRESSING USE IN AVIAN, MAMMALIAN, AND REPTILIAN VETERINARY MEDICINE

Dressing Type	Uses[1]	Selected Brands	Retail Cost
Transparent semi-permeable films	Impermeable barrier, allows oxygenation, maintains moisture in wound bed. For use in non-infected, shallow wounds.	Opsite™ Flexigrid	Box of 100; 2-3/8″ x 2″ $59.43
		Tegaderm™	Box of 10; 8″ x 12″ $48.95
Hydrocolloids	For packing in deep wounds to encourage granulation. Keeps wound bed moist. Negates the need for frequent dressing changes.[2]	DuoDERM® Extra Thin	Box of 10; 4″ x 4″ $49.00
		Comfeel®	Comfeel® Plus Clear Dressing; 3.5″ x 5.5″ $68.70
		Tegasorb™	Box of 6; 6″ x 8″ $58.75
Hydrating dressing/gels	Encourages debridement of dry or necrotic tissue. Keeps wounds moist and absorbs mild exudates. Gels assist with application of topical antimicrobials.	Aquacel®	Box of 10; 4″ x 4″ $70.35
		Intrasite™	Box of 10; 8 gm per unit $88.95
Alginates	Fibrous dressings absorb moderate to heavy exudates. Not to be used on dry or necrotic tissue.	Kaltostat®	Box of 10; 4″ x 8″ $168.74
		Calcicare™	Box of 10; 4″ x 4″ $55.62
Wicking dressings	Some varieties are permeable to exudate. Serves as contact layer between absorbent dressing and skin. If kept moist, dressing will not adhere to deep wounds or burns. Other varieties absorb and retain exudate, encouraging granulation and auto-debridement of wound by maintaining a moist environment. May have potential for adherence.	Tegapore™	Box of 25; 3″ x 4″ $86.54
		Lyofoam®	Box of 30; 2″ x 2″ $142.90
		Mesorb®	Pack of 10; 20 x 25 cm $66.54
Non-wicking dressings	Aids drainage of exudate from cuts, post-operative wounds, and minor burns.	Melolite™	Box of 100; 5 x 7.5 cm $28.49
Permeable tape	Air permeable, prevents skin maceration, and moderately tolerant of exposure to water. For use on non-flexing areas.	Micropore™	3″ x 10 yards $2.95
Other	Helps drain moist or infected wounds. Not to be used in sinuses or deep wounds.	Debrisan Paste™	Box of 6; 10 g packets $8.45
	Topical antibacterial burn or abrasion ointment. Low risk of absorption into body.	Silvadene®	Silver sulfadiazine 1% 85 gm, $18.51 400 gm, $34.29

hydrocolloid DuoDERM® Extra Thin was applied and left in place for 8 days. These interactive dressings assisted in the formation of granulative tissue and allowed the bandages to be changed less frequently than would be possible with conventional dressings (Cousqueer 2007c).

At the Three Ring Ranch Exotic Animal Sanctuary, human wound dressings have been successfully used to treat a variety of animal wounds. Three case studies involving treatment of a reptile, avian, and mammal are discussed below.

Case Studies

Reptile

An adult box turtle (*Terrapene ornata)* presented with a large wound to the carapace due to a canine attack. The full thickness wound measured 6x4 cm and was accompanied by a number of bleeding chew marks around the edge of the shell. The puncture wound was irrigated with normal saline, cleaned with diluted Betadine®, and rinsed again. It was then packed with Intrasite™, covered with a calcium alginate dressing, and topped with Transpore™. Every 72 hours the wound was checked and the dressing was changed. After 2 weeks the dressing was switched to DuoDERM®. Subsequent dressing changes occurred at day 17, day 31 and day 61. Dressing changes with DuoDERM® were done every 30 days for 18 months, at which time the wound had granulated to form smooth tissue. The turtle was fitted with a fiberglass shell patch. The patch is checked regularly and no problems have arisen. The animal is now a resident at Three Ring Ranch.

Avian

An adult male racing pigeon (*Columba livia*) presented approximately an hour after experiencing an anatomic skinning injury affecting both dorsal and ventral sides from crop to vent after having flown into a power line. The wound ranged from surface injury to full thickness, with muscle and crop exposure. The bird also suffered bilateral tibia-fibula fractures. The wound was prepared by removing peripheral feathers and irrigating with normal saline. The surrounding skin was prepped with benzoin and the wound was covered with Silvadene® silver sulfadiazine ointment and Comfeel® hydrocolloid dressing. The dressing was changed once a week for approximately 3 months. During this time, the wound became progressively smaller as tissue granulation occurred. The bird experienced total recovery and was returned to his owner.

Mammal

An adult male sheep (*Ovis aries*) was presented 48 hours after a canine attack with multiple deep wounds to the ventral neck. Due to the delay in treatment, the wound was infected and the animal was suffering from myiasis. The area surrounding the wound was shaved and the wound was irrigated copiously with normal saline. It was then lavaged with a solution of diluted hydrogen peroxide and Betadine®, followed by a secondary rinsing with normal saline. The wound was filled with Intrasite™ gel, packed with calcium alginate gauze, and covered with Tegaderm™. Baza® ointment was applied as a moisture barrier to the surrounding skin and the entire dressing was held in place with Vetrap™ and changed daily. As the wound healed, treatment was switched to Silvadene® ointment and covered with Vetrap™. Approximately 1 month following injury, the sheep was completely recovered.

Supplies Procurement

The staff at Three Ring Ranch found expensive supplies are easily obtainable for free. Acquisition methods are simple, self-sustaining, and cost effective. In her 20 years as an emergency room registered nurse, the curator of Three Ring Ranch witnessed outdated yet viable medical materials being discarded. As curator, she needed a regular supply of medical products to care for injured wildlife at the Sanctuary so requests were made to nurses, physicians, and acute care facilities, resulting in generous donations of outdated materials.

Efficacy studies show outdated medical supplies often are still usable. Wound dressings remain effective long past their expiration dates, thus expired medical supplies obtained at no cost may be suitable in wildlife rehabilitation practice. Accrediting bodies in human medicine, such as the Joint Commission on Accreditation of Healthcare Organizations, require the removal of outdated materials from active stock, however expiration dates are in reality sell-by dates. One study showed that sterilized medical equipment is sterile, and thus usable, five to 10 years past the sterility expiration date (Rutala et al. 2006). For example, suture material was found to be sterile at 8 and 10 years as long as the package was intact. The Shelf Life Extension Program (SLEP), developed by the U.S. Department of Defense (USDOD) and the U. S. Food and Drug Administration (USFDA), investigated medication integrity and found that 88% of compounds retain potency for at least a year past expiration with the average extension time being 66 months. "The SLEP data supports the assertion that many drug products, if properly stored, can be extended past the expiration date" (Lyon et al. 2006). Human medical treatment policies require expiration dates but these do not speak to the efficacy of the materials. We have discussed the use of eye drops with several optometrists who said the majority of the products they use were safe and did not decline for

TABLE 2. SUPPLIES RECEIVED AS A RESULT OF COLD CALLING WITH ESTIMATED TOTAL MARKET VALUE

Source	Supplies Received	Estimated Total Market Value (USD)
Ophthalmologists	Ophthalmic Drops and Ointments	$452.39
Wound Care Nurse	Dressings, Gels, Ointments, Alginates, Etc.	901.87
Dentist and Hygienists	Scrapers, Probes, Forceps, Misc.	553.62
Hospitals	Sutures, Irrigation, Hydration, Ointments, Dressings, Electrodes	12,875.87
	Total	**$14,783.75**

TABLE 3. WEB RESOURCES FOR SUPPLIES

Supply Source	Website
Hospice	http://iweb.nhpco.org http://www.hospicenet.org/html/find.html
Home Health Care Agency	http://www.medicare.gov/HHCompare/Home.asp
Ostomy Nurses	http://www.wocn.org/secure/Source/cDirectory/NurseRefSearch.cfm

over one year post date. They did say this did not apply to some antibiotics, which were noted to begin to decline 90 days post expiration. Oral powdered antibiotics were found to have the same efficacy at 1-year post expiration. We could not find any testing for medications beyond five years out, nor could we find any information regarding a medication for which compounds became harmful. Of course, using outdated products should always take place under your treating veterinarian's supervision.

Animal care practitioners can easily establish and maintain relationships with materials donors. Initially, cold calling is a simple and effective method for obtaining supplies. Hospice, wound, and home healthcare nurses are excellent sources of dressing, irrigation, and hydration supplies. The nurses themselves can explain the indications and contra-indications of new products as well as suggest other sources to contact. Physicians often obtain samples from pharmaceutical and wound dressing representatives and may be willing to put together a box of materials. Pediatricians and family practitioners are an excellent source of pediatric dosed drugs, such as Zithromax® and Augmentin™, that are easily transferable to animal use; orthopedists can provide dressings and irrigation supplies; optometrists may give out ophthalmic supplies; dermatologists may give out anti-fungals, germicidals, and anti-pyretics; dentists are a good source for oral washes and worn dental tools. Acute care hospitals can be one of your best sources for a wide variety of outdated medical supplies.

Pharmaceutical and wound care companies can be contacted directly for samples. Product information resources, such as *WoundSource,* the Kestrel Health Information Inc. wound product sourcebook, list contact numbers and websites for companies by region. Conditions and indications are matched to recommended dressings.

While preparing this article, calls were placed to two

home health agencies, two pharmacies, four private practice physicians, and two hospital purchasing departments. Most were able to give immediate answers as to whether they could or could not provide outdated supplies to an animal care agency; a few had to check with administration for authorization. Of the 10 facilities contacted, eight were willing to scan stock for outdates and bag them for pick up. The larger hospitals agreed to begin a regular transfer of all outdated supply materials, including but not limited to: infusion, irrigation, operating room materials (sutures and trays), and dressings. Each source committed to bagging and saving outdates.

Although cold calling is simple and straightforward, it is important to be prepared—know what to ask for and be able to provide possible uses for the supplies requested. We found it helpful to build a rapport with the nurses by mentioning some of the animals that would be treated with the donated supplies. When calling, request outdates and partially used boxes of products, explaining that outdated human supplies can be used to help save wildlife rehabilitation, humane shelter, or animal sanctuary patients. It is ideal to pursue a long-term relationship with physicians and head nurses by asking that a box be designated for outdated supplies. Be prepared to sort through collected supplies to recover those useful to your practice.

Two weeks after calls were made we had received approximately US$15,000 worth of medical supplies. Clearly this volume far exceeds what a small sanctuary or single facility would use. Thus, sharing between multiple organizations in a region makes the most sense. The Three Ring Ranch sorts materials as they are gathered and creates "goody bags" for private practice veterinary physicians and humane societies. By sharing, animal caregivers create and cement a support network in their community.

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Michelle Hagopian, BSc, plans to attend veterinary school.



APPENDIX. PRODUCT LIST

Product	Manufacturer	Generic Name/Category
Augmentin™	Global Community Partnerships GlaxoSmithKline One Franklin Plaza P. O. Box 7929 Philadelphia, PA 19101 USA	Penicillin
Aquacel®	ConvaTec, a Britsol-Myers Squibb Co. ConvaTec Professional Services P.O. Box 5254 Princeton, NJ 08543-5254 USA	Hydrating gel
Baza®	Coloplast A/S Holtedam 1 DK - 3050 Humlebaek Denmark	Moisture barrier
Betadine®	Purdue Pharma 575 Granite Court Pickering, ON L1W 3W8 Canada	Microbicide
Calcicare™	Hollister Limited Rectory Court 42 Broad Street Wokingham, Berkshire RG40 1AB UK	Alginate

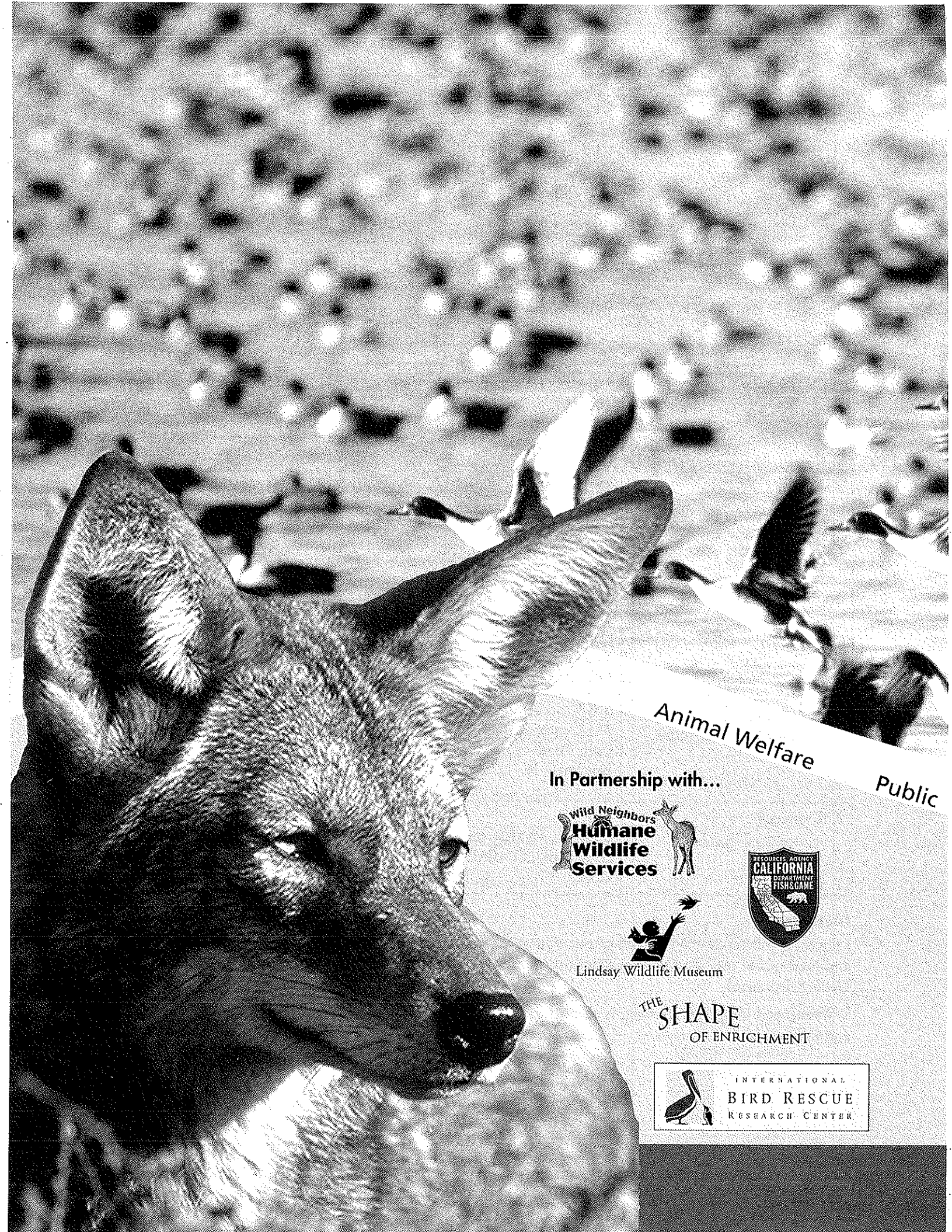
Comfeel®	Coloplast A/S Holtedam 1 DK - 3050 Humlebaek Denmark	Hydrocolloids
Debrisan Paste™	Pharmacia & Upjohn Limited Hatton House Hunters Road Weldon North Estate Northants NN17 5JE UK	Necrotic wound draining
DuoDERM® Extra Thin	ConvaTec, a Britsol-Myers Squibb Co. ConvaTec Professional Services P. O. Box 5254 Princeton, NJ 08543-5254 USA	Hydrocolloids
Intrasite™	Smith & Nephew Pty Limited 315 Ferntree Gully Road P. O. Box 242 Mount Waverley, Victoria 3149 Australia	Hydrating Gel
Kaltostat®	ConvaTec, a Britsol-Myers Squibb Co. ConvaTec Professional Services P. O. Box 5254 Princeton, NJ 08543-5254 USA	Alginate
Lyofoam®	ConvaTec, a Britsol-Myers Squibb Co. ConvaTec Professional Services P. O. Box 5254 Princeton, NJ 08543-5254 USA	Wicking dressing
Melolite™	Smith & Nephew Pty Limited 315 Ferntree Gully Road P. O. Box 242 Mount Waverley, Victoria 3149 Australia	Non-wicking dressing
Mesorb®	Mölnlycke Health Care AB Box 130 80 GÖTEBORG SE-402 52 Sweden	Wicking dressing
Micropore™	3M United Kingdom PLC 3M Centre Cain Road Bracknell, RG12 8HT UK	Permeable tape
Opsite™ Flexigrid	Smith & Nephew Pty Limited 315 Ferntree Gully Road P. O. Box 242 Mount Waverley, Victoria 3149 Australia	Transparent semi-permeable films

Orabase®	Colgate-Palmolive Company 300 Park Avenue New York, NY 10022 USA	Soothing and protecting paste
Silvadene®	King Pharmaceuticals,® Inc. 501 Fifth Street Bristol, TN 37620 USA	Silver sulfadiazine
Tegaderm™	3M United Kingdom PLC 3M Centre Cain Road Bracknell, RG12 8HT UK	Transparent semipermeable films
Tegapore™	3M United Kingdom PLC 3M Centre Cain Road Bracknell, RG12 8HT UK	Wicking dressing
Tegasorb™	3M United Kingdom PLC 3M Centre Cain Road Bracknell, RG12 8HT UK	Hydrocolloids
Transpore™	3M United Kingdom PLC 3M Centre Cain Road Bracknell, RG12 8HT UK	Surgical tape
Vetrap™	3M United Kingdom PLC 3M Centre Cain Road Bracknell, RG12 8HT UK	Adhesive tape
Zithromax®	Pfizer 235 East 42nd Street New York, NY 10017 USA	Macrolide antibiotic

Footnotes

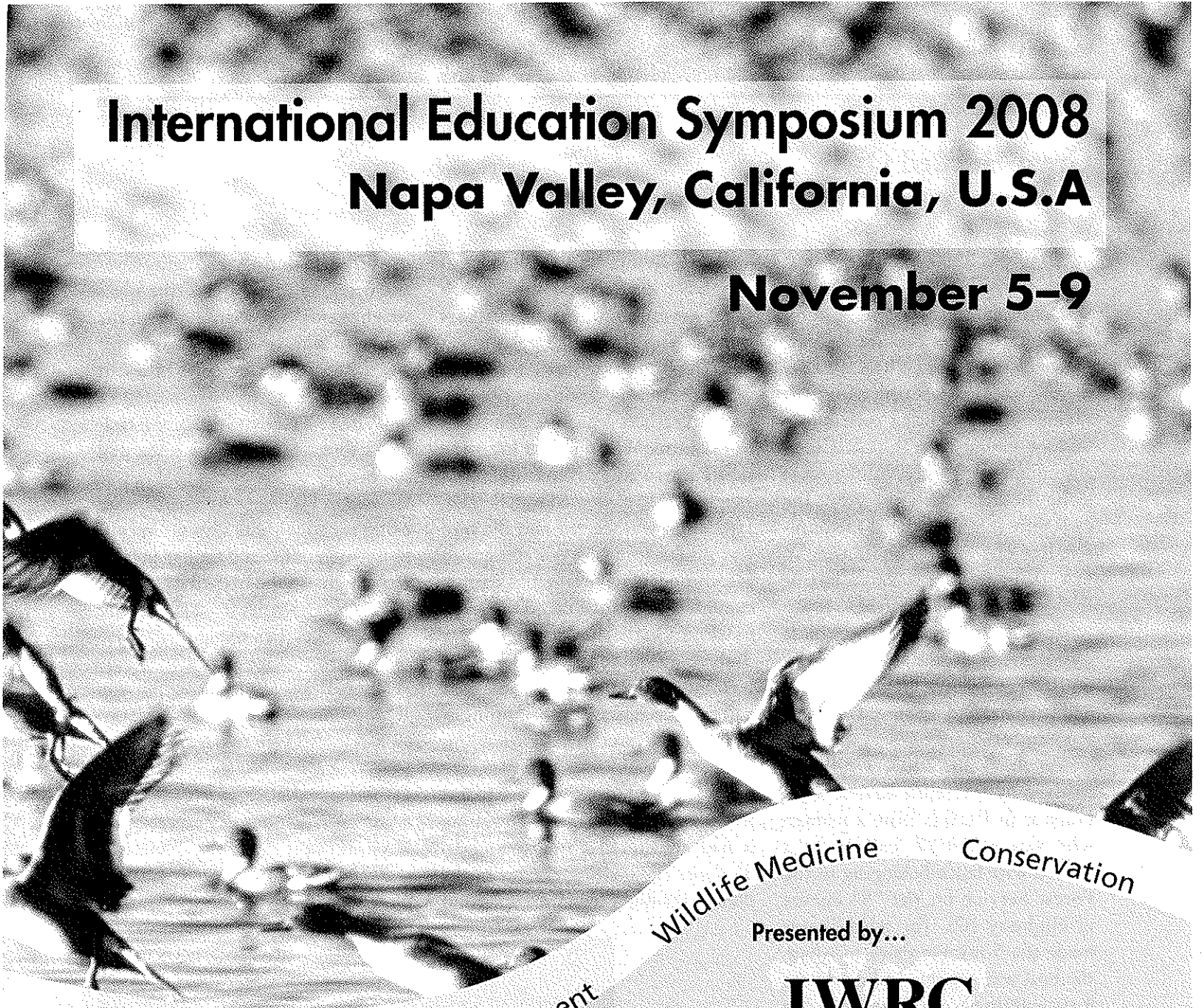
[1] For more information on the full gamut of human wound care, including indications, contra-indications, and methods of use, see www.dressings.org and www.worldwidewounds.com/1997/july/Thomas=Guide/Dress-Select.html.

[2] Whenever a long-term dressing is applied, it is suggested to shave or pluck surrounding tissue to prep and follow with benzoin.


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SUCCESS STORY

Great Horned Owl

by E. P. Elliston and Peggy McCormick, Wildlife Rescue, Inc. of New Mexico

Early in 2006, four young great horned owls (GHOW) were displaced and brought in for rehabilitation to Wildlife Rescue, Inc. of New Mexico (WRINM). They spent 7 weeks competing with their siblings plus two other owlets in a 40-foot flight. There was considerable competition and encouragement to be the first to get the prey. The owls were initially offered medium-size live rats (approximate weight: 125 g), increasing to large rats as their size and skill required.

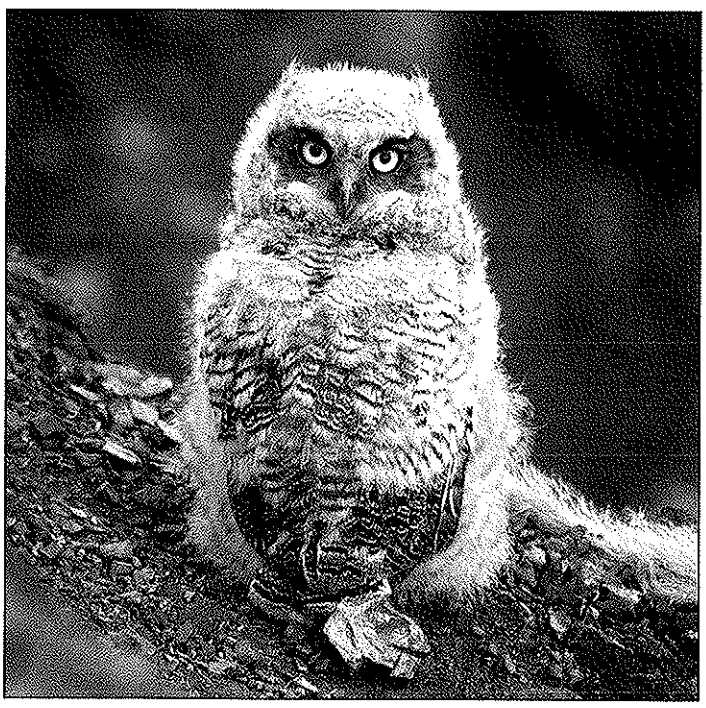
In June 2006, one of these birds was released on Camino de las Huertas Road in Placitas, New Mexico. It had been banded by Steve Cox with the number 788-39077.

On April 30, 2008, a call was received by a Wildlife Rescue rehabilitator in Placitas from a woman who saw a GHOW caught in a barbed-wire fence belonging to the Forest Service on the "S" curves of Highway 165. The rehabilitator made the 5-minute drive to where the bird was caught, and could see it struggling on the top wire. After covering the bird's body from front to back with a folded towel, she cut the barbed wire, placed the bird in a box and took it home. The bird had a USFWS band on it which was reported it to USFWS. Fortunately only the base of the shafts of two or three feathers had caught in the barb on each wing that held this bird captive. It is believed that the reason the bird was not seriously injured was because it was caught in the top wire of a three-wire fence, the second wire being at a height on which the bird could place its feet and support its weight.

The only injuries found—several tiny holes in the patagium of each wing—were assumed to be tears caused by the bird's struggles to get free. The wire was removed from each wing, the injured soft tissue cleaned, broken feathers removed, and Silvadine ointment applied to keep the injured area moist. The bird, at a weight of 920 g, seemed well fleshed. Hydration was started and the bird was placed in a box tall enough to accommodate its height and narrow enough that the owl could not open its wings. On the third morning (May 3) there was mute and a pellet in the box, indicating this was a male who had eaten recently. By the morning of May 5 the wounds in the patagium were no longer visible. That night the owl was placed in a flight cage to test its ability to fly. By the next morning it had consumed a mouse and an 85 g rat. The evening of May 6, the door to the flight remained open and the bird left during the night. Over the 6 nights in captivity, the owl's weight varied less than 8 g from the intake weight, which confirmed this was a healthy young male of about 920 g size.

When we received the Bird Banding Laboratory report we learned the history of the bird—that it was released in Placitas in June 2006 after being raised with its siblings in captivity and competing for live prey. It was caught on the barbed wire fence about 6 flight-miles from the release site 2 years earlier. JWR

Penny Elliston, one of the founders of Wildlife Rescue, Inc. of New Mexico (WRINM) has been rehabilitating and educating the public with birds since 1980. Peggy McCormick is a WRINM volunteer rehabilitator and educator. WRINM works closely with Steve Cox of Rio Grande Bird Research, banding birds since 1979.



GREAT HORNED OWL (*BUBO VIRGINIANUS*) PHOTO: WALTER KITUNDU, USED WITH PERMISSION

As with many species, little data is available on the post-release success or rehabilitated great horned owls.

One Day at Teton Marsh

by Sally Carrighar

New York: Ballantine Books, 1976; 214 pages; SBN 345-24821-X-175

Reviewed by Elsa Bumstead

"The universe breathed, and the world inside it breathed the same breath. This was the cosmic life, with suns and moons to make it lovely. It was important only to keep close enough to the pulse to feel its rhythm, to be comforted by its steadiness, to know that Life is vital, and one's own minute living a torn fragment of the larger cloth."

—Marjorie Rawlins

Sally Carrighar (1898–1985) is known for her series of books that chronicle the lives of wild animals. She grew up on the outskirts of Cleveland, Ohio, daughter of a railroad worker, and granddaughter of a Great Lakes skipper. In her autobiography, *Home to the Wilderness,* Carrighar told of walks she and her father took along the Cuyahoga River to watch the iron ore boats come and go, to the freight yards where boxcars were coupled and uncoupled, and to blast furnaces where iron ore from the boats was processed. Was her father trying to turn her into a boy? Not at all. She came from a family of remarkably adventurous women who showed her that "girls and women reached out for life eagerly and that it was natural for them to be interested in absolutely everything."

Carrighar attended Wellesley College, ambitious to be a concert pianist. At some point that ambition dissipated and she became a scriptwriter in Hollywood. At the age of 35 an epiphany led her to the realization that the "natural world should be the source for her then unsuccessful writing career." What followed were travels that took her far and wide to unique places, and adventures that led to the emergence of another feminine voice in nature writing.

More than one of Carrighar's books have been labeled a nature "classic" and placed on many a "must read" list. During the 1930s Carrighar spent time in California at Beetle Rock. Out of this period came her first book, *One Day at Beetle Rock* (1945). Her autobiography, *Home to the Wilderness,* provided insights into the sources of her passion for detail and accuracy. Ten years were spent in the Arctic. A novel, *Icebound Summer* (1953), was the result of her studies of wildlife and Eskimos.

Time spent in Wyoming in the mid-1940s brought forth *One Day at Teton Marsh* (1947). The setting is the fall equinox. The marsh residents are restless as they sense the changing season. The lives of Otter, Mink, Muskrat, Osprey, Marsh Hawk, Hare, Scud, Merganser, Leech, Snail, Trumpeter Swan, Beaver, and Moose intertwine eventfully with the fall of a tree.

The tree is key. It anchors a beaver dam. When the tree falls, the dam is broken open and disaster strikes. The marsh community goes into shock. As the water level lowers, animals are left stranded and exposed. Everyone knows everyone is someone's dinner. Life and death dramas unfold as Beaver battles Moose. Beaver wants to move an aspen to rebuild the dam; Moose wants the aspen left alone so he can eat the leaves in peace. Panic, fear, terror, and suffocation are juxtaposed with the stillness against the background of a sky turning dark and the blessing of a snowfall. Will the dam be restored? Who will survive? Who will not?

Time and time again Carrighar paints the canvas of the tree falling, each time from the perspective of a different animal. She brushes the pages with details, much like a painter covers a canvas with color, light, shadow, and texture, hooking and reeling the reader into each drama. It's all in the details: a whodunit...the wind...the onset of winter...the fall of the tree...the dam breaking...the tug of war... struggles for survival...lives of plants and animals hanging in the balance. The stuff of a classic indeed. JWR

Elsa Bumstead is a field biologist, environmental scientist, interpretive naturalist, writer, and sometime wildlife rehabilitator based in Albuquerque, New Mexico.

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

Up for Discussion

RELEASE OF VISUALLY IMPAIRED PATIENTS

Our recent Membership Survey made it clear just how much rehabilitators value the chance to network with their peers. This information caused us to look for ways to provide even more ways to provide you with opportunities to learn from and add to the expertise of the rehabilitation community. As a result, "Up For Discussion," a column that once ran in the *JWR*, has returned after undergoing a bit of editorial rehabilitation.

Here's how it works: periodically, the *IWRC Newsletter* will feature what we hope is a thought-provoking situation related to rehabilitation and ask our readers to share their opinions and experiences. Responses will be compiled and published in the "Up For Discussion" column. Keep in mind that, due to space limitations, not every submission can be included and some may have to undergo editing to allow as many as possible to be published.

This Issue's Question:

A variety of birds, mammals, and herps with limited or complete loss of sight in one eye—due to a birth defect, injury, or illness—are occasionally observed living in the wild. These individuals would appear to be at a significant survival disadvantage, yet they have apparently learned to cope with their disability. Even so, rehabilitators often are uncertain whether to release a partially-sighted patient and concerned about the ethics of doing so. In your opinion, is the release of a partially-sighted animal unethical? Have you ever faced this kind of situation and, if so, what considerations played a role in your decision-making process? Do you or your organization have a standard policy or protocol regarding the release of partially sighted animals?

Responses:

IF WE RECEIVE a bird of prey with only one functional eye, when other treatment(s) are completed and it can prove to us that it can hunt it is returned to its territory if it is not otherwise handicapped. Songbirds are evaluated in a similar way, taking into account their response to predators.

—Ann C. Lynch,
Director
South Bay Wildlife Rehab
Rancho Palos Verdes

WE DO RELEASE some animals with partial vision. We put the animal through all the release training it needs to have (catch live prey, keep away from predators, maneuver through branches, etc.) and if it is successful, we release. There are a few species that we will not release with partial vision, one of them being a Cooper's hawk. Being the type of predator that chases birds in flight for food, most likely they would not fare well in the wild with limited vision. I think it's important to give all animals a chance and see what they can adapt to. Some of them do, and some of them don't, but it is only fair to give them a chance.

—Megan Tadiello
Wildlife Rehabilitation Coordinator
Lake Erie Nature & Science Center
Bay Village, Ohio, U.S.A.

I HAD THE GREAT privilege of releasing a one-eyed long-eared owl into the wild after a period of intense rehabilitation. There was great discussion within our organization about whether to release this young fellow or not. The general consensus was that our work was and is all about quality of life for our wildlife. In this case, we had an owl who after treatment for his severe eye injury, including removal of the eye, was a very healthy bird. We live prey tested this fellow and he passed with flying colors. We had the choice of releasing him, transferring him to a facility where he would remain caged for the rest of his life, or euthanasia. To send him to a facility where he would remain caged seemed to be less than a good quality of life. To euthanize a creature who had fought so hard to become healthy seemed wrong. To give him a chance at a life in the wild to which he had been born was really, in all our minds, the best way to reward him for all his hard work during rehab. It is all about quality of life; releasing him was our way of ensuring that he has that.

—Anni Nicoll
Volunteer
Wildlife Rehabilitation Society of Edmonton
Edmonton, Alberta, Canada

I'VE HAD SEVERAL partially sighted animals this year—they seem to come in waves—and the causes ranged from malnutrition to infections to injuries. Whether the animal is normally binocular or monocular is an important consideration; an animal that is naturally monocular (eyes on the side of the head) but has lost sight in one eye will probably be less successful than a one-eyed animal with binocular (eyes looking forward) sight.

I've found several things that helped to reverse the damage in younger animals. First, of course, is to correct dietary deficiencies and treat infections ASAP. Second, for infections or clouded corneas, using neo-poly-dex eye drops one to two times per day for as long as the animal will tolerate them, up to two months, in conjunction with atropine drops once a week at night can give some pretty spectacular results—of course, consult with your veterinarian before administering any medications. Third, visual stimulation is critical. You can achieve pretty good visual stimulus by turning on a television program or video in your rehab area for about 30 minutes 1–2 times a day. Anything with bright colors, strong shapes, and lots of motion will work—cartoons are a good choice. The sound isn't as important although initially it will attract their attention. As they improve, you can reduce the amount of TV time. Adding brightly colored toys to the environment helps, too.

Once the critical paths to the retina are reestablished, you can move to more natural toys like pinecones, but these appear to be harder to see when the animals don't have full sight. Using a full-spectrum light in your rehab area, and making sure that there is a sufficient amount of daylight is important even in nocturnal animals. Initially, nocturnal babies develop the critical paths in their eyes in brighter light and if they don't have full sight, they need more light for a longer period of time. You can use a laser pointer to test how well they follow an object by sight.

Soft release may be a good option for some of these animals. Giving them a bit more time to adjust to their new surroundings, with backup feeding for a period of time while they sort themselves out, can increase the probability of success. Unfortunately, animals that are completely blind rarely do well in protective sanctuary placements. As long as they are inside they seem to do all right, but once they move to outside accommodations they become fearful and develop neurotic behaviors. They seldom do well as education animals. In those cases, humane euthanasia may be the kindest solution.

—Kate Rugroden
Volunteer
Wildcare, Inc.
Fort Worth, Texas, U.S.A.



LONG-EARED OWL (*ASIO OTUS*) PHOTO: ANNI NICOLL, USED WITH PERMISSION

INSIGHT

Voice from Abroad

BIRDING IN SOUTHERN TEXAS

by guest columnist Nathan Terzaghi, age 15

On vacation from our home in Europe, Dad and I spent a day in and around Brownsville, Texas, the state's southernmost town. Adjacent to Matamoros, Mexico, all the signs in this American town are written in Spanish and few inhabitants speak English. We had traveled southeast from Padre Island and the contrast between that rapidly developing tourist destination, complete with a multitude of glitzy Miami Beach-style hotels, and this shabby border town could not have been more stark. Searching for a motel, we cruised along in heavy traffic but accommodations were scarce. Half an hour later we were feeling rather desperate when we stumbled upon a Best Western® motel.

The next morning we rose at dawn and following a quick breakfast managed to find our way out of Brownsville. We drove south and after several wrong turns entered the Sabal Palm Bird Sanctuary, the southernmost point in Texas. It was full of trees, with an undergrowth of long grass and a thin mist that would disappear with the rising sun. We had the place to ourselves if you don't count the birds—they were everywhere, singing loudly. Olive sparrows were numerous but rather hard to see; a few Lincoln's sparrows were hopping around discreetly, while Couch's kingbirds sat prominently on the tops of trees. Golden-fronted woodpeckers chased one another noisily, adding their voices to those of several long-billed thrashers. Next to the visitor's center was a feeder where gaudy green jays shared a meal with red-winged blackbirds and prim white-tipped doves.

As we walked along the trails though subtropical scrub, we saw and heard many other species, including melodious Carolina wrens, common yellowthroats, scarlet and summer tanagers, red-eyed and blue-headed vireos and the local specialty, the buff-bellied hummingbird, which flew around drinking nectar from flowers. Suddenly, we were jolted by an incredibly loud noise, rapidly repeated three times. Then, as soon as it ended, another noise started up, higher in pitch and also repeated three times. We realized these were plain chachalacas, large brown pheasant-like birds that belong to the tropical family *Cracidae*. More joined in, drowning out all the other bird songs.

We walked to the edge of a pond surrounded by tall trees, accidentally flushing a broad-tailed hawk. Many turtles, draped in aquatic vegetation, were sun-bathing on logs as little grey feather balls swam nearby—least grebes. In the trees, great kiskadees were singing out their names and great-tailed grackles made a racket speaking in tongues. Then we spotted a huge ringed kingfisher. By then quite a few people had arrived and the bird activity ebbed, so we drove back to the motel, packed up and drove west to Bentsen State Park.

We drove past large open fields of irrigated crops and strange suburban sprawls, military in their conformity. South Texas was once covered in the subtropical vegetation that is now scarce beyond the protected lands in Sabal Palms and Bentsen. By late afternoon we had pitched our tent next to the park and walked in. Bentsen State Park was once an RV park so the roads are paved. The park is near the Chihuahuan desert and its vegetation is somewhat drier than at Sabal Palm. But there were plenty of birds, including two stunning Altamira orioles building a nest on a wire, plus green jays, Bewick's wrens, and pyrrhuloxias—the cardinal's long-crested desert cousin—an as the sun set lesser nighthawks began chasing insects through the air. A rumor spread among the human visitors that a ferruginous pygmy-owl, the most widespread owl of the American tropics (but scarce in the U.S.), lived here. It wasn't too long after that we heard that rumor confirmed—"poot-poot-poot-poot-poot-poot"! By now there was quite a large crowd waiting to see the owl so we all walked quickly and excitedly towards the source of that call, speaking with hushed voices but still making rather a lot of noise. Surprisingly, everyone got great looks at this little owl. Once the ferruginous pygmy-owl stopped calling, the crowd dispersed, but the quivering hoot of Eastern screech-owls floated through the night as pauraques shouted "pou-WEEil!" from the depths of bushes. We looked for both, and managed to see the shadow of a screech-owl speeding through the dark.

We walked back to our campsite and entered our tent. We were nodding off when a loud "pouWEEil!" just outside jolted us awake. We got out of the tent and managed to see the nightjar as it winged away. We crawled back into our sleeping bags but the pauraque returned over and over again to a spot just outside our tent and treated us to a rather fitful night's sleep. JWR

Certification: A Continuing Dialogue

by Nancy Hawekotte

Introduction

In 2007, several years of intense planning finally paid off for IWRC with the launch of the Certified Wildlife Rehabilitator™ (CWR) program. This column is the first installment of an ongoing dialogue intended to address questions many have voiced regarding the CWR program and what it means to the wildlife rehabilitation community. It's a multi-part interview between the author, a long-time mammal rehabilitator, and Kieran Lindsey, Certification Review Board (CRB) Chair and former Chair of the Certification Recommendations Committee. The interview grew out of their continuing discussion on the meaning of the CWR designation and its potential long-term effects upon a vocation that is growing rapidly in numbers, visibility, expertise, and challenges faced.

The purpose of the CWR designation is the same as most other professional certifications—to indicate a level of knowledge achieved by the designation holder, as authenticated by a professional and independent source. The CWR designation is obtained by passing an exam to demonstrate a wide range of knowledge related to the practice of wildlife rehabilitation. Anyone may take the test—no organization memberships or affiliations are necessary, no classes or texts are required. The exam is graded on a pass/fail basis and retesting is an option for those who do not pass. To be maintained, certification must be renewed every two years, based on accumulation of continuing education units.

The first set of brave souls took the exam in January 2007. At the date of this publication, 50 people have passed the exam and may include the CWR designation after their name.

Information about CWR program policies and procedures can be found online at http://iwrc-online.org/certification/index/html, along with an application. At the bottom of the page is a link to the *CWR Applicant's Handbook*, a printable PDF file with more details for those wishing to pursue certification.

The Interview

Nancy Hawekotte (NH): Why does the wildlife rehabilitation community need a professional certification?

Kieran Lindsey (KL): In most other skilled fields, the knowledge base is tied to education—a bachelor's, professional or graduate degree—that guarantees a level of knowledge based on outside assessment. Until now, wildlife rehabilitator qualifications have been based largely on self-assessment. But is anyone in any discipline really qualified to decide if they themselves are an expert? Consider medical care: would you go to a dentist who isn't a DDS? Or a self-appointed, self-taught vet? Likely not.

> Certification may be what brings the game officer TO YOUR DOOR with that injured animal.

The field of wildlife rehabilitation has no degree...yet. Certification offers a guarantee that one has met a standardized baseline of knowledge others can trust. It provides a level of credibility and promotes professionalism. It may be what brings the game officer to your door with that injured animal instead of someone s/he is less confident about. Plus, it's a source of reassurance during moments of self-doubt, when working with a difficult case, for example, to have the affirmation certification provides: "Yes, I do know this."

NH: You mention professionalism. How will it help to professionalize the field?

KL: There are many benefits to rehabilitators, and the wildlife who depend on them, in being recognized as part of a professional and legitimate field. And let's keep in mind that one doesn't need to be paid to be professional! On a broad scale, the lack of professional standards has largely blocked wildlife rehabilitation from acceptance by our colleagues in the biological sciences, often impeding our work as well as our utilization of these important human resources. Individually, it establishes one's credibility to others outside the field, as well as to fellow rehabbers, potentially opening doors to knowledge and assistance previously unavailable.

NH: What is the difference between CWR/professional certification and a permit? Is a permit automatic once I am certified?

KL: No. A permit is a legal mechanism used by government agencies to allow rehab activity to occur. Certification is not intended to replace the permitting process...and

legally it can't. In the U.S., each state has a legislative mandate to manage the wildlife within its borders, and permits to rehabilitate mammals, reptiles, and amphibians are issued by each state's department of natural resources or DNR (although they go by many different names). The federal government (U.S. Fish & Wildlife Service) is responsible for permits to rehabilitate migratory birds, endangered species, and some other special cases.

Of course, laws vary in other parts of the world but in many countries permits are required to rehabilitate or "hold" wildlife. Certification, on the other hand, is voluntary, though some DNRs, at their own discretion, may look to independent certification programs to help inform their permitting decisions.

Becoming a CWR does not give you the legal right to practice rehabilitation. It's a method for the rehabilitation community to encourage professionalism among members and legitimacy in the wider world, to develop a level playing field, and to enhance our capabilities.

To be continued...

Nancy Hawekotte is a communications professional who has worked in the field of wildlife rehabilitation for the past 20 years in the roles of development, public relations, board of directors and team leader for several species. She resides in Omaha, Nebraska.

CONGRATULATIONS!

IWRC is proud to announce that Brooke Stutz recently became our 50th Certified Wildlife Rehabilitator!

Congratulations to Brooke, and to her fellow CWRs.

Noelle Adams, *Texas, U.S.A.*
Diana Alleman, *California, U.S.A.*
Sherry Ard, *South Carolina, U.S.A.*
Karen Bailey, *Kentucky, U.S.A.*
Satya Priya Gautam Bhalla, *Uttaranchal, India*
Susan Birch, *Pennsylvania, U.S.A.*
Lisa Birkle, *California, U.S.A.*
Bonnie Bradshaw, *Texas, U.S.A.*
Angela Burch, *Texas, U.S.A.*
G. Suzanne Chacon, *Washington, U.S.A.*
Rebecca Dmytryk, *California, U.S.A.*
Michelle Downs, *Alberta, Canada*
Alexander Dutkewych, *New York, U.S.A.*
Elizabeth Penn Elliston, *New Mexico, U.S.A.*
Adam B. Fahnestock, *Washington, U.S.A.*
Petra Franzen, *Texas, U.S.A.*
Aimee Fritch, *California, U.S.A.*
Lisa Fritch, *California, U.S.A.*
Susan Good, *Michigan, U.S.A.*
Michele Goodman, *Pennsylvania, U.S.A.*
Jennifer Hamada, *Texas, U.S.A.*
Kristen Heitman, *Indiana, U.S.A.*
Yvette Hodges, *California, U.S.A.*
Grace Holden, *Virginia, U.S.A.*
Anais Horden, *Veracruz, Mexico*
Francine Jones, *Michigan, U.S.A.*
Abe Karajerjian, *California, U.S.A.*
Jennifer Keller, *New Mexico, U.S.A.*
Tammie Lowry, *Virginia, U.S.A.*
Kristin Madden, *New Mexico, U.S.A.*
Rebecca McKeever, *Texas, U.S.A.*
Karen McKenzie, *Wisconsin, U.S.A.*
Kimberly McMunn, *Indiana, U.S.A.*
Livia McRee, *California, U.S.A.*
Emily Meredtih, *Ontario, Canada*
Early Mitchum, *South Carolina, U.S.A.*
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Tara Tamasi, *Alberta, Canda*
Mary Todd, *California, U.S.A.*
Lisa Tretiak, *Manitoba, Canada*
Jacquelyn Walton, *California, U.S.A.*
Emily Winners, *Louisiana, U.S.A.*
Dody Wyman, *Michigan, U.S.A.*

Forester's Log

STREAM SENSE

by Mary Stuever

I am standing in a gaping landscape wound. The trickle of greenish orange liquid gathered around my mud-caked boots seems insignificant. It is hard to believe this same stream has cut a gully that is, at places, 30 feet wide and 7 feet deep. Standing upright near the head of the cut, I am eye-level with what was, only months earlier, ground level. It is this rapidly degrading watercourse that has focused our attention today. We are working on the Rodeo-Chediski Burn (2002) on the lands of the White Mountain Apache Tribe in central Arizona.

I gaze up at my colleague standing in the streambed where this drastic cut begins. Our mentor, Alvin Medina, a research ecologist with the U.S. Forest Service's Rocky Mountain Research Station in Flagstaff, stands off to edge. "Larry is standing on the answer," he instructs us. A tribal member and contractor with the tribe's watershed department, I have sometimes thought that Larry Ethelbah *is* the answer—at least to questions on how to move rocks around stream beds to protect roads, cultural sites, and other sensitive landscape features.

Our patient teacher wants us to understand the natural processes that held this stream together before the fire occurred. When asked what I see, I state the obvious. "Larry is standing on a lens of coarse gravel," I reply, hoping I am demonstrating how quickly tree-focused foresters can grasp new fields of study.

Bingo. For the moment, this rock lens is keeping the soil from unraveling below. It is a hardened spot in a streambed affectionately termed a "nick point." Nick points can be rock, root, or buried wood. Nick points affect everything above and below them. When you lose a nick point, you lose the integrity of the stream system.

Medina is a master reader of streambeds. He escorts us further up the drainage encouraging us to see through his eyes. The goal is to understand the natural rhythm of the stream course. There are patterns of pools and riffles that have developed over the centuries. They alter with changes in slope and substrate. We are instructed to observe and interpret what we see. Although solutions are apparent on each site, they vary from stream course to stream course.

Once we understand nature's patterns we can emulate the geometric arrangement we see. By mimicking patterns of rock size, arrangement, and spacing, we can nurture the damaged watercourse back to stability. What took hundreds or thousands of years for nature to arrange, a handful of caring, observant people can pull back together in a matter of days. At least our instructor seems to think so.

There are some guidelines for this work. We should avoid metal, such as wire baskets of rocks (known as gabions) or steel girders. Our tools should be the natural materials around us, rocks mostly, but sometimes logs. Where the damage is gaping, we will use heavy equipment to haul and place rock fill, but for the most part the work can be done by hand.

We can also prevent future problems by purposely falling standing dead trees away from the stream so they do not fall directly into the stream bed where they might redirect water to less protected soils. In addition, falling the trees reduces the likelihood that the natural fabric of tree roots (nick points) which stabilize the stream bed will be jerked out of the ground.

Once the physical adjustments are made, we can enhance the biological glue by adding native, riparian—or water-loving—plants.

The real keys to these solutions are working their way upstream toward us. Three tribal members, led by Mae Burnette, are carefully measuring and documenting the latest conditions of the stream course. Over the past year, Mae has personally visited and studied critical springs, streams, and drainages. She has witnessed springs that only the elders remembered reappearing in places where the fire removed dense vegetation. She has also witnessed the damage caused by the record runoff from the barren slopes.

Mae raised the initial alarm regarding this particular drainage, and through her constant surveillance, alerts our staff to other sites that need some intervention to prevent major erosion problems. Through the dedication of Mae, her co-workers, and other tribal members paying attention to the land, we interact with the landscape, admiring the powerful natural restorative processes we are witnessing, while stepping in with a helping hand when it seems that we can make a difference. JWR

Mary Stuever is a consulting forester specializing in forest ecosystems of the American Southwest. She can be reached at sse@nmia.com.

Next

By Michael Crichton

New York: Harper, 2006;
paperback, 560 pages;
ISBN 0-0608-7316-7

Next is about genetic engineering. After doing the usual Herculean research for his book, Michael Crichton came to five major conclusions:

Genes should not be patented. First, he says, they are "facts of nature" which have always been considered not subject to patent. A gene is not a creation of man and to grant a patent on a gene is like patenting iron or carbon. He develops the arguments for why gene patents are bad public policy and what can happen (and has happened) when universities or commercial interests hold these patents

Establish clear guidelines for the use of human tissues. Here Crichton discusses why the original donors of tissues should have the final word on how such tissues are used. He points out that federal regulations already exist that protect use of human tissues but that they are rarely enforced by the courts which tend to consider them (the cell lines, or tissues) comparable to library books. When books are given to a library, the donor transfers all ownership for any purpose. Genes, originating in and being part of human beings, are different.

Pass laws that ensure that data about gene testing is made public. It is important to report negative as well as positive data regarding gene research for other scientists to inspect. Otherwise the public is exposed to unknown hazards and the bias (and sometimes outright falsehoods) in commercially supported research remains hidden.

Avoid bans on research. Have such prohibitions ever deterred an activity? They historically drive the activity underground where it becomes unexamined, unregulated, and generally obscure.

Rescind the Bayh-Dole Act. Crichton tells us that in 1980 Congress decided that discoveries made in university labs were not being made available to benefit the public fast enough. Congress passed the Act to enable researchers to sell their discoveries for personal profit, even if the funding for the discovery was made with taxpayer support. The result was that most science professionals now have ties to companies of their own creation or other commercial interests. Another unintended consequence of the Act was that universities became more and more commercial in their pursuits, blurring the distinction between "basic science" and "commercial interests" and eradicating the pool of "disinterested" scientists. Now everyone has a vested interest, often conflicting with the interests of others, the public in particular. The Act has had the effect of corrupting the role of the universities often resulting in the public being required to pay top dollar for the benefit of drugs, tests, and techniques, discovery of which the public financed in the first place, through taxpayer dollars.

All of this rumination, however, begins on page 529. The preceding pages are a hilarious presentation of all the things that can wrong when mixing an exciting new biological technique (and opportunity to make money) with the ignorance, stupidity, impatience, avarice, greed, malevolence, guilt, love, and whimsy of human beings.

Michael Crichton can always be relied upon to produce a great read. The thread that sustains the story is the attempt at commercial use of the cells of a man who recovers from acute cancer of the bone marrow and is discovered to have a gene that causes the super production of an enzyme that actually effected his cure. His university doctors and their commercial associates try to establish ownership of the man and all his progeny since, during treatment, he signed releases for the study of his cells. They claim that the original patient signed release on use of his cells extended to all his cells, forever. And, since he passed his cells on to his progeny, the "ownership" extended to them. In fact, they claim, the progeny were in possession of "stolen property." This theme was distracting for me as a reader with some knowledge and admiration of the author. He knows, as does any graduate from high school biology, that the cells of progeny are not "passed down" from either parent, and the next generation has an even smaller component of its grandparent's genetic composition. Any knowledgeable person, lawyer, scientist, or salesman, dealing in genetic engineering would know that too. However, due to the independence of alleles, I chose to read "gene" instead of "cells" when that issue arose in the text. That made it easy for me to swallow and enjoy.

Interjected into the complex plot are transgenic apes (an orangutan and a chimpanzee), a feisty transgenic parrot, and a variety of other transgenic animals. Most of the characteristics of the animals are well described and a lot of fun. The parrot gave me, a bird person, a little heartburn. He has enhanced senses and

abilities due to the human genes in his makeup. He's such a mathematician he does sums on request and his vocabulary is well chosen and skillfully applied. However, it appears that his sense of taste and smell is also enhanced such that he is nauseated by chicken feed and smells an orange when flying overhead. Hmmmm. How is his sense of smell so enhanced? Parrots aren't famous for the ability to smell; neither are humans for that matter. But this is a minor point. Also in the transgenic mix are a number of people who for one reason or another ingest experimental genes to "cure what ails them." They're cured of their immediate problems but unfortunately for them suffer the unanticipated consequences of very rapid aging. Most of the animals, usually with sidesplitting humor, seem to live long and well.

Crichton is able, with these fictional characters, to develop persuasive arguments for the five points of his conclusion. He seems to have a great time grinding the axes of his most prominent pet peeves about people and the way they behave. The book is wonderfully entertaining with the usual underlying frisson of anxiety that much of it may be true, if not now, soon. JWR

Reviewer Penny Elliston is a wildlife rehabilitator in Albuquerque, New Mexico.

Editor's Note: *The* Journal of Wildlife Rehabilitation *welcomes reviews of relevant books, including veterinary reference books, memoirs, natural history, and novels. 600–700 word reviews should be e-mailed to journal@iwrc-online.org.*

SELECTED ABSTRACTS

MAMMALS

West Nile Virus infection in tree squirrels (Rodentia: Sciuridae) in California, 2004–2005

by K. A. Padgett, W. K. Reisen, N. Kahl-Purcell, Y. Fang, B. Cahoon-Young, R. Carney, N. Anderson, L. Zucca, L. Woods, S. Husted, and V. L. Kramer

The American Journal of Tropical Medicine and Hygiene 76(5): 810–13

West Nile virus (WNV) transmission generally involves a mosquito vector and an avian reservoir host, with mammals as incidental hosts. Although most mammalian WNV infections cause low or no morbidity or mortality, tree squirrels are susceptible to WNV-associated neurologic disease with infection prevalence comparable to that in dead birds. Positive species included fox squirrel (*Sciurus niger*), western gray squirrel (*S. griseus*), and eastern gray squirrel (*S. carolinensis*). Kidney tissue (dissected and swabbed), and oropharyngeal (oral) swab samples from tree squirrels submitted by California vector control and rehabilitation organizations were tested following the same protocol used for birds. Samples were submitted to the Center for Vector-borne Diseases (CVEC) at University of California, Davis. Kidney tissue (dissected and swabbed), and oropharyngeal (oral) swab samples from tree squirrels submitted by California vector control and rehabilitation agencies were tested by reverse transcription–polymerase chain reaction; cycle threshold values were similar for all three samples, ranging from 21.9 to 26.5. Kidney tissue was more sensitive than oral swabs for detecting WNV in squirrels. Tree squirrels are useful in WNV surveillance and provide localized evidence of WNV transmission to mammals.

Twenty-five years of rehabilitation of Odontocetes stranded in Central and Northern California, 1977 to 2002

by K. A. Zagzebski, F. Gulland, MD, M. Haulena, M. E. Lander, D. J. Greig, L. J. Gage, M. B. Hanson, P. K. Yochem, and B. S. Stewart

Aquatic Mammals 32(3): 334–45

Rehabilitation of stranded cetaceans is receiving increasing attention and involves considerable financial and personnel resources, although the survival rate appears to be low. To evaluate rehabilitation success, we examined 25 years (1977 to 2002) of data on live-stranded Odontocetes (n = 70) from northern California that were rescued for rehabilitation. Thirty-five animals died within the first 24h of being rescued, 13 died within the first week, seven died within a month, and 5 survived longer than 1 month, but subsequently died. Three animals were deemed non-releasable and placed into captivity, whereas 5 animals were released back into the wild. Two animals were relocated and released; these animals were never seen again. Clinical signs were nonspecific, and it was difficult to differentiate medical problems that resulted from stranding from those that may have caused the stranding. Causes of death included pneumonia (n = 16), septicemia (n = 6), encephali-



FOX SQUIRREL (*SCIURUS NIGER*) PHOTO: DAVE HERR

tis (n = 3), maternal separation (n = 7), and blunt trauma (n = 6). No morbilliviral inclusion bodies or typically associated lesions were detected. Cause of death was unknown for 23 cases. Myocardial degeneration and contraction band necrosis (n = 9) and nephrosis (n = 4) probably resulted from the stress of stranding. Ulcerative glossitis and esophagitis were observed in most animals that were tube-fed in rehabilitation. Four animals that had been in rehabilitation for more than 1 week had rhabdomyolysis; one had scoliosis. These data indicate that the success of rehabilitating and releasing stranded odontocetes in California is minimal, and the stress of stranding and rehabilitation in addition to pre-existing disease can result in morbidity and mortality. Of the animals released, two common dolphins (*Delphinus delphis*) and one harbor porpoise (*Phocoena phocoena*) were tagged with satellite transmitters. Transmissions were received for up to 5 months after release. Increased use of telemetry is essential for post-release monitoring and evaluating rehabilitation success.

AVIAN

Fungal flora in the trachea of birds from a wildlife rehabilitation centre in Spain

by M. E. Garcia, P. Lanzarot, V. L. Rodas, E. Costas, and J. L. Blanco
Veterinarni Medicina 52(10): 464–70

Mycoses are among the most frequent and most serious systemic diseases in birds. Most are caused by ubiquitous microorganisms to which birds are continually exposed. Stress appears to be an additional factor in the development of fungal infections, and may be associated with captivity, inadequate management, prolonged treatment with antimicrobials, or other debilitating conditions. It may also be associated with a certain form of physiological stress such as during the breeding season or in winter when environmental conditions are more severe. Anatomical characteristics—the absence of the epiglottis and the diaphragm, and a limited distribution of pseudo-stratified ciliated columnar cells through the respiratory tract—may predispose birds to this disease. This study was undertaken to collect baseline data on fungal flora and establish the prevalence in tracheal epithelium of wild birds. Two hundred and sixteen birds from a Spanish rehabilitation center were examined representing 26 species from seven orders were sampled. Yeasts and molds were isolated from 92 of the birds sampled (42.5%); in 24.5% only yeasts, in 12.5% only molds, and in 5.5% both molds and yeasts together. Cattle egret (*Bubulcus ibis*) had the highest percentage of positive isolation. The prevalence of yeasts shows significant differences between raptors and Ciconiiformes. Within the yeast flora, basically there were strains belonging to the genus *Candida*, mainly *C. albicans*. In the molds, almost a half of them belonged to the genus *Aspergillus*.

Identification of a novel circovirus in Australian ravens (*Corvus coronoides*) with feather disease

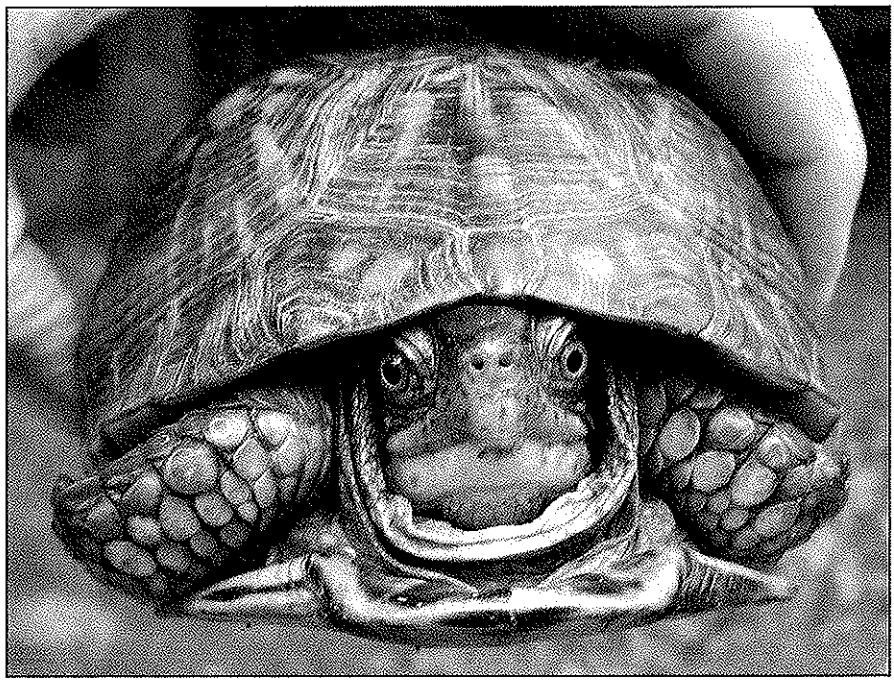
by M. E. Stewart, R. Perry, and S. R. Raidal
Avian pathology 35(2): 86–92

Circoviruses are small, non-enveloped, spherical viruses that contain a circular, single strand DNA genome. The family presently contains two genera; *Gyrovirus* and *Circovirus*. Avian circovirus infections cause dif-



CATTLE EGRET (*BUBULCUS IBIS*) PHOTO: K. WILLIAMS, USED WITH PERMISSION

ferent clinical manifestations ranging from severe chronic feather, beak, and claw abnormalities to non-specific ill-thrift, lethargy, and poor performance, but a common feature shared is lymphoid depletion and associated immunosuppression that exposes the infected birds to secondary opportunistic infection. The authors report on the identification of a novel circovirus isolated from an Australian raven (*Corvus coronoides*) with feather lesions similar to those that occur in psittacine beak and feather disease. Sequence analysis indicated the tentatively named raven circovirus (RaCV) is similar to other avian circoviruses (ORF C1 and ORF V1). Comparison with other members of the *Circoviridae* demonstrated that RaCV shares the greatest sequence homology with canary circovirgus (CaCV) and pigeon circovirus (PiCV) and was more distantly related to the beak and feather disease virus, goose circovirus, duck circovirus, and the two porcine circoviruses (PcV1 and PCV2). It is possible RaCV presents an aberrant infection by a circovirus adapted to some other avian host; futher epidemiological or pathogenesis studies are warranted to rule out this hypothesis but knowledge of host specificity among other avian circoviruses suggests this is unlikely. Since this first case several other ravens with chronic lesions more severe than those described in this paper have been examined by the authors.



EASTERN BOX TURTLE (*TERRAPENE CAROLINA*). PHOTO: DAVID KNEPPER, USED WITH PERMISSION

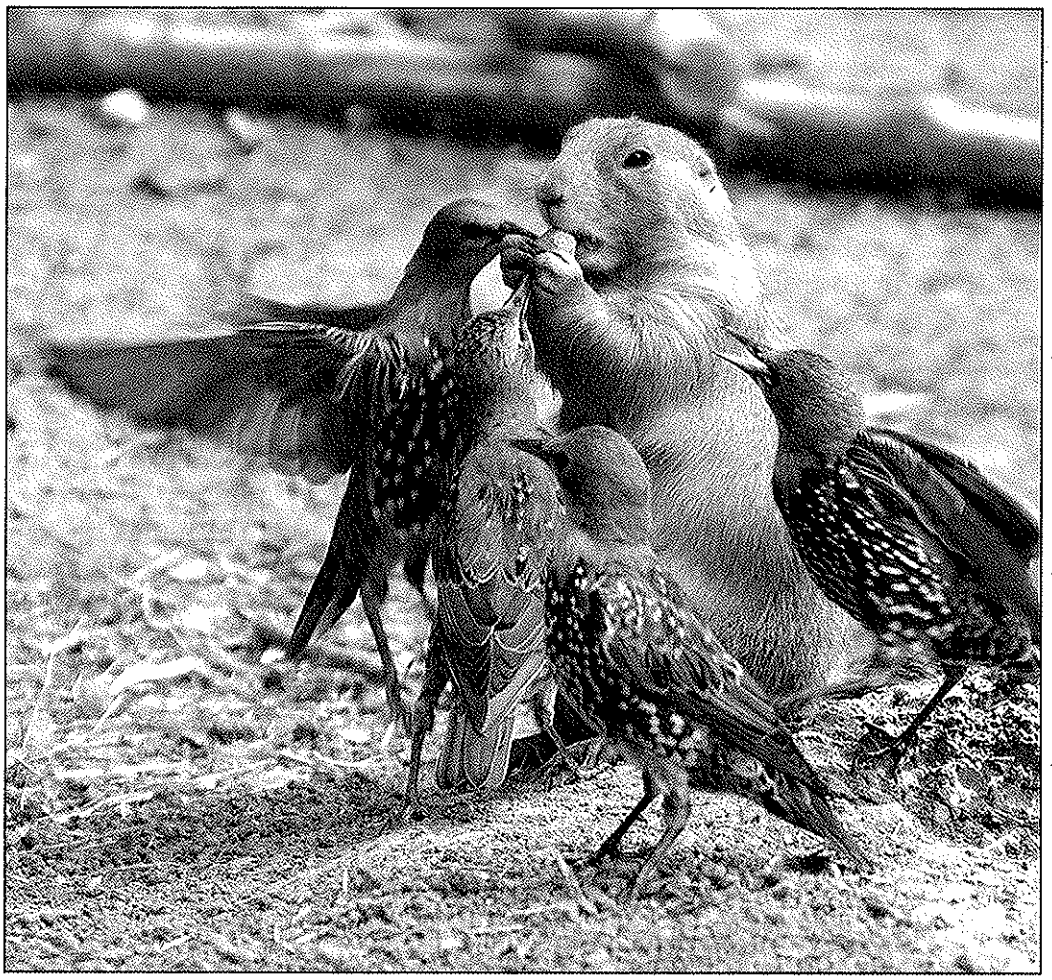
HERPS

Effects of relocation on movements and home ranges of Eastern box turtles (*Terrapene carolina*)

by J. M. Hester, S. J. Price, and M. E. Dorcas
Journal of Wildlife Management 72(3): 772–77

Many reptile populations have declined worldwide as a result of factors such as habitat loss and degradation, pollution, disease, and collection for food and the pet trade. One proposed management strategy for endangered reptiles is relocation, which is defined as the movement of a free-ranging animal or population of animals away from an area where they are threatened to an area historically occupied by that species. Although some relocation programs have successfully established self-sustaining populations of mammals (44% success rate), the success rate for reptiles is considerably lower (19% success rate in 25 relocation projects). One frequently relocated reptile species is the eastern box turtle (*Terrapene carolina*). This species is an excellent candidate for relocation because it is threatened by expanding urbanization and the resulting loss of habitat. Often, box turtle relocation occurs when concerned humans move turtles from roads or yards to a new location, when injured turtles are taken to wildlife rehabilitators and subsequently released in a different site, or when wildlife managers try to protect turtle populations by relocating them to a better habitat. Results of most of these relocation attempts have been unsuccessful or inconclusive, indicating that the utility of relocation for eastern box turtles must be questioned. To examine effects of relocation on eastern box turtles (*Terrapene carolina*), we compared home ranges and movement patterns of 10 resident and 10 relocated box turtles in Davidson, North Carolina, U.S.A. Home ranges of relocated turtles were approximately 3 times larger than those of resident turtles when measured by minimum convex polygons, 6 times larger than resident turtles when measured with 95% kernels and 7.5 times larger than resident turtles when measured by 50% kernels. Relocated turtles also moved a greater average distance per day than resident turtles. Additionally, 5 relocated turtles experienced mortality or disappearance compared to no mortality or disappearance of resident turtles. Our results raise questions about the success of relocation as a management strategy for eastern box turtles. JWR

TAIL END



BLACK-TAILED PRAIRIE DOG (*CYNOMYS LUDOVICIANUS*) AND EUROPEAN STARLINGS (*STURNUS VULGARIS*)
PHOTO: TAD ARENSMEIER, USED WITH PERMISSION

"Dang... I never know how to respond to panhandlers!"

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