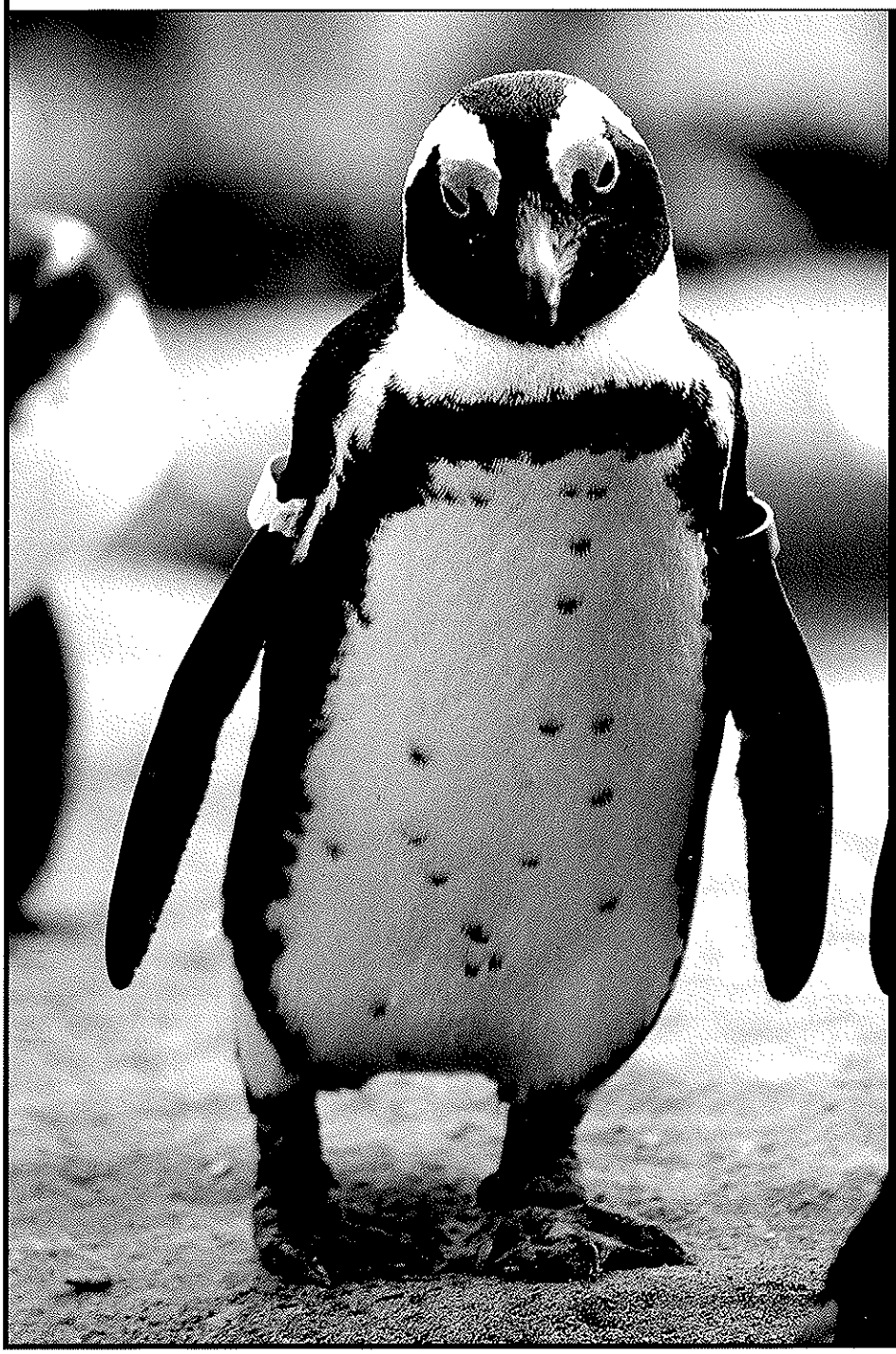
INTERNATIONAL WILDLIFE REHABILITATION COUNCIL

SPRING 2001
VOLUME 24, NUMBER 1

JOURNAL OF WILDLIFE REHABILITATION



IN THIS ISSUE

The World's Largest Seabird Rehabilitation Effort ...

Adventures in Avian Nutrition: Dietary Considerations for the Hatchling/Nestling Passerine ... Asking Current Donors for Money ... Education for Environmental Sustainability ...

and much more

ABOUT THE JOURNAL . . .

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

ON THE COVER: WORLD'S LARGEST SEABIRD REHABILITATION EFFORT. The Treasure oil spill off the coast of South Africa last June affected tens of thousands of African penguins, *Spheniscus demersus.* More than 20,000 were captured and rehabilitated in an immense international effort. Before the penguins were released, each was banded. This allowed highly accurate postrelease and population studies. BELOW: While at the rehabilitation facilities the penguins were housed in large wire-framed and plastic-lined swimming pools, 60–80 to a pool. [PHOTOS: Jon Hrusa]



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EDITORIAL

New Directions

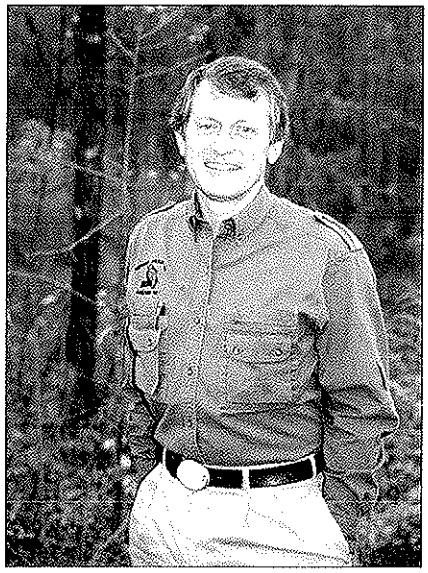
Any wildlife rehabilitator knows that for an animal to survive, it must constantly grow and renew itself, adapting to the changes in the world around it. All creatures must learn from their experiences and adapt their behavior to changing circumstances. Failure to respond to a changing environment means failure to survive.

Organizations like the International Wildlife Rehabilitation Council are exactly the same. To remain healthy and vital, IWRC needs to grow, develop new capacities, and sometimes change old ways of doing business. At the same time, IWRC needs to assist its members in making similar adjustments and improvements of their own. In a constantly changing world, we must all do more than simply try to keep up. To thrive, we must help to shape and direct the changes that affect us.

IWRC is striving to strengthen itself and grow in new directions. For our members, this will mean better and more efficient services, and a broader range of programs. For the greater wildlife rehabilitation community, IWRC's voice will be heard in new places and our influence felt in new arenas.

As your new president, it is my job to help guide and facilitate this growth. During the year ahead, I have recommended four priorities for IWRC's board to address:

- We need to upgrade and modernize IWRC's internal operations. Our members, and the rest of the world, are fast moving to electronic communication as a mainstay of business and finance. Simple things, like being able to register online for our conference or a training program are presently beyond our capabilities. We are working to get away from paper-based procedures and take advantage of new information technologies that are now the standard for a modern office. I hope that within a year, people around the world will be able to join IWRC or renew their memberships with the click of a mouse. This is ambitious but achievable.
- We need to expand and improve our training programs. IWRC's skills classes are widely respected and in great demand. We are working to modernize and diversify the way these classes are presented. Our basic skills instructors have already begun to receive training in new presentation techniques. We are upgrading printed materials and supporting documentation for both basic and advanced skills programs. We also plan to train more people!
- We need to recruit more members to IWRC. We will be reaching out to more people involved in all aspects of wildlife care and conservation—rehabilitators themselves, educators, administrators, and regulators who are also a part of our larger community.
- Finally, we need to tap new sources of funding for IWRC and wildlife rehabilitation. Membership dues are not sufficient to fund our operations. We are hard at work developing new sources of income to help pay for the improvements and expansion of member services. We plan to expand both grant funding and earned income from classes and conferences.



Of course, there are many other things going on at IWRC, but these are my priorities on your behalf. I welcome your suggestions and feedback, and I thank you for your support.

—*Ed Clark*
IWRC President

Case Study of the World's Largest Seabird Rehabilitation Effort

by Barbara Callahan

ABSTRACT: On 23 June 2000 the damaged bulk-ore carrier *MV Treasure* sank off the coast of South Africa between Dassen and Robben Islands. These islands support the largest and third largest colonies of African penguins, *Spheniscus demersus*, in the world. The ship spilled more than 1300 tons of bunker oil, which oiled thousands of penguins. Two programs were immediately put into place: a pre-emptive effort to capture and relocate nonoiled penguins to a distant location, and a collection and rehabilitation program to save the remaining oiled penguins. This paper focuses on the rehabilitation program of the 20,000 oiled African penguins that were captured and rehabilitated following the *Treasure* oil spill.

KEY WORDS: African penguins, *Spheniscus demersus*, South Africa, oil spill, rehabilitation, waterproofing

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J. Wildlife Rehab. 24(1): 3–9
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Introduction

On 23 June 2000 the damaged bulk-ore carrier MV *Treasure* sank off the Western Cape of South Africa between Dassen and Robben Islands, spilling more than 1300 tons of bunker fuel. These islands are, respectively, the world's first and third largest breeding colonies of African penguins, *Spheniscus demersus*. Dassen Island is home to approximately 55,000 African penguins, Robben Island to approximately 18,000.

African penguins are one of the smaller species of penguins, standing 70 cm (2.3 ft) tall (Williams 1995). The average weight for the species is 2547 g; males are generally larger and heavier than females. Both sexes have the same feather morphology. African penguins catch their prey using pursuit diving, sometimes diving 30–90 m (98.4–295.2 ft) deep. Predominate prey include pelagic fish (e.g., anchovies); the birds also eat cephalopods and small crustaceans (Williams 1995).

The world population of African penguins is currently fewer than 180,000 and declining at a rate of 2% annually (Crawford et al. 2000). The *International Red Data Book* places the African penguin at near-threatened status. While there is a great deal of speculation about the penguin's decline, one of the known major threats is marine pollution. Small-scale oiling events occur near-continuously and are primarily caused by illegal bilge pumping and pipeline leaks. These involve 1000–1500 penguins per year, on average, about 0.7% of the total population (Cheney 1999). Rehabilitation of oiled penguins has thus become an integral part of the overall conservation and management program for the species.

Many oil spills have endangered the lives of millions of seabirds over the last two decades. In South Africa alone, several large-scale spills have oiled thousands of African penguins. In 1994 the *Apollo Sea*, a bulk-ore carrier, broke and sank close to Dassen Island. An estimated 10,000 African penguins—6% of the population—were oiled (Erasmus 1995). At the time, this was the world's worst disaster for coastal birds. Of the penguins that were oiled by the *Apollo Sea* spill, 9740 were brought to the South African National Foundation for the Conservation of Coastal Birds (SANCCOB) for rehabilitation. Of those, 50% were rehabilitated and released. A comprehensive study led by the University of Cape Town, Avian Demography Unit showed that 73% of the birds that were rehabilitated and released from the *Apollo Sea* spill had been seen during the five years that followed the spill (Crawford 2000).

When the *Treasure* spill occurred, it was immediately apparent that the oil would impact a far greater number of penguins than even the *Apollo Sea* spill. More than 20,000 African penguins were oiled on Robben Island. An additional 19,500 nonoiled birds were removed from Dassen Island, which was also threatened by the spill. In all, more than 20% of the world's African penguin population was affected by the *Treasure* spill.

To truly understand the enormity of the response effort, it is helpful to contemplate the following: During the ten-week rehabilitation program, 45,000 volunteer shifts were needed. Often more than 1000 volunteers a day served as the bulk of the workforce, directed by the International Oiled Wildlife Response Team. More than 362.8 metric tons (400 U.S. tons) of locally available fish was used for bird food, sometimes up to 9.6 metric tons (10 U.S. tons) a day. During the washing portion of the program, three hundred and two 25-liter (6.12 gal) jugs of detergent were used and three 1.89-kiloliter (500 gal) water heaters (and many smaller ones). For the outdoor pens, 6575.7 metric tons (7250 U.S. tons) of beach sand were brought in from local beaches to provide an adequate substrate.

Statement of the Problem

The effects of oil on birds are many, with the most immediate danger coming from hypothermia. When seabirds come in contact with even with a small amount of oil, the alignment of the feather structure is disrupted, and the feathers can no

longer act to keep water away from the down and the skin. Depending on ambient temperatures, birds can quickly become hypothermic if not captured and stabilized rapidly after oiling. There are a number of other effects, both external and internal, that oiled animals can suffer. The ingestion of oil can lead to anemia and gastrointestinal disruption; the inhalation of volatile fuels can cause tracheal and lung burns, as well as pneumonia.

The *Treasure* spill occurred in the middle of breeding season, so the majority of Robben Island's 18,000 African penguins were actually on nests with either eggs or chicks. The Cape Nature Conservation Agency (CNCA), the local governmental organization that is the wildlife trustee, immediately began a massive collection program that brought thousands of oiled penguins to the South African National Center for the Conservation of Coastal Birds (SANCCOB). Due to the chronic oiling problem in the area, SANCCOB, a Cape Town–based nonprofit rehabilitation center, has many years of experience with oiled penguins. It was obvious that SANCCOB's limited space would quickly become overrun with birds and a much larger facility would be needed. Within hours of the oil spill, SANCCOB requested the aid of the International Fund for Animal Welfare (IFAW), and together the two organizations initiated a massive rehabilitation program. The IFAW International Oiled Wildlife Response Team is directed by the International Bird Rescue Research Center (IBRRC), which was immediately mobilized to South Africa. IFAW has a retainer agreement with the IBRRC to direct oiled wildlife rehabilitation programs when a response is required.



JON HRUSA

An oiled penguin, one of thousands affected by the *Treasure* oil spill.

Successful seabird rehabilitation requires moving the birds through the entire rehabilitation process quickly but without compromising the stabilization process by rushing the birds through that stage. Seabirds generally have a very short window in which to be rehabilitated and returned to the wild. If kept in captivity for long periods of time—i.e., housed on any substrate other than water—seabirds can succumb to secondary problems such as hock and keel lesions, feather rot, and bumblefoot, and to diseases such as aspergillosis (Tseng 1995). The particular physiological adaptations of penguins, however, allowed the response team to modify some of its standard protocols, as is discussed below.

Methods

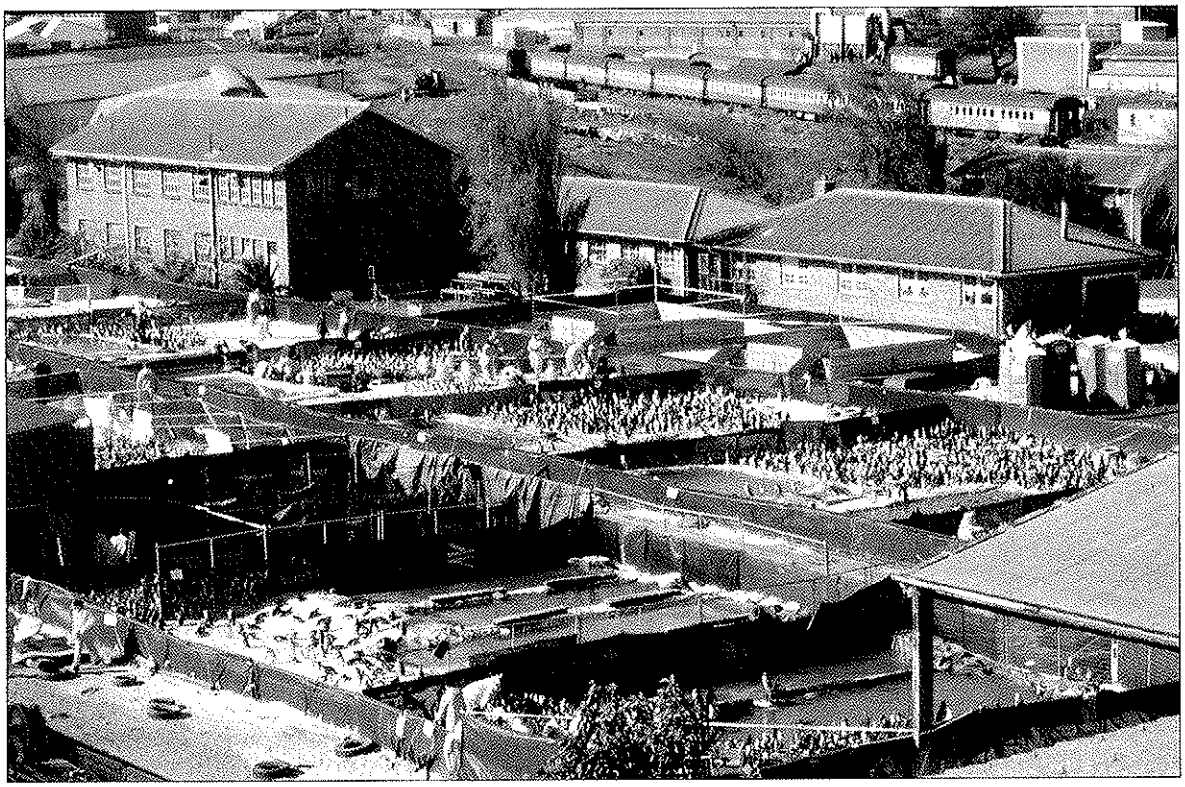
Patient Admit

Within a week of the sinking of the *Treasure*, 20,251 oiled penguins were admitted to the rehabilitation facilities. (The two primary facilities were SANCCOB's permanent facility at Table View and a second, larger center that was established for this effort in the Salt River area of Cape Town.) The birds were brought to the rehabilitation centers, sometimes three or four to a box, in newly designed, well-ventilated cardboard boxes that essentially eliminated the substantial mortality due to suffocation and overheating that had occurred during transportation following earlier spills (Crawford et al. 2000).

Incoming birds were given a physical examination and, when deemed fit, were placed in a large holding pen with many other penguins. This is where triage of oiled penguins was necessary. While the response team worked to provide the best possible care for the birds, the focus was on doing what was best for the greatest number of birds. This herd health approach is imperative during a huge wildlife response and means that when a bird comes in with an injury or disease—something requiring extra time and attention—its care must be addressed in one of two ways. Oftentimes, local rehabilitators can handle the particular problem, and once the bird is stabilized it can be transferred to that facility. The other option is euthanasia.

Separate from the thousands of adult and subadult penguins in care at the Salt River and Table View facilities, 2126 chicks (two to twelve weeks of age) were admitted and cared for in several other facilities. The Salt River facility also admitted about 1000 chicks for rehabilitation. The chicks were kept in small groups of up to 50 of like size while they were taught to eat fish and adjusted to their new home. Once these birds adapted to the new environment and caregivers they were kept in a pen, approximately 12.2 m^2 (40 ft^2), complete with an indoor pool and constructed of mesh panels with beach sand as the flooring substrate. Eventually chicks were moved to outside pens with large pools for waterproofing and exercise. The chicks remained in captivity for approximately three weeks.

Two private residences were also used for chick rehabilitation. Once the chicks were close to fledging age, they were brought to either the Salt River or Table View facility for final waterproofing and evaluation prior to release.



JON HRUSA

In the days following the spill thousands of newly oiled adult and subadult African penguins arrived at the Table View and Salt River rehabilitation centers. Young chicks were cared for in several smaller facilities.

Veterinary Care

Throughout the rehabilitation program, a large group of veterinarians, led by Dr. Heidi Stout, DVM, of Tri-State Bird Rescue Research Center in Delaware, USA, oversaw all aspects of veterinary care and minimized the possibility of disease outbreaks. All the birds in care at both facilities were inoculated against Newcastle disease; due to the past prevalence of this disease within the poultry industry in the area, it became a permitting requirement for the local rehabilitation center. Care was taken to ensure a low likelihood of disease outbreak such as aspergillosis, caused by the fungus *Apergillus fumigatus*. The high ceilings and good ventilation in the Salt River facility helped combat the fungus.

Initially, birds were given multivitamins (in fish) and a B-complex. Both supplements were made for human consumption; they were not easily taken by the birds and were, in addition, fairly low in thiamin. After the first two weeks, the response team was able to obtain thiamin tablets, which were used to supplement the frozen fish fed to the birds. Because the response team gave Mazuri© seabird tabs twice per week to each bird, Mazuri© manufacturers helped to offset the cost of shipping these vitamins to South Africa.

While the birds were in outdoor pens, they were continually checked for signs of weakness and emaciation. There was a medical care ward for birds that were ill due to the effects of oil, or that had an eye injury or were generally weak. A supportive care unit was set up in a building in the middle of the outdoor pens for birds that simply needed increased nutritional support. These birds were fed several times a day and were also given fluids by gavage.

Although some birds died and still others were euthanized, the total number of birds that died in care was under 2000, fewer than 10% of the oiled birds.

Indoor Caging

The penguins were housed in large wire-framed and plastic-lined swimming pools that were approximately 5 m (16.5 ft) in diameter and 1 m (39.4 in) high. Each pool could accommodate 60–80 penguins. Unlike other seabirds, penguins are not strictly pelagic; their bodies are better designed to bear their body weight, as they spend a considerable amount of time on land.

The inside floor of these cages was lined in newspaper, overlaid with a section of rubber matting. The matting helped to keep the penguins' feathers out of the feces and provided a good substrate to lessen the likelihood of bumblefoot. (Feces are extremely corrosive and will damage the feathers, rendering them unable to become waterproof.) The papers and mats were changed daily. One of the most important aspects of indoor housing was being able to get the birds into water daily even to clean their feathers of feces and to allow them to exercise and drink regularly. Much of penguins' buoyancy derives from their body fat, which made it possible for them to stay afloat even before they were waterproof. Response team staff and volunteers created 7 m (21.6 ft) long, fairly shallow pools from tarps hung on chain link fence sections in which to swim the birds.

The birds were swum in the same groups in which they were housed, and the water in the pools was changed after each group was finished swimming. This allowed the birds to swim in clean water and limited the spread of disease. Daily swimming was kept to five or ten minutes for each group of birds so they did not get completely soaked through to the skin and become hypothermic.

Indoor Feeding

In the Salt River facility there were more than 18,000 penguins. The daily feeding was a huge task because each bird had



JON HRUSA

Each unit of indoor housing—large plastic-lined swimming pools—housed 60–80 penguins. At this stage of the process, the birds were placed in swimming pools a for short period daily to clean their feathers and allow them to exercise and drink normally.

to be force fed fish. Wild penguins don't eat on their own when provided a bowl of fish; a rehabilitator can give a bird adequate nutrition either by gavage or force feeding fish. There are far fewer problems with force feeding than with gavage. Force feeding can also provide a diet close to what the birds would get in the wild. Due to the large number of birds and the number of calories that can be given during one tube feeding, it would also have been almost impossible to get the necessary amount of calories into each bird in a twenty-four hour period. Given the largely unskilled labor force, it would have been difficult to ensure the quality of care when tube feeding. By force feeding whole fish, the potential for aspiration was minimized.

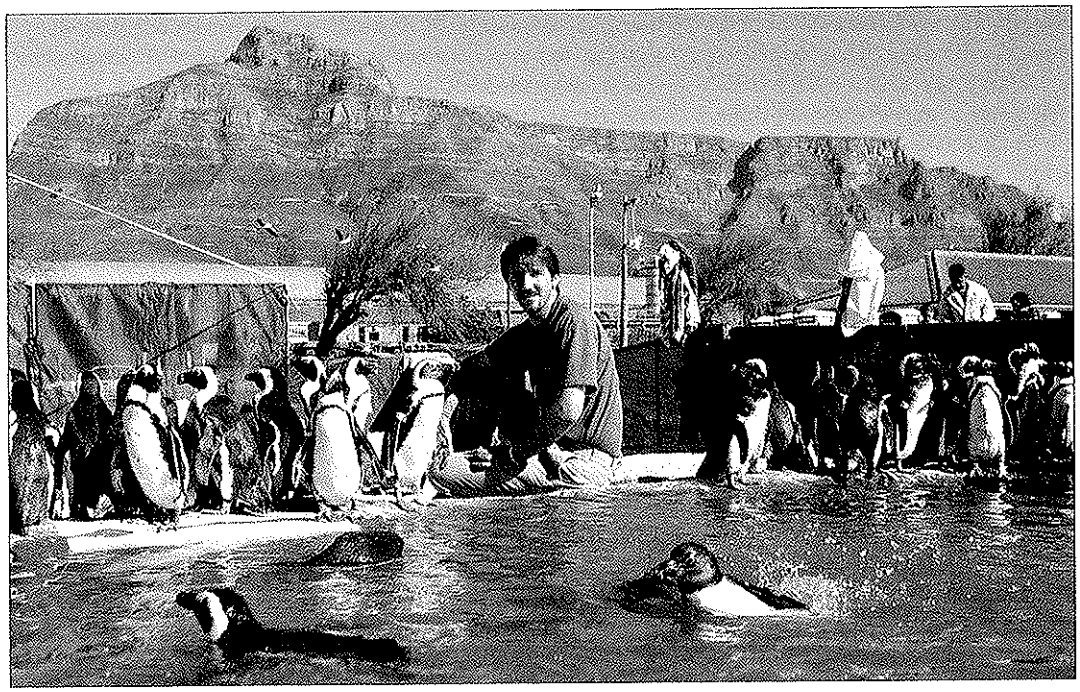
While not quite as labor intensive as tube feeding, force feeding African penguins is, nonetheless, a difficult and time-consuming task. During the first week, the penguins were fed four 20 cm pilchards every other day. While far from ideal, this did provide them the bare minimum for nutritional requirements. (Penguins are able to go for several days without eating while they are on the nest [Williams 1995].) After the first week, an increase in the number of supervisors and volunteers allowed for each bird to be fed its four fish daily. As a supplement to force feeding, the penguins were offered fish by free feeding. To free feed a penguin, the fish is offered by hand and must be held until the penguin gets the fish about half way down, in the right orientation. While the penguins were inexperienced in being hand fed, very few of them were interested in free feeding (although fish was offered). Training the birds to free feed once they were clean and in outdoor pens became a very important part of the rehabilitation process. Once the birds learned to free feed they often ate more and gained weight faster.

A specially trained team of staff and volunteers worked each day to hydrate birds by gavage. As with the feeding, approximately half of the birds in care received fluids each day, allowing for the animals to be hydrated every other day. Birds were herded into pools for swimming on days that they weren't hydrated by gavage and allowed to hydrate themselves.

Washing/Rinsing/Drying

The penguin washrooms at the Salt River facility were adapted from two large rooms that had formerly served as human washrooms. These worked well and provided much-needed drainage and ventilation. As the two wash bays at the Salt River facility were coming on-line, the penguins were being stabilized through good supportive care and many were ready to be washed. The birds were pretreated with a highly refined vegetable oil to loosen the bulk of the weathered bunker oil, and then washed. A locally available and preapproved household detergent was used for washing oiled penguins. It generally takes forty-five minutes to wash each bird thoroughly, ensuring that all the bunker oil is completely removed from the feathers, skin, and beaks. Water heaters were used to provide massive amounts of hot water to the wash bays. The water temperature for washing and rinsing was 37.8–38.9°C (104–106°F) to keep the birds from becoming hypothermic. As the wash crews and equipment came up to speed, there were days that more than 600 penguins were washed at the Salt River facility alone. After washing, birds should be rinsed extensively with warm water, at a pressure of 40–60 psi, but with18,000 penguins to wash, there was time for only a cursory rinse; the birds were then allowed to bring up their waterproofing with frequent swimming in the outdoor pools. Water for washing and rinsing was not softened, since softeners weren't available. Instead, birds were encouraged to rinse for a longer period of time in the pools. Wash water was disposed of through the local sewer system, which had the capacity to remove the oil/soapy suspension.

After the birds were washed and rinsed, they were put in one of two large drying rooms that were equipped with hanging infrared heat lamps. The drying rooms were modified from empty locker rooms and were adjacent to the washrooms. They



JON HRUSA

The penguins began the waterproofing process the day after they were washed. Supervised swim times were held several times a day. After swimming the birds would preen and realign their feathers. This cycle of swimming and preening the wet feathers made the birds waterproof once again.

were spacious and well ventilated. During this time the birds were given fluids. The following day, birds were moved to outdoor pens to begin the waterproofing process.

Outdoor Feeding

One of the greatest challenges was ensuring the birds received adequate nutrition. To be sure that each bird was fed daily, a feeding regime was instituted that included training the birds to accept fish from the hand in feeding boxes that were lined up across the pen. The penguin feeding box design was developed during the *Apollo Sea* spill (see "Simple Solutions," page 24.). During that spill, and in two subsequent spills, the feeding boxes had proven to be the most efficient feeding system for large numbers of penguins. The feeding box design has sliding panels, front and back. As the front of the box was opened, birds were gently herded into the boxes in groups of four or six. By this point, many of the birds knew how to take fish from the hand and if they took fish while in the box, they were given as many as they would eat and allowed to go out the back of the box, into the pen. Birds that did not take fish from the hand on a first try were given several chances in the box to feed on their own. If they still did not eat fish from the hand, they were force fed. After a few times in the box, however, birds learned to eat from the hand. Within three days, more than 90% of the birds in outside pens were eating fish in this manner. Getting the majority of birds to eat without being force fed was one of the greatest achievements of the rehabilitation program. Not only did this lessen the stress on the birds from handling, it helped ensure that each bird was fed daily in a short period of time and allowed them to eat their fill. Using the feeding boxes permitted the staff to know that every bird was fed, and for the first time since the beginning of the rehabilitation program, feeding crews were able to feed all the birds in Salt River by early evening. This greatly reduced the stress and fatigue of the staff and volunteers. Once box feeding was done in each pen, crews spent the rest of the day free feeding fish to any bird that would eat.

Outdoor Housing and Waterproofing

Previous efforts rehabilitating oiled penguins had taught the IBRRC that penguins do well when they have a cage that is easily cleaned, is not overcrowded, and has water access for swimming and drinking. Beach sand and shells were used as substrate because they were available in large quantities, can be easily cleaned and raked, can be changed out, drain well, and help prevent bumblefoot and feather problems.

Outdoor pens were constructed using 1.2 m (4 ft) high shade-cloth-covered wire panels and beach sand as the substrate. The outdoor pens were approximately 12.2 m^2 (40 ft^2) and contained shallow pools 2.4 m x 6.1 m x 0.6 m deep (8 ft x 20 ft x 2 ft deep) for hydrating and waterproofing. The pools had constant water overflow and were cleaned daily to keep the water quality high. Simultaneous to the industry of indoor feeding, washing, rinsing, and drying, outdoor pens were constructed daily to accommodate the birds as they were moved outside the day following washing.

The birds were herded into swimming pools several times each day for an initial supervised swim time of five minutes. This was gradually increased with each session as the birds' waterproofing improved. Swimming helped remove the soap residue from the birds' feathers. Each time the birds left the water, they would spend time preening and realigning their feathers wherever there was a wet spot in the plumage. This repeated swimming and preening is the essence of what brings waterproofing up in birds and is the best way for them to build muscle tissue and regain body condition (IBRRC 1999). Body condition rapidly deteriorates when birds are held in captivity for periods of time and are no longer foraging for food. The penguins were allowed free access to the pools once the mandatory daily swim sessions were done.

Within the first week of managing clean birds in the waterproofing pens, it became apparent that larger pools would help birds become waterproof in a more timely manner because the water quality could be kept high with increased

overflow. Eight very large pools, 9.14 m x 9.14 m x 0.9 m deep (30 ft x 30 ft x 3 ft deep), were constructed. This helped to move more birds through the swimming sessions at one time. After birds were in outdoor pens and swimming several times a day, it took an average of a week before they were able to stay in the water for long periods of time.

Prerelease Evaluations

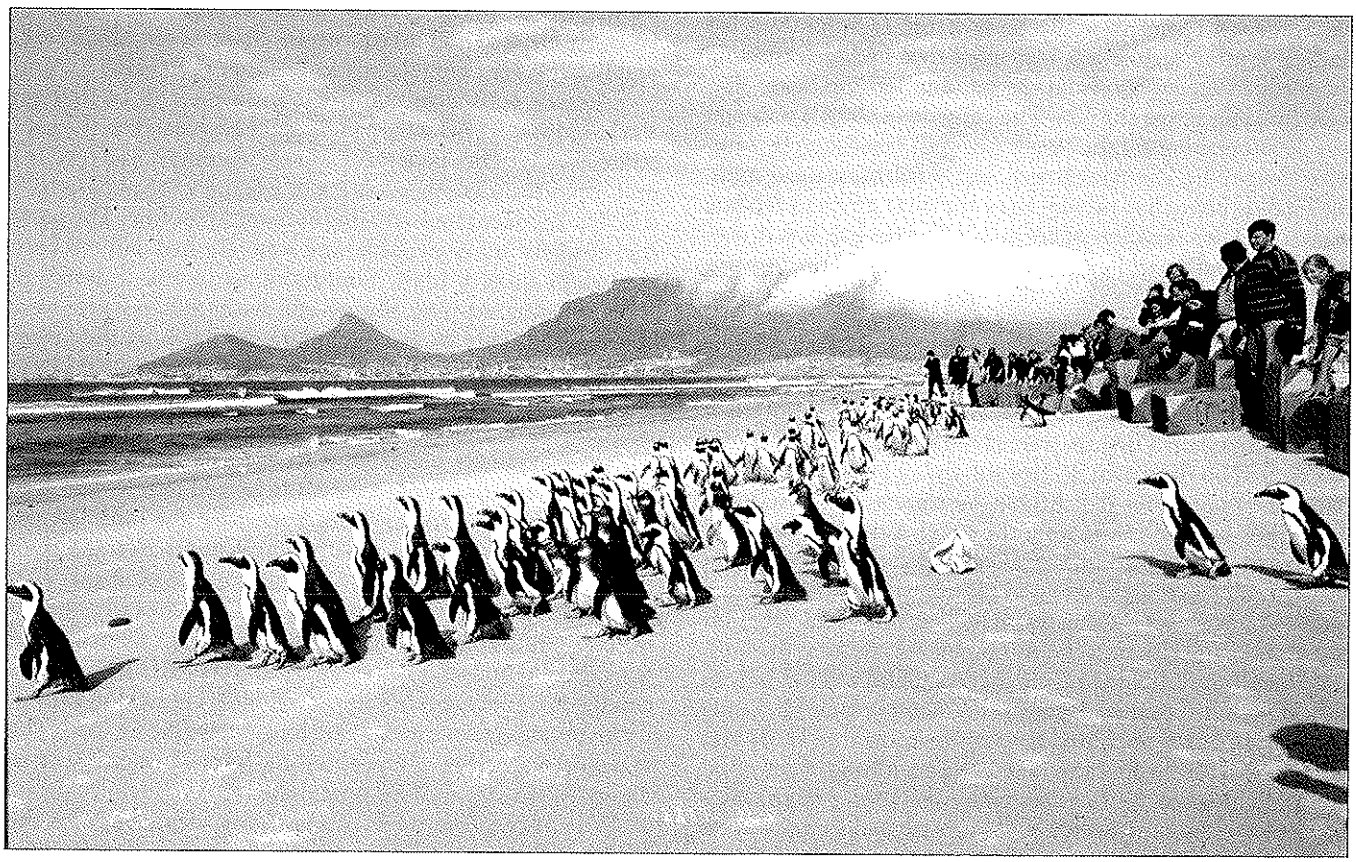
As the birds became increasingly waterproof, it was time to start a process to evaluate them for release. To ensure that each bird was completely waterproof, the birds were locked in pools for a minimum of one hour and then released into a holding pen where they were individually assessed in a process called *grading*. Supervisors coordinated a team of trained graders who evaluated each bird as soon as it was out of the pool. The bird was picked up and its down checked over the entire body. It takes five to ten minutes per bird to pull back all the contour feathers and assess the dryness of the down. In addition to inspecting for waterproofing, each bird's body condition was evaluated on a scale of 1 to 3, with 3 being the most fit. If a bird was deemed waterproof, it was given a pink spray paint spot on the breast and passed on to the next prerelease evaluation. The paint spot lasts about a month and aids in spotting birds in the wild. Birds that were not completely waterproof were held back for more mandatory swim sessions and graded again at a later date.

After grading, a blood sample was taken from each bird's toe veins and evaluated for packed cell volume (PCV) and total solids (TS). Bloods smears were made for each of the first approximately 5000 birds and screened for *Babesia sp.* (babesiosis) and *Plasmodium sp.* (avian malaria). Thereafter, smears were made for only one in six of the samples. No birds were treated for either of these parasites at Salt River as there was such a low incident rate found. A few cases (less than 20) of parasitic infection were treated at the Table View facility, as per their standard protocols. Prior to these prerelease evaluations, release criteria were set to include a minimum 38% PCV, perfect waterproofing, and good body condition. If a bird's blood was not above the 38% PCV, it was treated with iron and B-complex by intramuscular injection and held for five days before being re-bled. On re-bleed, approximately 75% of the birds were releasable.

Finally, each bird was fitted with a permanent, numbered, metal flipper band. Although a tremendous task, banding each bird allows postrelease and populations studies to be done with a high level of accuracy. Banding crews spent entire days in bird pens, meticulously banding each penguin. Sometimes this would happen before grading but generally was done after the birds were deemed releasable. These bands were then recorded as the birds were boxed for release.

Releases

In an effort to move the penguins back to the wild in the shortest period of time, birds were graded and bled on one day and, if they passed all the prerelease evaluations, were released the following day. Between a couple of hundred to more than 1200 birds were released each day. Early releases had to take place in a remote location due to the oiling on the local



JON HRUSA

Once cleaned, evaluated, and banded, the penguins were released. Between a couple of hundred and 1200 birds were released each day.

beaches around Cape Town. These birds were boxed in specially designed, well-ventilated penguin transport boxes, three birds to a box, and trucked eight hours to Port Elizabeth for release. It was a two-week swim for the penguins to return to their Robben and Dassen Island breeding grounds. As this was not optimal for the birds and difficult logistically, it was a relief when the local beaches were deemed clean, and daily releases were held right into Table Bay near Cape Town.

To give the chicks the best chances of survival, they were taken to Robben Island by ferry for release. When chicks fledge from their burrows they normally work their way to the ocean and instinctively begin to swim and eventually hunt for fish. Chicks were released in the penguin colony near other chicks and adults on the beach.

Discussion

The tremendous impact of the *Treasure* oil spill was immediately apparent, and the International Oiled Wildlife Response Team readied to treat more than twice the number of birds affected by the *Apollo Sea* spill six years earlier. Local trustees later estimated that more than 80% of the Robben Island penguin colony was in the response team's care (Crawford et al. 2000).

With the knowledge that good postrelease survival was possible, the response team's expectation of releasing the majority of the oiled birds after rehabilitation was high, even though the task at hand was overwhelming. The risk of disease outbreak among the birds or other logistical problems affecting the success of the rehabilitation program were ongoing concerns. Nonetheless, the staff and volunteers managed to stay one step ahead of these threats throughout the rehabilitation effort.

The first days following the spill were the most intense, with hundreds or even thousands of newly oiled birds arriving at the rehabilitation centers daily. Simultaneous to the oiling of thousands of Robben Island penguins, Dassen Island, home to the world's largest breeding colony of African penguins, was also threatened. While oil had not yet come ashore on Dassen Island, wind conditions at the time led local officials to conclude that vulnerable areas of the island would soon be covered with bunker oil, and a majority of the nesting birds there would be affected. In an unprecedented preemptive move, the Cape Nature Conservation Agency (CNCA) organized a massive collection and relocation program. More than 19,500 penguins were rounded up from their nests and burrows and placed in well-ventilated boxes, previously stockpiled on the island. The birds were ferried to the mainland (30 minutes) and then trucked eight to ten hours to the town of Port Elizabeth. The birds were released in Port Elizabeth with the hope that it would take most of them 10–14 days to return to Dassen Island. CNCA correctly took the calculated risk that the oil would be cleaned up by the time the birds returned.

Although the relocation program saved thousands of adult birds, numerous eggs were left in burrows when oiled adults were captured and removed from the islands. Many chicks were also rescued and brought to three rehabilitation facilities, but others hidden in deep burrows were inaccessible and lost. The actual chick and egg mortality is not known.

The *Treasure* spill occurred on 23 June 2000, and by late August the majority of the oiled birds had been rehabilitated and released. Response team members have since been out to Robben Island and found a substantial number of birds, identified by their pink spots, that are again paired up and sitting on newly laid eggs. The team supervisors assisted island biologists with a monitoring program on the islands and were scheduled daily to monitor survivability of rehabilitated birds and nest activity on Robben Island. These studies will continue for many years to collect data on postrelease survivability on the islands.

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Mazuri®
PMI Feeds
1401 South Hanley
St. Louis, MO 63144
USA

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Please Note

The fall 2001 issue of the *Journal of Wildlife Rehabilitation* will include a companion article that discusses the administrative challenges involved in conducting this massive rehabilitation effort.

Adventures in Avian Nutrition: Dietary Considerations for the Hatchling/Nestling Passerine

by Astrid MacLeod and Janine Perlman

ABSTRACT: Diets fed to nestling passerines in rehabilitation have long been formulated on the basis of custom rather than science. Yet altricial nestlings are perhaps the most nutritionally demanding of any animal, because their growth rate is so great. Virtually all songbird parents feed their nestlings solely insects (and calcium), because only insects supply the amount and quality of protein needed by growing youngsters. In turn, nestlings have evolved to be able to digest only the nutritional components present in insects, regardless of what the adults of the species eat. Basic concepts of nutritional biochemistry, coupled with data from studies of the physiology and natural history of songbirds, imply fundamental nutritional requirements of baby passerines. Using these requirements, the authors present principles of diet formulation for nestling songbirds and give an example of one such diet.

KEY WORDS: avian nutrition, diet formulation, altricial, passerine, songbird, nestlings, insects as food, protein, growth requirements

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J. Wildlife Rehab. 24(1): 10–15
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Introduction

One of the greatest challenges faced by avian rehabilitators is that of raising hatchling and nestling passerines. These fragile, helpless altricial babies are far less developed than their precocial counterparts at hatching. They hatch in a more primitive state, with eyes closed and feathers nonexistent. Unable to thermoregulate or self-feed, they depend on their parents completely. When something goes amiss, necessitating these birds to be raised by rehabilitators, they require warmth, humidity, expert care, and frequent feeding. Of these, correct diet has, historically, been the most difficult to provide.

While the nutritional requirements of domestic poultry and some companion birds have been studied because these birds have commercial value, the requirements of passerines have been little understood. Poultry, because of selective breeding and centuries of captivity, no longer have exactly the same nutritional requirements of even their wild counterparts, and the requirements of psittacines, whose parents regurgitate food for them, are also not comparable.

The nutritional requirements of altricial passerines are as different from those of their precocial counterparts as are their stages of development. Their rapidly growing bones (Starck and Ricklefs 1998) require a higher level of dietary calcium. The feathers that must still emerge will require additional dietary protein. Crucially, baby passerines grow at one of the fastest rates of all the vertebrates. Nearly all of the mass that they are laying down is composed of protein. That protein can only come from the diet; it must be present in very high amounts, and it must be of animal origin, to match the body protein of the chick (Klasing 1998).

Virtually all passerine parents feed their young insects, regardless of the adult diet (hundreds of studies, summarized by Terres 1980). The exceptions are a few finches, which are fed a diet of very particular regurgitated seed not replicable with grain-based captive diets (Klasing 1998). Plants are much more plentiful than animals, are immobile, and thus are much "easier pickings." Although passerine parents invest only as much energy in their offspring as necessary to minimally ensure their own reproductive success (Trivers 1974), they do not even supplement insects with such things as nutrient-rich seeds. It is therefore both the amount and the very high quality of insect protein (e.g., Landry et al. 1986) that are required by nestlings. Furthermore, their gastrointestinal tract structure and function are uniformly evolved to digest this diet. They have high levels of proteases and low levels of amylase and lipase (Klasing 1998). They therefore cannot assimilate grains and fats in significant amounts.

For all intents and purposes, then, the young passerine can be considered an obligate insectivore.

The hatchling bird has a sterile gut, and the enzyme levels for digestion of foods are low. The digestive system is weak and can only partially digest much of the food that the bird consumes in its first days. The enzymes that occur at the highest levels at this stage of development are proteases, required to break down proteins. The young bird will meet both its growth and much of its energy requirements, in the first two weeks of life, through the proteins in its diet (Klasing 1998). Proteins are used in building the entire body—for growth of muscle, bone, tissues, and organs; for cellular repair; and for synthesis of keratin, from which feathers, bill sheath, leg scales, and nails are formed.

As the young birds mature, their parents will begin to broaden their nutritional horizons, but for the first two weeks of life most species feed their nestlings a diet consisting solely of a variety of insects. They supplement the insects with calcium

in the form of eggshell, fragments of mollusk shell, limestone, or tiny pieces of bone (Klasing 1998).

The nutrients in insects vary depending on species, what the insect has been eating, stage of development (larva, pupa, adult), and size of the insect (Barker et al. 1998). Avian parents select insects at all stages of development, and when the digestive tract of the hatchling is stronger, parents will choose insects that are larger than those they would eat themselves, and often make them more digestible by removing chitinous parts like wings and legs (Klasing 1998). Larger insects have a higher protein-to-chitin ratio.

Water in the diet comes from the insects themselves, although some parents feed their young partially digested or moistened insects. On average, insects are composed of about 65% water. The remaining 35%, or "solids" portion, averages about 62% high-quality protein, 20% fat, and 18% carbohydrate. Again, these percentages vary depending upon species, life stage, and size (Barker et al. 1998). Live insects also contribute enzymes, microbes, vitamins, minerals, essential fatty acids, and pigments.

Methods

Nutritional analyses presented in this paper were conducted using data from manufacturers or from the United States Department of Agriculture (USDA) Nutrient Database.

Results

In rehabilitation, it is almost impossible to offer the variety and number of insects required to ensure balanced nutrition. Any one particular food or insect will not meet all the needs of the growing bird. In the past, when the requirements of passerines were less understood, rehabilitators relied on diets based on pet food and cereals. An example of such a diet shows, when compared (calculated from USDA Nutrient Database for Standard Reference, Release 13 1999) to a natural diet based on a variety of insects, that these diets did not meet the needs of the birds (Figure 1).

The old "cereal-based" diet contains the following ingredients:

- 180 cc (3/4 cup) puppy chow
- 60 cc (1/4 cup) roman meal cereal
- 227g (8 oz. jar) carrot baby food
- Soft-boiled egg
- Water

Rehabilitators today may offer far more live insects in the form of mealworms, waxworms, crickets, and so forth, but these are usually alternated with diets based on pet foods. Many of these diets are still not balanced to the requirements of passerines. The result of using diets based on dog food, for example—which lack sufficient protein and contain far too much carbohydrate—is that birds mature more slowly than in nature, are stunted, and have plumage that is less glossy, less intensely colored, and/or less keratinized than wild conspecifics of the same age (unpublished observations; personal communication with numerous avian rehabilitators). These characteristics virtually guarantee that the bird's size is permanently stunted (Starck and Ricklefs 1998). Body stores and plumage, which need to be perfect for survival, are likely inadequate, and the bird may not survive to the next spring. The authors have found that dull plumage actually consists of severely malformed feathers, and cannot supply necessary insulation or waterproofing. Inhibited growth results in impaired competitiveness in nature (Klasing 1998). Neither of these is compatible with survival in the wild.

An analysis and comparison of the ingredients of kitten and puppy foods reveals that puppy food does not offer the nutrients required by most birds, but that kitten foods come closer. Figure 2 compares two good-quality pet foods with the natural diet and with a rehabilitation diet (MacDiet) that has been formulated to more closely match the requirements of growing passerines. When supplemented with live insects in amounts of up to 50% of total intake, the composition of the MacDiet compares even more favorably with that of the natural diet.

FIGURE 1. COMPARISON OF CEREAL-BASED NESTLING-PASSERINE DIET TO NATURAL DIET

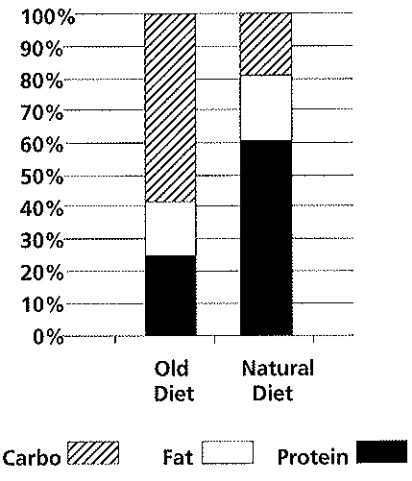
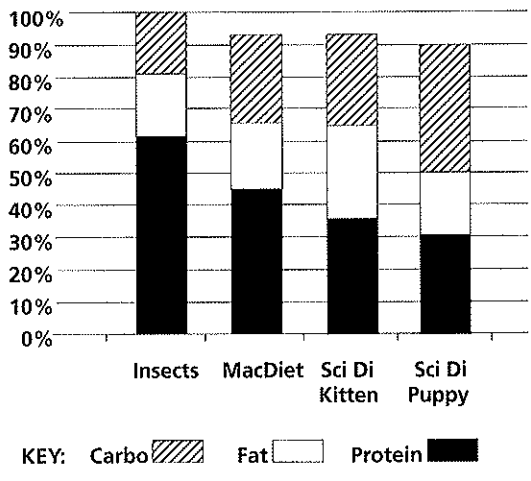


FIGURE 2. COMPARISON OF PET FOODS TO NATURAL AND PROPOSED NESTLING PASSERINE DIETS



Kitten Kibble as a Base

The best-quality dry kitten food is approximately 35% protein, 18% fat, 40% carbohydrate, 1.3% calcium, and 1% phosphorus. In addition, it provides the nutrients taurine and vitamin A (as opposed to beta-carotene), which may be essential for faunivorous birds (i.e., insectivorous passerine nestlings; Klasing 1998), and which are not necessarily present in puppy food. However, even kitten kibble, fed alone, is not adequate food for nestling songbirds. The reasons for this become apparent when three primary nutritional components—protein, carbohydrates, and calcium—are examined.

Protein: Some of the protein comes from grains, which are an inferior source for young passerines. Plant proteins do not contain amino acids in the total or relative amounts needed by nestling songbirds (Klasing 1998), so the overall protein content of kitten kibble is not of optimal quality.

Carbohydrates: The starches in the grains in kitten kibble are largely unutilizable, as young passerines have little or no enzymes with which to digest them (Klasing 1998). In nature, fiber is provided by the partially digestible chitin of insects (Klasing 1998) and presumably by their intestinal contents. Grains in kibble may substitute in this function.

Calcium: Parent birds presumably supplement their young with calcium amounting to approximately 2% of the diet (Klasing 1998). The calcium percentage of dry kitten food does not meet this requirement, or offer the optimal Ca:P ratio for passerine babies of 2:1.

To determine whether a particular kitten kibble is suitable, look at the percentages of protein, fat, and carbohydrates listed on the package. Next, look at the ingredients list. A good food will list chicken as the first ingredient. Any food that lists grain (e.g., corn) as the first ingredient should not be chosen. The better foods include whole chicken and poultry by-products. While these ingredients may not seem palatable to us, in nature whole prey is consumed and is required. By-products offer some whole-body nutrients. A good food will usually include egg and may include some fishmeal. Foods that list soy as an ingredient should be avoided, as soy will make the protein content appear higher but does not offer the amino acid profile required for growth. The best foods are preserved naturally. Some good brands of kitten kibble (based on current formulations) include Pro Plan®, Eukanuba®, and Purina One®. Even the best foods, however, do not meet the requirements for high-quality proteins and calcium, and must be supplemented.

Creating a Better Diet

To improve upon kitten kibble, we can choose from a number of animal-based proteins that are highly bioavailable. These may include freeze-dried insects, egg, chicken, chicken liver, and so forth. Some foods, such as egg yolk and chicken baby food, also raise the overall fat percentages of the diet, and usually the fat percentages from animal-based foods are already adequate or in excess. It is preferable, then, to choose low-fat proteins that will lower the overall fat content and the overall carbohydrate content.

Egg: Using raw egg is not recommended for several reasons, one being that raw egg white contains avidin, a glycoprotein that will bind the vitamin biotin and make it unavailable to the bird. Cooked egg, however, is a safe addition. When analyzed on a dry-weight basis, egg yolk offers 32.7% protein, 60.3% fat, and 3.5% carbohydrate. Egg white, however, offers 86% protein, no fat, and 10.7% bioavailable carbohydrate (USDA Nutrient Database for Standard Reference, Release 13 1999).

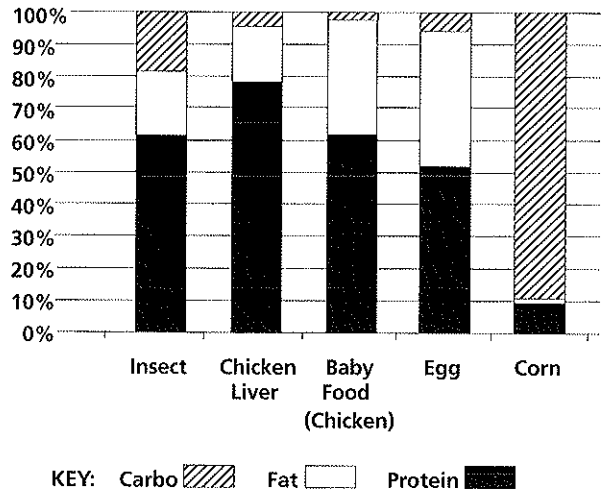
Freeze-dried insects: A number of freeze-dried insects are available on the market today. They are often found in the aquarium or reptile supplies sections of pet supply stores, or can be ordered from companies that supply feeder insects. Freeze-dried red grubs, mosquito larvae, ant eggs, flies, fly larvae and pupae, crickets, and crushed insect mixtures can be purchased. While they offer good-quality proteins, current peer-reviewed literature reports that insects, live or dried, have poor Ca:P ratios that must be corrected in the overall diet. Freeze-dried insects should also be soaked in a small amount of water to "reconstitute" them.

Strained chicken baby food: The dry weight analysis of chicken baby food is 60.9% protein, 35.1% fat, and almost no carbohydrate. The Ca:P ratio is poor—0.66:1. This food, however, "as fed," is mostly water, and this must be considered when compiling the overall diet. A 71 g jar contains 55.9 g of water.

Figure 3 compares the percentages of major nutrients found in some possible dietary additions (note: whole egg is used in this example), and includes corn for comparison. It is clear that corn does not compare to the other foods, with its poor protein level. While chicken liver appears a very good choice in terms of protein and fat, it is too concentrated in some minerals and vitamins that are toxic in excess to be used as anything more than a small part of the diet.

Calcium levels must be corrected using a source that does not include phosphorus. It should *not* contain vitamin D; otherwise, dietary levels could be toxic. Bone meal cannot correct a diet, as it contributes phosphorus. Powdered calcium carbonate is the best form . This is the calcium that is

FIGURE 3. COMPARISON OF ANIMAL-BASED PROTEIN SOURCES



found in eggshell, limestone, oyster shell, cuttlebone, etc. It can be purchased as tablets, and then the tablet can be crushed to a fine powder. The finer the powder, the better it is absorbed (Klasing 1998). Calculate the overall calcium comprising the diet's dry weight, and adjust it to 1.8% to 2%. (For a sample calculation to correct dietary calcium, see "Food for Thought," page 26.) When additional live insects are fed, they will require additional calcium correction; it can be assumed that insects contain about 0.1% phosphorus on a dry weight basis (Barker et al. 1998). Supplemental calcium must be weighed if an already-powdered form is being used instead of a tablet. It should not be measured by volume, because the amount of calcium in a teaspoon, for example, varies with particle size, whether compressed, and other factors, thus risking under- or oversupplementing.

An example of a diet that is based on the above principals of avian nutrition, using kitten food with additions to improve the overall nutrients, is MacDiet. MacDiet, when fed with live insects, has been reported by numerous rehabilitators to improve success rates—as measured by survival, faster maturation, and plumage quality—in raising a wide range of hatchling and nestling passerines (and some other species commonly cared for by passerine rehabilitators). The species reported to do better on MacDiet than on previously used formulations include sparrows, finches (including those fed special seeds by their parents), nightjars, swifts, swallows, thrushes, corvids, woodpeckers, warblers, vireos, flycatchers, and others. The diet is a simple correction of common rehabilitation diets, providing animal-based, easily digested protein.

This type of diet works particularly well when augmented heavily with live insects. The diet, with vitamins, minerals, and calcium "built in," is used to correct the live insect portion of the diet and augment it. Live insects are critical to any diet, as they offer not only major and minor nutrients, but also enzymes and gut flora.

MACDIET RECIPE
120 cc (1/2 cup) Purina ProPlan® Feline Growth dry food, soaked in just enough water to soften completely. Drain off excess.
2 hardboiled egg whites, sieved through a fine mesh strainer
45 cc (3 tablespoons) canned Science Diet® Feline Growth Food, drained of liquid
30 cc (2 tablespoons) freeze-dried insects
8 cc (1/2 tbs.) Knox® Blox
600 or 800 mg calcium carbonate, crushed and powdered
50 mg vitamin C (ascorbic acid)
1 small pinch of powdered B-complex vitamins
3–5 drops cod liver oil (supplies vitamins A and D)
1 drop of 1:10 vitamin E in corn oil
20 cc (1 slightly rounded tablespoon) plain yogurt (low- or nonfat)

Mix ingredients with a fork. This mixture can be refrigerated for a day but should not be frozen, as storage will affect the vitamins. The recipe can easily be halved, quartered, doubled, etc. When mixed with a fork, the mixture resembles paté or canned cat food and can be fed by hand, using forceps, or can be expressed through a 6 cc oral monoject syringe to form "worms." If a wetter mixture is preferred or a tube mix to feed a compromised bird is needed, the diet can be mixed in a blender and extra water can be added as necessary. If a creamy mixture that will pass through a small syringe is preferred for very small birds, everything but the ProPlan® can be mixed with a hand mixer or in a blender, and then the ProPlan® can be mashed through.

Each box of Knox® unflavored (plain) gelatin powder contains a number of small white envelopes, each of which contains 15 cc (1 tablespoon) powder. Put 5 cc (1 teaspoon) powder in a small baby food jar (71 g size) and add about 20 cc (a few teaspoons) cold water to dissolve. Add boiling water to 2/3 full. Put on lid and shake to mix. Eight (8) cc (1/2 tablespoon) of this mixture (as called for in the recipe above) can be added wet and the remainder can be placed in the refrigerator and used in its gelled state. Unused portions should be discarded after three days.

Freeze-dried insects can be purchased at most large pet stores where fish and aquarium supplies are sold. They include such products as Freeze Dried Red Grubs, Aqua-Fit Freeze Dried Red Mosquito Larvae®, and Freeze Dried Bloodworms. In a pinch, small cubes of tubifex worms can be used. They should be soaked in warm water to loosen.

Yogurt should be plain, containing only live cultures, cultured milk, and any of the following: whey protein, whey, gelatin, or pectin. It should contain no other additives. Although birds do not make lactase (the enzyme that digests lactose) themselves, the live culture Lactobacillus provides lactase and makes the yogurt more digestible. The authors have never observed lactose-intolerance diarrhea when birds are fed yogurt, and the benefits appear to be appreciable. Live-culture Lactobacillus bacteria has been demonstrated to compete with pathogens and prevent infection (Reid and Howard 2000). They serve that purpose both in the food and in the animal. Live culture yogurt is strongly recommended over other Lactobacillus products (such as Benebac™, acidophilus capsules, etc.). Many of these products may have little or no live bacteria, or the bacteria may be quite delayed in starting to grow (unpublished data), which may make them ineffective in birds.

Vitamins are added fresh, as shown, because (a) they degrade rapidly upon storage in any form, and (b) the amounts in the recipe are both safe and effective. Remember that some, though not all, vitamins are toxic at high levels, so do not add more than prescribed here.

Minerals should not be added, because they do not degrade and are only safe and effective within relatively narrow ranges. Because vitamins degrade (and at various rates) while minerals do not, a multivitamin/mineral supplement can quickly become unbalanced while stored. For that reason, the authors recommend *not* using multivitamin/mineral supplements.

Fly mix should be crushed before use, and only about 1/2 teaspoon of flies used in the insect portion. A mixture of red

grubs and mosquito larvae comprise the rest. Familiar wild invertebrates—earthworms, small crickets with legs and wings removed, etc.—can be gathered, frozen, and powdered. Care should be taken in choosing wild invertebrates. Some insects can be toxic to birds. For example, the caterpillar of the monarch butterfly feeds on milkweed, a plant that is toxic to birds. The butterfly bioaccumulates the plant's toxins, and, thus, the monarch butterfly is toxic to birds (described in Waldbauer 1998). Insects gathered in the wild must not possibly have had contact with pesticides.

Feeding

MacDiet is 45% protein, 20% fat, and 28% carbohydrate (dry weight basis). This approaches, but is not identical to, the gross composition of the natural diet of young birds, and offers the high-quality proteins required for growth. To make the composition of this diet closer to what birds are fed by their parents, the addition of significant amounts of live insects is required.

The diet offers 1.5 kcal/gram. Note that the *effective* kcal/gm are higher than this number would indicate, compared to other diets, because a larger percentage of the calories come from foods that are highly bioavailable to birds. It is important not to "overfeed" MacDiet based on comparable amounts of less bioavailable diets; more of the latter are eliminated in the feces, undigested. Fecal sacs on MacDiet are therefore likely to be somewhat smaller than those from less bioavailable diets.

It is important to monitor droppings to determine whether to feed more or less. (Droppings are probably the best proximate way to assess appropriate feeding, in terms of amount and moisture content, for any diet. Too little food results in scanty, dry droppings; too much causes diarrhea. Too much moisture results in voluminous urine; too little moisture is indicated by dry droppings. See, for example, Rosskopf and Woerpel 1996.) Well-formed feces in a moderately wet dropping, produced after every feeding, show that the amount being fed is correct. If the fecal sac is loose or runny, offer less food or increase the intervals between feedings, and add a small amount of water for several feedings to replace fluids that the bird has lost.

Note: The Ca:P ratio = 2.3:1 if using 800 mg calcium from calcium carbonate. This amount of calcium carbonate corrects a diet that is augmented with approximately 1/3 part live insects. If the insect portion is less than 1/3 of the daily ration, use the lower amount, 600 mg calcium, from calcium carbonate. This amount of calcium corrects the phosphorus in mealworms or other live insects that are supplemented up to 1/3 part.

Pure calcium carbonate should be used. Sources include oyster shell calcium tablets *(without vitamin D)*, cuttlebone, calcium carbonate powder for reptiles *(without vitamin D)*, or sterilized eggshell. Any of these should be powdered (Klasing 1998). (For additional ideas, see "Food for Thought," p. 26.) Antacid-type calcium carbonate tablets are not optimal because of their additives. For example, many food dyes are proven or possible toxins or carcinogens (see www.cspinet.org/reports/food.htm), and young passerines do not possess saccharidases to digest sugars (Klasing 1998).

Do not add:

- Calcium sources containing any phosphorus
- Raw meat, particularly ground meat (as it is a source of dangerous pathogenic bacteria)
- Soy protein powder, wheat germ or plant-based foods (grains, pablum, baby cereal, etc.)
- Chicken, duck, gamebird, or other "starters" or foods meant for precocial or psittacine birds
- Uncooked egg white
- Artificial colors or flavors
- Excess fat; for example, egg yolk adds considerable fat
- "Odd" insects with which you are not familiar (some are toxic)
- Any ingredient whose complete composition and purpose you do not understand

Do offer fledglings that are learning to self-feed a variety of natural foods in an "enriched," interesting, and varied physical environment. These birds have evolved to be curious and to explore novelty. The psychological health of birds has an enormous impact on their physical health and ability to adapt to foraging and conditions in the wild.

Discussion

It is the authors' opinion that rehabilitators should not depend on "what has always worked" for them or others. Research suggests that even birds that appear to be healthy may be undernourished on most rehabilitation diets. If this is true, we are releasing animals with weak bones, delayed growth, and consequent lack of biological fitness.

The authors recommend that rehabilitators who create their own diet analyze it completely, on a dry weight basis, and know the exact percentage of protein (and its source) and of fat, carbohydrate, calcium, and phosphorus. The sources and amounts of vitamins and minerals should also be known.

MacDiet is an example of a "better" diet, but it is not the only possible diet. However, the principles on which MacDiet is formulated, as presented here, are the realities of nature and of nutritional biochemistry. This diet is based on the principles of natural history, physiology, and nutritional biochemistry that delimit what babies *must* be fed in nature, and therefore what they *must* be fed in captivity. MacDiet is an effort to improve upon the traditional diets of nestling passerines in captivity. However, continuing research results in the frequent emergence of new information. It is incumbent on us, as responsible wildlife rehabilitators, to stay abreast of new developments in all aspects of rehabilitating, not the least of which is nutrition.

Product Sources

Eukanuba (Iams Company, Dayton, Ohio, USA) is available at many veterinary clinics, pet supply stores, and some grocery stores, as well as from online sources. For more information, see www.iams.com.

Frozen Flies and Fly Larvae can be ordered through Biconet (www.biconet.com) or from Skipio's (www.skipios.com). Both companies sell a "mix" that includes dried adults and larvae.

Freeze Dried Red Grubs® are available from Hagen Products (www.hagen.com/hagen/canada/english/ aquatic/sub_category.cfm).

Knox® gelatin is available at almost any grocery store.

Purina ProPlan® Feline Growth (Ralston Purina Co., St. Louis, MO, USA) is available at many veterinary clinics and pet supply stores.

Purina One® (Ralston Purina Co., St. Louis, MO, USA) is found in most grocery stores.

Science Diet® Feline Growth Food (canned; Hill's Pet Nutrition, Topeka, Kansas, USA) is available at many veterinary clinics and pet supply stores.

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Additional Reading

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Note

The authors and colleagues will be conducting comparative studies of nestling diets in the coming summer. Participants will be asked to use whatever diets they ordinarily would, and to faithfully record certain specific information. If you are interested in more information about participating, please contact the authors.

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A version of this article is also published in NWRA Quarterly Journal, *18, no. 4 (winter 2000).*

Asking Current Donors for Money

WHY, HOW, AND HOW OFTEN

by Kim Klein

In many organizations' constant search for better ways to recruit new donors, they sometimes overlook the possibilities for raising additional money from current donors. In fact, grassroots groups often act as though their current donors are precious and fragile, like Grandmother's good china, and should only be brought out on special occasions. Consequently, many organizations appeal to their donors once or twice a year at the most.

However, years of fund-raising experience show that many donors will respond well and generously when asked for extra gifts, and that organizations that ask their donors for money three to six times a year will have a higher renewal rate overall in addition to all that extra income.

Why Do Multiple Appeals Work?

Many groups are hesitant to send several appeals to their current donors because they have heard donors complain about being asked too often. In fact, even you may dislike being asked over and over for money from the same organization. So the fact that multiple appeals work is a little counter to our experience and bears exploring.

First, we need to remind ourselves of the purpose of fund raising, which is building relationships. Every year, an organization should have more donors, and every year its donors should be more loyal. This will occur if the donors are treated like whole people and not just ATM machines; if they are thanked in a timely fashion with a personalized note; if they are invited to the organization from time to time through an open house or other event. If a donor calls to complain that their name has been spelled wrong or that they are getting two copies of the newsletter, their complaint is dealt with swiftly and they are treated respectfully. As much as possible, the donors are integrated into the work of the organization by being invited to be volunteers or attend events.

Obviously, most of the donors to any organization will simply send their donation and wish the group well. The organization will never meet them. But the donor will have the impression that if they were to want to meet staff or board members or get more involved, they would be welcomed.

As such, if a donor sends in a check and attaches a note saying, "Only ask me once a year because I will only give once a year," then the organization complies with that request. The name of that donor will be coded accordingly in the database and suppressed for multiple mailings. Similarly, donors who write, "Don't phone me" should not be phoned. These are reasonable requests and a group can accommodate them.

In the absence of such a directive, however, donors should be asked for gifts several times a year. In addition to helping you raise more money, the requests help to educate the donor about the work of your group. Studies have shown that about ten percent of donors will give each time they are asked. Some donors will give every time they are asked, and some may only give one or two extra times, but each time you send a letter you will have at least a ten percent response. More interesting is the fact that even donors who only give once a year are more likely to renew their gifts if they are asked several times during the year than if they are asked only once annually.

Multiple appeals are successful for any number of reasons. First, a person's cash flow can vary a great deal from month to month. In one month a person may receive an appeal from a group she supports, but has just replaced all the tires on her car and can't afford to give. Two months later, she has gotten a raise and is able to make a donation to the appeal that comes then.

ABSTRACT: Common wisdom among many grassroots nonprofits holds that asking current donors to give more than once or—at most— twice a year is somehow "wrong." In reality, however, multiple appeals are successful, yielding a higher renewal rate overall, as well as extra income. This article discusses why and how multiple appeals work and offers a variety of ideas for specific appeals.

KEY WORDS: fund raising, donor response, multiple appeals, seasonal appeals, holiday appeals, combination appeals

KIM KLEIN is copublisher of the *Grassroots Fundraising Journal.*

This article originally appeared in the *Grassroots Fundraising Journal,* 2000 19(1). Reprinted with permission from Chardon Press, www.chardonpress.com.

J. Wildlife Rehab. 24(1): 16–19

Second, some people respond better to some types of appeals than to others. Sending only one or two appeals a year does not allow for much variety. Organizations that send four or five appeals will discover that donors who regularly give $25 will give $50, $100, or more to a special appeal. They like the idea of buying something for the organization— media spots, an organizing drive, new computers, and the like.

We rarely know why people don't respond to appeals, but we usually make the assumption that the donor doesn't want to give when any of the following might be just as true: (a) the donor has been away on vacation and mail has piled up, so he throws anything away that is not a bill or a personal letter, including your appeal; (b) the donor is having personal problems and cannot think about anything else, even though she might be very committed to your group; (c) the appeal is lost in the mail; (d) the donor loses the appeal; he meant to give and put the appeal in a pile of papers that later got thrown away. Sometimes organizations report receiving donations for an appeal that is six months or a year old, showing that the donor has saved the appeal until he or she had some extra money, or misplaced it and decided to give when he or she saw it again.

Donors have a sense that a lot is going on with a group that sends several appeals a year. Multiple appeals keep your organization on the donor's radar screen and insure that your group will be taken into account as the donor makes his or her charitable gifts. Remember that your group is not the only one the donor gives to and may in fact be one of a dozen or more groups they support. The donor needs to know that your group continues to do good work throughout the membership year.

How Do Multiple Appeals Work?

Once we have established that multiple appeals do work, we have to look at how they work. Clearly, if so many people dislike being asked many times a year, it is possible to overdo appeals or to do them badly. So how do you do them well?

When you make a donation to a large national organization that appeals to its donors a dozen or more times a year—which is not unusual—this is what will happen. You send in your gift. You may or may not get a thank you note; if you do, it will not be personal. But, six weeks or so after your first gift, you will get a request for another gift. This request will not acknowledge your previous gift at all. In fact, it won't be clear from this appeal that the group even knows that you gave before. Whether or not you send in another gift, you will get another appeal. This is what makes people dislike multiple appeals—the sense that whatever they send is not enough.

To counter this problem, always begin an extra appeal by thanking the person for their previous gift. This can be done even in a form letter by saying, "Dear Friend, Thank you so much for what you have given so far this year. We have used your donations to further our work. Now we have a chance to expand our work and need your help with an exciting project." The letter explains what work you are going to do and asks the donor for an extra gift: "If you can help us with an extra gift of $35, $50, $100, or whatever you can afford, we will be able to. . . ." The letter ends by thanking the donor again: "Thank you for what you have already done, and thank you in advance for helping in whatever way you can now."

How Often Should We Send Appeals?

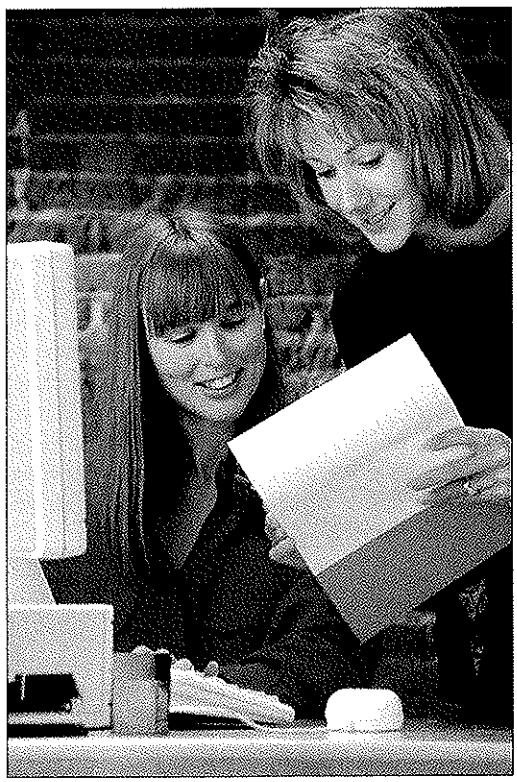
Grassroots organizations generally find that sending four appeals a year works well. They can be sent quarterly, with a description of the exciting work coming up in the fall, winter, spring, or summer. Some groups plan to send three appeals and hold one appeal as a "floater." The floater appeal will be sent whenever something really exciting is happening and may not be sent at all during a year when nothing lends itself to description in a mail appeal. Some groups send three appeal letters and one invitation to a special event, and some groups send two appeals and an invitation to a special event and call donors once a year.

What you do will depend on how widely scattered your donors are (national groups will hesitate to run up their long distance bills by calling and generally will not be inviting donors who live far away to a special event); how many volunteers you have to help you with the appeal; and how many donors you have.

To find out what works best, you may want to segment your donors and try different methods on different donor segments over the course of the year. Return envelopes put in newsletters, although a good idea, do not take the place of multiple appeals.

What Should We Say in Our Appeals?

Once an organization has accepted the idea of doing multiple appeals, it often wonders what it is going to say in each different appeal. The following list of twenty-six ideas should



While many donors will respond to multiple appeals each year, those who request just an annual appeal should be coded as such.

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help you choose some approaches that will work for your organization. Some of these ideas will be better suited to one organization than another, but almost any organization should be able to find one or two ideas that it can modify and use for its group.

Seasonal Appeals

1. **Beginning of year (written as a testimonial):** "One of my New Year's resolutions is to give more money to Verygood Group. I realized that, like many of my resolutions, this one could fade if I didn't act now. So I sent an extra $35 on January 5. Will you join me and act now? Verygood will put the money right to work, right in our community."
2. **End of summer:** "This fall we know that our organizing efforts in Southend are going to result in the clean-up of the now-closed Foul Factory. Getting the factory closed was one of our most important victories, but we must keep the pressure on to make sure the site is properly and thoroughly cleaned. Will you help us get a head start on our fall fund raising with an extra gift right now? Knowing that we have the money for our organizing campaign to monitor the clean-up process will make planning for it much easier."
3. **End of year:** "If you are like many of us at Very Effective Group (VEG), you are gearing up for Hanukkah, Christmas, or the Winter Solstice. As you think about gifts for your loved ones, please think about us. This is your last chance to make a tax-deductible gift and count it against this year's taxes. We appreciate all you have done and wish you all the best in this holiday season."
4. **Spring appeal for new members:** "In the spring everything seems to put on a new look—new leaves, new flowers. Everything starts growing again. Our organization is growing, too. You have been a big part of our growth and we thank you for that. This year we hope to recruit five hundred new members—people like you. So, instead of asking you for a contribution, we would like you to send us the names of five people you think would be interested in joining our group."

Holiday Appeals

1. **Martin Luther King's birthday:** "It is no secret that Dr. King would be both pleased and appalled at the progress America has made toward ending racism. Pleased, because much that is positive has happened. Appalled, because in some ways racism has gotten worse. We at _____ Organization live and work by the principles of Dr. King and other civil rights leaders who gave their lives for their beliefs. Help us continue the legacy of Dr. King with a tribute gift to our organization in his memory."
2. **Lincoln's birthday:** "President Lincoln was only one of the more famous people to be killed with a handgun. I know you want to end this senseless and continuing outrage of handgun violence. An extra donation from you, sent today, will give us the extra funds we need to work on a special program to stop the sale of handguns in our city."
3. **Valentine's Day:** "Do you often think of important people on Valentine's Day? Do you remember them with flowers, candy, or cards? I know I do. This year, I thought of other important people in my life—the people at _____ Organization. They really depend on us, the members, for the financial support they need. Will you join me in sending an extra donation? You can send flowers or candy as well."
4. **April:** "Taxes. That's what's on everyone's mind right now. How much you owe. How you're going to pay it. Whether you are getting a refund. And where the tax money is going. At People Against Military Waste, we try to stop wasteful spending on weapons no one will ever use and we question the size and scope of our military. This year, we are asking people who have supported our work in the past to consider sending us a donation equal to ten percent of what you owe the government or what you will get back in a refund."
5. **Memorial Day:** "We invite you to remember someone important to you with a gift to OurHospice Group. We will send a special card to the family of the person you are honoring and put the money right to work helping people cope with terminal illness."
6. **Flag Day:** "Flag Day. Most of us don't even own a flag anymore, but when I was a kid everyone put out a flag on June 14. At Center City Organizing Project, we were reminded by one of our senior members of the principles the flag stands for: Freedom of Speech, Liberty, Democracy, Equality, Pursuit of Happiness. With your help, we will continue to work for these ideals. We aren't putting out a flag, but we are putting out a request: Will you help us with an extra gift? You cherish these ideals as much as we do, and with your help they can become reality for all people."
7. **July 4:** "We are inviting all our members to a special July 4 Barbecue at Phyllis Wheatley Park—the park we fought to save and worked to restore. Suggested donation: $15 a person, $25 for two; children under twelve are free. All you can eat, games, and fun! If you can't come, be with us in spirit by sending a donation in the enclosed envelope."
8. **Mother's Day/Father's Day:** "On this day, we remember our own parents and celebrate parents we know. For many people, these are fun times, surrounded by loving family. But what happens when this vision of a loving family turns sour, as it does for more than half of married women who suffer from domestic abuse, or for the millions of children beaten, humiliated, or sexually assaulted by relatives? Mother's Day/Father's Day becomes a cruel irony. Mark this holiday in a different way this year—with an extra donation to the Abuse Prevention Project."
9. **Labor Day:** "Labor Day is a wonderful day to rest from work. But what about all the people who want to work and can't find jobs? For them, Labor Day is another reminder of their joblessness. We provide training to thousands of people so that they can get good jobs in areas needing workers. Help us make sure that we are able to

provide training to everyone who wants it with your extra gift this Labor Day."

10. **Columbus Day:** " 'Columbus discovered America.' This is one part of American history almost everyone knows. The problem is that this is a half-truth: Columbus discovered America for white people. There were already people here—our people. We are Native Americans. Yet our history since Columbus has been one of genocide, displacement, and oppression. Our latest project at Native American Advocacy Fund is free lesson plans, games, and plays for people who work with young children to teach them who Columbus really was and who we really are. Your donations in the past helped us develop this curriculum, and your donation now will ensure that it is widely used."
11. **Thanksgiving Day:** "Your donation of $14.50 will provide a family with turkey and all the trimmings. Give whatever you can."
12. **Any holiday:** As _____ holiday approaches, we are just $1,000 short of our goal to provide _____ to all the seniors in our community. Help us celebrate this holiday with your extra gift of $ _____."

Old Stand-Bys

1. **Anniversary:** Our organization is now entering its ____ year of service to the community. Celebrate with us by sending $10 (or more or less) for every year we have existed. For your gift, we will be pleased to send you our special anniversary calendar. For those donating $1,000 or more, there will be a special reception with Famous Person at the home of Important Person."
2. **Pledge:** "Did you ever wish you could give more? Would you like to be a major donor, but can't afford it? Now you can. By joining our Monthly Donor Club, you can give $10, $20, $50, or whatever you wish on a monthly basis. You can do this by automatic charges to your credit card, direct debit from your checking account, or we can send you convenient reminder envelopes."
3. **Famous Person:** "I'm _____ . You may have seen me on television. In my personal life, I am very concerned about _____ . From your support of _____ Organization, I know you are, too. Will you join me in making an extra gift and ensuring that this important work continues?" (Famous Person can be truly famous, like Jimmy Smits or Oprah Winfrey, or it can be someone well known and well respected in your community.)
4. **Another member:** "My name is Joe Murphy and I have been a member of Right On Group for five years. In that time, I have witnessed the malicious efforts of our elected leaders to deny us our rights. All that stands between us and them is Right On Group. In the past five years, Right On has succeeded in _____, _____, and _____. That's why I am giving a little extra this year. My additional gift of $15 is not a lot for me, but if all our members gave at least that much, it would really add up."
5. **The story that might have been sad, but ended well because of your group:** "Ruthie is ten. She ran away from her violent stepfather two years ago. She was brought to our program from the streets of New York City where she was found wandering alone, penniless and dazed. Today she is a good student and has found friendships with her classmates. She needs the support of our structured program, but with continued counseling Ruthie can achieve her dream of becoming a judge. You have helped Ruthie and five hundred children like her. Help us help more. Please send your extra donation today."
6. **Urgent need:** "We have an urgent need to raise $2,000 to alert the public to the efforts of our city council to sell Vacant Lot to developers. We have been working for four years to have that lot turned into a community center. The developers want to make it into condos that no one in our neighborhood could afford. Help us stop this gentrification. Send your extra gift today."
7. **Specific project:** "Our day care center is in desperate need of new playground equipment. The quality of day care is threatened by the dilapidated swing sets and slides that are all the children have to play on. To replace the whole playground will cost $5,000. Will you make an extra gift today toward that goal?"

Combination Appeals

1. **Monthly donor to a specific project:** "Please join our Food for Thought Donor Club. For $10 a month minimum donation, you will help us keep serving one hundred meals daily at our Parish Hall. In return we will be pleased to send you our special newsletter, *Food For Thought*."
2. **Request for funds and new members in honor of an anniversary:** "In honor of our second anniversary, we are forming a 2 x 4 club. Send us any combination of money, as long as it has two's in it—$2, $2.22, $222, $22.22, and send us the names of 4 people who you think will be interested in joining. To thank you, we have had a special anniversary pin designed by one of our members. It is a 2 x 4, in a shape that will surprise and delight you. Join today."
3. **Any of the above appeals with a premium:** "If you send your special gift before _____ date, we will send you free an autographed copy of *A Great Book* by A. Famous Person."

Education for Environmental Sustainability

by David L. Haury

ABSTRACT: "Sustainable development" considers environmental issues and objectives interdependently with economic issues and objectives; (b) is committed to social equity and the fair distribution of environmental benefits and costs and (c) offers an enlarged view of "development" that extends beyond simple measures of "growth" to include qualitative improvements in daily life. This paper discusses what might be covered in education for sustainability and offers an overview of available resources.

KEYWORDS: environmental education, sustainability

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J. Wildlife Rehab. 24(1): 20–22

Early in the final decade of the twentieth century, the largest group of world leaders ever to assemble defined what may be education's greatest challenge and responsibility: to help citizens of the world prepare for a future of sustainable development (Sitarz 1993). Sustainable development has been defined over the years in a variety of ways, but Jacobs (1993) has suggested that all definitions have a core meaning characterized by three elements: (a) consideration of environmental issues and objectives interdependently with economic issues and objectives; (b) a commitment to social equity and the fair distribution of environmental benefits and costs, both geographically and across human generations; and (c) an enlarged view of "development" that extends beyond simple measures of "growth" to include qualitative improvements in daily life.

The educational challenges for sustainable societies are great for several reasons: (a) the global sustainability challenge is unprecedented in both magnitude and complexity; (b) there is no history of societies willingly and deliberately taking steps to institutionalize restraints and change individual and collective behaviors to achieve greater sustainability; and (c) a constructive educational response must include a comprehensive, coordinated attempt to redefine the human role in nature and reexamine many assumptions, values, and actions we have long taken for granted (Orr 1992). We must "prepare each student to lead a sustainable lifestyle" and "place ecosystems concepts at the intellectual center of all disciplines." (Disinger 1993).

In the United States, President Bill Clinton responded to the challenge by creating the President's Council on Sustainable Development (online at www.gcrio.org/edu/pcsd/toc.html). The council, in turn, convened a National Forum on Partnerships Supporting Education about the Environment, and produced a report, *Education for sustainability: An agenda for action* (1996). In outlining an array of strategic actions and initiatives promoting education for sustainability, the report focuses on six themes:

- Lifelong learning within both formal and nonformal educational settings
- Interdisciplinary approaches that provide themes to integrate content and issues across disciplines and curricula
- Systems thinking as a context for developing skills in problem solving, conflict resolution, consensus building, information management, interpersonal expression, and critical and creative thinking
- Partnerships between educational institutions and the broader community
- Multicultural perspectives of sustainability and approaches to problem solving
- Empowerment of individuals and groups for responsible action as citizens and communities

These themes reflect an acknowledgment that education about the environment and sustainability is interdisciplinary in nature, must allow for multiple perspectives, depends on collaboration across agencies and groups, and presumes a lifelong path of learning that extends through all levels of formal education into a variety of nonformal settings. The task, simply put, is to transform prevailing mindsets to recognize the long-term limits that nature imposes and the need to "nurture, rather than jeopardize, the ecological systems" that support our activities (Smith 1992, p. 90).

What Is to Be Learned?

Just as there is a wide range of definitions for sustainable development, there is great diversity in the characterizations of education for sustainability. One starting

place in considering the content of education for sustainability is to examine the relationship with environmental education. The North American Association for Environmental Education (NAAEE) has developed a set of guidelines for environmental education, *Excellence in Environmental Education—Guidelines for Learning (K-12)* (1998). The guidelines provide a conceptual framework for environmental education; they are organized around themes that are well aligned with the ideas shaping education for sustainability. Indeed, some have suggested that education for sustainability has become the new focus and justification for environmental education (Tilbury 1995; 1997).

The organizing themes for the NAAEE guidelines are as follows:

- Questioning and analysis skills
- Knowledge of environmental processes and systems
- Skills for understanding and addressing environmental issues
- Personal and civic responsibility

These themes clearly complement the six themes of *Education for Sustainability*, and they reflect a connectedness among natural systems, human actions, and the need for individuals and groups to analyze issues, make decisions, and take actions that support sustainable ecosystems. It is also clear from these two sets of themes that teaching for sustainability cannot be relegated to a single course or subject area; the themes of education for sustainability must come to permeate all subject areas at all educational levels (Munson 1997).

Neal (1995) has suggested a four-component framework for teaching about sustainable development: (a) people, (b) environment, (c) economics, and (d) technology. The component focusing on people would consider such matters as human populations, health care, literacy, equity, and urbanization. The environment component would foster awareness of issues related to water supplies, waste disposal, energy use and pollution, farming practices, and habitat preservation. Matters related to trade, expenditures on defense, wasteful consumption, poverty, and access to resources would be considered in the economics component. The technology component would focus on control of emissions, fossil fuels, transportation, and industrial processes.

Rather than prescribe the content for sustainability education, Tilbury (1995) has suggested combining approaches that build on past practices but lead to an outcomes-oriented futures perspective. She characterizes traditional environmental education as being "about" the environment; students gain awareness, knowledge, and understanding of human-environment interactions, usually within the context of a science, social studies, or geography class. Another common approach is education "in" the environment where experiential learning fosters both awareness and concern for the environment. To these components, Tilbury would add education "for" the environment that would promote "a sense of responsibility and active pupil participation" in resolving environmental problems" (p. 207).



SILVERANDER, ETHNOGRAPICS

Sustainable education teaches an understanding of human-environmental interactions.

As Sitarz (1998) has suggested, education for sustainability is not a new course of study or new content, but rather "it involves an understanding of how each subject relates to environmental, economic, and social issues" (p. 202). Developing the content of this new educational dimension will require "educators at all levels [to] reach beyond school walls to involve parents, industry, communities, and government in the educational process" (p. 200).

One way to begin the process is to create environmentally safe and healthy school buildings and grounds where daily routines and facilities reflect attention to environmentally sound practices. *The Blueprint for a Green School* (Chase 1995) is a comprehensive guidebook that provides background information, activities, and resources for creating environmentally sound learning environments.

Challenge to Communities

Though sustainable development is a national and international issue, it becomes locally defined through actions and decisions within cities, neighborhoods, and communities. It is clear from the nature and magnitude of the challenge that providing education for sustainability will require communities to view schools as components within the educational system, not the sole agents responsible for education. Indeed, education for sustainability will not be sustained unless communities embrace the concept and systematically build sustainable patterns of living where the local economy, policies, services, resource consumption, and land-use regulations meet the needs of residents while preserving the environment's ability to support the desired standards of living into the future. Roseland (1998) has developed a practical handbook for communities ready to take the challenge, and the Izaak Walton League of America has produced several community-oriented workshop guides on sustainability, including *Monitoring Community Sustainability* (1998). This and other curriculum materials associated with the league's Sustainability Education Project are described online (see www.iwla.org/sep/). One possible community education strategy would be to involve school students in the collection and reporting of data related to environmental indicators. Community Sustainability, a minicurriculum produced by the Izaak Walton League for grades 9–12 (Hren and Hren 1996), includes guidelines for conducting a community sustainability monitoring project.

Another curriculum guide produced by Zero Population Growth (Wasserman 1996) for middle-school students includes activities that lead to development of a Quality of Life Index. Developing an index with ten community indicators is one of the culminating activities after students have examined general principles relating to population dynamics, use of natural resources, and global issues.

The supplementary curriculum materials described here represent modest moves towards engaging students in local actions that promote community sustainability. The long-term goals of education for sustainability will be realized, however, only when communities build on these efforts and involve schools in comprehensive plans to create sustainable communities. More resources supporting such efforts are available through the following websites:

Second Nature: Education for Sustainability
www.secondnature.org

President's Council on Sustainable Development
www.whitehouse.gov/pcds/

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The 24th IWRC Annual Conference

Call for Papers

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Each year the International Wildlife Rehabilitation Council (IWRC) invites wildlife rehabilitators and associated professionals to share their experiences, knowledge, and skills with the wildlife-care community. Our annual conference audience will include veterinarians, rehabilitators, environmental educators, and administrators. All submissions are subject to review by the conference committee.

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A Penguin Feeding Box

by Barbara Callahan

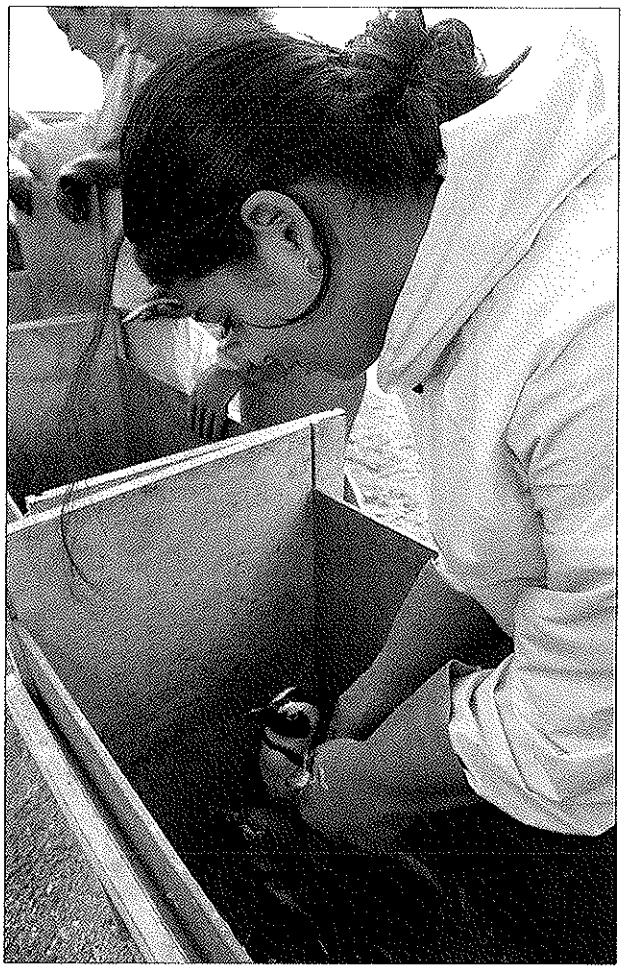
In 1994 the International Bird Rescue Reseach Center helped with the rehabilitation of almost 10,000 African penguins that had been oiled by the sinking of the *Apollo Sea* in June of that year. The local rehabilitation center, the South African National Foundation for the Conservation of Coastal Birds (SANCCOB), had cared for hundreds of penguins in the past, but this was a monumental task, and they were in need of assistance. During this response, a newly designed penguin feeding box was put into use for the first time.

One of the biggest challenges in the captive care of wild penguins is getting the birds to eat. Generally, these birds must be force fed. This is stressful to birds and physically demanding for the handlers. When penguins first come into a rehabilitation center, they are force fed fish and given fluids by gavage. Once stable, the birds are encouraged to eat fish presented from the hand. They don't take readily to this, and fish may need to be presented a number of times. Once the penguin shows interest, the handler continues to hold the fish (always presented head-first) until it is approximately half in the mouth of the penguin. This prevents the bird from dropping the fish onto the ground, where it would not be picked up again by the bird and would go to waste. African penguins quickly become used to this method of feeding.

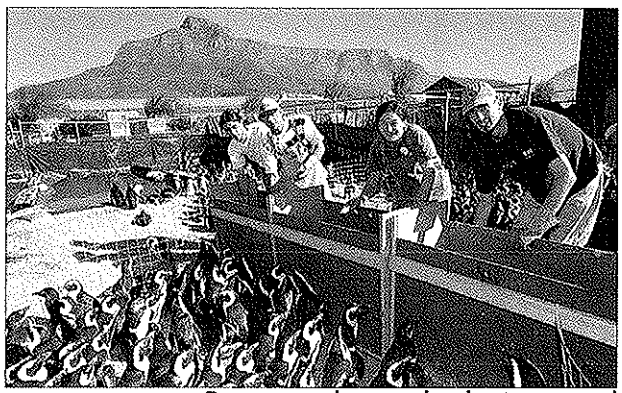
Following the *Apollo Sea* spill, rescuers had hundreds or even thousands of birds to feed each day. It was difficult to keep track of which birds had been fed. To ensure that each bird had eaten, 76.2 cm high x 91.44 cm across x 35.56 cm deep (30 in x 36 in x 14 in) feeding boxes were designed and placed in long rows that provided a barricade across individual pens. The boxes have sliding panels on the front and back. Each day, the barricades were set up across the pen, with all the penguins on one side. The front panels were then opened, 3–6 birds were herded into each box, and the panel was closed. The human feeders stood outside the boxes and leaned over them to feed the birds. The penguins were offered fish from the hand and allowed to eat as much as they wanted. Once the birds stopped eating, the back panel of the box was opened and the birds that had eaten were allowed to enter the back half of the pen. The birds that hadn't eaten—or hadn't yet learned to eat fish from the hand—were allowed to go back to the main group and try again.

In most cases, penguins learn to feed in this manner within a day or two. Using the feeding boxes greatly reduced the stress on the birds of being picked up and force fed, allowed them to eat as much as they chose, and made it possible to know that each bird in each pen had been fed at least once per day. After all the birds in a pen had moved through the feeding boxes, the boxes were removed for the remainder of the day, and the penguins were allowed to free feed from the hand as often as they liked.

This technique has been successfully used in subsequent rehabilitation of large numbers of birds, including the enormous rescue effort the was mounted in the wake of the MV *Treasure* oil spill of August 2000 (see "A Case Study of the World's Largest Seabird Rescue Effort, p. 3). JWR



JON HRUSA



JON HRUSA

Rescue workers and volunteers used the feeding boxes to ensure that African penguins affected by the *Treasure* oil spill receive the necessary nutrition.

COLUMN

Open Minds

PICK A THEME...ANY THEME

by Kieran Lindsey

Let's get serious: What is the goal of your education program?

If all you want to do is entertain your audience, you probably don't need much help from me or anyone else. Wild animals are appealing enough—in person or beautifully photographed—to grab and hold just about anyone's attention for the duration of a thirty- to forty-five-minute presentation. That's one of the reasons animals so often are used in advertisements. There you are, mindlessly paging through a magazine, when you spot...a raccoon sitting in a LazyBoy® recliner. Now they've got your attention. At least for thirty seconds.

But if the goal of your education program is to educate as well as entertain, we need to talk about themes.

Why themes? Because research has shown that audiences will remember the theme of a presentation long after they have forgotten the facts, figures, and humorous stories. There is no doubt that audiences find nonthematic presentations entertaining. Ask them on their way out the door if they had a good time and they'll usually answer with an enthusiastic "Yes!" But ask them thirty minutes later what they learned and you'll be sadly disappointed. When communication isn't thematic, our message gets lost.

Using themes is a simple, tried-and-true method for improving audience retention and increasing the chance your audience will want to act on what they've just heard—with a donation, by signing up to volunteer, or writing a letter to their state representative.

Most audiences find thematic presentations easier to comprehend and more interesting than those that aren't unified by a clear theme. Revealing the theme early on helps the audience to see the relevance of the rest of the information you provide. Education psychologists call this an "advance organizer" because when we know in advance where the presentation is going, its easier for our brains to sort and store the information.

Many people use the terms "topic" and "theme" interchangeably, but they're actually quite different. The topic of a presentation is simply its subject matter. A theme is the central or key idea; the specific message you are trying to communicate. Many different themes can be developed around a single topic. **For example:**

Topic: Bats
Themes: *Bats are important pollinators.*
Our native bats are disappearing.
Bats fly with their hands.

You could probably add to this list without much effort. All you need to do is think of all the different ways you can complete the following sentence? "When it comes to bats, I think it's important for people to understand that...." Try it for yourself. Fill in the blank and you've got a theme.

Still feeling unsure about your theme-writing skills? In *Environmental Interpretation: A Practical Guide for People with Big Ideas and Small Budgets*, author Sam Ham offers three steps guaranteed to help anyone to write a theme.

Step 1: Choose your general topic (thematic presentations) and use it to complete the following sentence:

"Generally, my presentation is about thematic presentations."

Step 2: State your topic in more specific terms and complete this sentence:

"Specifically, I want to tell my audience about the importance of using themes for education programs.

Step 3: Express your theme by completing the following sentence:

"After hearing my presentation, I want my audience to understand that using themes makes education programs more effective.

Resulting Theme Statement: *Using themes makes education programs more effective.*

Themes should be short, simple, complete sentences. Each theme should contain only one idea. The statement

> *Snakes are beautiful and help keep rodent populations in check*

should be separated into two themes (and two different presentations):

1. *Snakes are beautiful.*
2. *Snakes help keep rodent populations in check.*

Too often environmental educators want to hit the audience with everything we've got, right now, while we've got their attention. After all, this may be the *only* chance we have to reach these people. We want to say (take a big breath),

> "*Please* don't kill snakes because they really aren't slimy, they're soft and smooth and beautiful, and most of them aren't venomous, and they're important, too, because they eat rats and mice, which sometimes carry diseases that affect humans, and those same pests can damage agricultural crops, and besides, everything in nature is connected and you can't remove one strand without damaging the whole web!"

Unfortunately, in trying to give the audience everything, they often walk away with nothing. One of the most important—and difficult—steps in creating an effective presentation is deciding what to leave out. Themes help simplify this process—anything that doesn't support the theme, whether it is a fact or a story or a photo, is set aside for another day—and another presentation. We have to trust that when we provide people with an entertaining *and* meaningful experience, they'll come back for more.

Your audience may be merely looking for an amusing way to pass an afternoon, but your time is too valuable to spend on simple entertainment. Your message is far too important to fall on deaf ears. There are many reasons for using themes in your education program, but when all is said and done, only one reason really matters—because they work. JWR

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

COLUMN

Food for Thought

CALCIUM: IT'S ELEMENT-ARY

by Janine Perlman and Astrid MacLeod

Welcome to the first Food for Thought column. This column will appear in each issue of the Journal of Wildlife Rehabilitation, *volume 24. It will offer an understanding of the nutritional needs of wildlife in captivity, so that you can prepare diets on which your charges will not merely survive, but thrive.*

Animals in the wild eat very particular foods, and there is always a reason for what they choose. We often wishfully believe that we can replace natural foods with substitutes that are convenient for us. Science is revealing that, as a result, the animal often suffers, in obvious or subtle ways.

Because this is the time of year when most rehabilitators are working with neonate mammals and birds, we've decided to begin by boning up on calcium.

Introduction

Because they have to build a bony skeleton, all young vertebrates have a few nutritional requirements in common. Mature skeletons are, of course, made of bone, but babies are born with skeletons largely composed of cartilage. They have to *ossify* their skeletons, or deposit the minerals required to make bones.

Bone must be hard and strong enough to support the body, withstand the stresses of locomotion, and protect vital organs. Bone becomes mineralized by the action of bone cells called *osteoblasts*, which, in a complex process, deposit the mineral *calcium phosphate*. In bone, the weight ratio of calcium to phosphorus is about 2:1. The faster an animal is growing, the closer to that ratio the diet should be, since most of the calcium and much of the phosphorus in food is required for bone formation. The diet must also have particular percentages (on a dry-weight basis) of calcium and phosphorus, providing sufficient but not excessive amounts.

In addition to calcium and phosphorus, vitamin D_3 is the third major necessity for bone formation. An excellent diet with adequate protein, minerals, often additional vitamin C, and either vitamin D_3 or exposure to sunlight is necessary for healthy skeletal growth.

Metabolic bone disease (MBD), causing weak, deformed, and broken bones, is often a result of diets that are insufficient or unbalanced in calcium, phosphorus, and/or vitamin D_3. Typically, diets that cause MBD are deficient in calcium.

Phosphorus

Phosphorus is needed at about half the level of calcium, for bone formation. As phosphate, it is central to the body's functioning and metabolism, as it is a component of nucleic acids (DNA and RNA), cell membranes, and energy-storing and energy-releasing molecules. Phosphorus is an element that is plentiful in many nutrient-dense natural foods. Foods of animal origin are particularly high in phosphorus. It is a mineral that is generally associated with protein. Young animals require so much protein that phosphorus almost never needs to be added to the diet.

Calcium

Calcium is notably required for the formation of bone and teeth, but it is also necessary for blood clotting, nerve and muscle function, pH regulation, and the activity of some enzymes. Most foods that are high in protein are low in calcium. The major exceptions are whole vertebrates (such as adult rodents fed to carnivores) and mammal milks.

Any animal that is still growing requires adequate calcium, above levels required by adults of that species. In rehabilitation, young, recently weaned mammals are often fed calcium-deficient diets. We have also recently learned that nestling songbirds require even higher levels of calcium than other growing animals, because their relative growth rates are so high.

Amounts and Ratios

Young mammals appear to need about 1% dietary phosphorus and 1.3%–1.5% calcium. This gives a Ca:P ratio of approximately 1.4:1. Young songbirds appear to need about the same amount of phosphorus (1% of the diet), but about 1.8%–2% calcium. This gives a ratio of about 1.9:1.

Note that while the target ratios and percentages happen to be the same in the overall diet of young animals, ratios and percentages often differ. For example, a food may be 0.1% phosphorus and 0.13% calcium. The *ratio* would be 1.3:1, but the percentages are one-tenth of what is needed in the diet. Most common foods have more phosphorus than calcium, so a more typical Ca:P ratio might be 0.4:1; thus there is not enough calcium present.

In nature, suckling mammals obtain their calcium in milk. Weanling mammals eat foods rich in calcium. In nature, the parents of nestling songbirds feed their babies a diet consisting almost entirely of insects, which are very low in calcium, and moderately low in phosphorus. Parent birds supply necessary calcium with bits of eggshell, limestone, or snail shells and give both phosphorus and calcium in bits of bone.

Adult mammals and birds require less phosphorus and calcium than do youngsters. In general, a diet of about 1% calcium and 0.5%–1% phosphorus is adequate, although antler formation and lactating, pregnant, or laying females require much higher levels of calcium. Adults also, of course, require vitamin D_3.

Calcium and Phosphorus Percentages

If dietary percentages of calcium and phosphorus are correct, the ratio will also be correct. However, the reverse is not true, so calculating the percentage of each mineral is necessary.

Dry Weights

Percentages must be calculated on a dry-weight basis, which is simply the weight of the dietary components without water.

Elemental Calcium

Calcium is not found in a pure, or elemental, state; it is always complexed with other molecules (anions), as *compounds*. The most bioavailable calcium compounds include calcium carbonate, calcium citrate, and calcium gluconate.

It is the amount of *elemental calcium* in the diet that matters. For example, calcium carbonate is $CaCO_3$, meaning that for every atom of calcium, there is also one atom of carbon and three atoms of oxygen. The carbon and oxygen together weigh 1.5 times that of calcium. Therefore, elemental calcium is only 40% of the mass (weight) of calcium carbonate.

Example

The label for Brand X kitten kibble says that it is 1.3% calcium and 0.96% phosphorus. It has 12% moisture. Calculate how to make a baby songbird diet that is 1.8 % calcium and 1% phosphorus, starting with 60 g of this kitten kibble.

The dry weight of the kibble is 60 g kitten kibble x (100% total ingredients – 12% moisture) = (60 g x 88%) = 52.8 g (round up to 53g).

To calculate the amount of Ca and P already present:

Ca = 53 g x 1.3% = 0.7 g
P = 53 g x 0.96% = 0.51 g

We want 1.0% phosphorus, which is close enough to 0.96% that no addition of P is needed.

However, we want a 2:1 ratio of Ca:P, with Ca approximately equal to 2%.

2 x 0.51 g P = 1.02 g Ca

We need to add 1.02 g (total needed) – 0.7 g (amount already present) = 0.32 g calcium.

Calcium is 40% of the weight of calcium carbonate ($CaCO_3$).

If W = the weight of the $CaCO_3$ that we need to add, then 0.32 g = 40% x W,

or W = 0.36/40% = 0.36/0.4 = 0.8 g.

Therefore, 0.8 g of pure calcium carbonate must be added.

1.02 g Ca/ 53 g total dry weight = 1.9% calcium.

The Ca:P ratio is then 1.02 g:0.51 g = 2:1.

Caveats

- Calcium supplements should *not* contain phosphorus. If they do, it is impossible to correct the amounts and ratios in most foods. Bone meal is therefore not a good choice.
- Ratios are *not* the same as percentages. The correct percentages of Ca and P will give the correct ratio, but not vice versa.
- Calcium compounds must be weighed; they cannot be measured volumetrically (in teaspoons, for example). One teaspoon of a fluffy powder weighs much less than a teaspoon of a dense powder. It is the weight that matters.
- All tablets contain binders and, usually, fillers that add to the weight of the tablet. They may contain other additives, as well. For example, an antacid table containing 200 mg of elemental calcium (or 500 mg $CaCO_3$) may weight 1.3 g, because of the additives.
- Avoid using supplements that contain sweeteners, artificial colors, or flavors.
- Do not use supplements containing vitamin D unless the animal presents a specific reason for doing so. Vitamin D may already be present if the food you are using has been fortified, or if you are adding vitamin and mineral supplements to food. Vitamin D toxicity is a possibility when it is oversupplemented.
- Calcium supplements in a variety of forms have been found to be contaminated with toxic heavy metals. Contaminated products have included bone meal, oyster shell, cuttlebone, and even antacid tablets. Although some types of products (e.g., bone meal, which should not be used to correct calcium levels) are more prone to such contamination, any product may contain them. Unfortunately, the U.S. Food and Drug Administration exercises little oversight of dietary supplements. Nevertheless, "human grade" supplements are probably safer than those sold for reptiles or other pets.

Supplemental Calcium

Calcium carbonate is a good source of calcium. It is most bioavailable as a powder, rather than as larger pieces. Its disadvantages include the facts that some sources are contaminated to some extent with heavy metals, and that many kinds of tablets contain sweeteners, dyes, and/or other undesirable components.

Note on Measuring Calcium

Many supplements are labeled helpfully—for example, "1 tablet contains 200 mg elemental calcium." In this case, you can use tablets as your units. Liquid supplements may say, for example, "60 mg elemental calcium per cc." In this case, it is fine to (and you must!) use volumetric measurements.

Specific Calcium Supplements

Calcium carbonate free of additives is not easily found. Some sources with products made for human consumption are:

- Puritan's Pride/SDV Vitamins 1/800/738-8482
- www.lef.org/prod_hp/php231.html

We do not know whether the levels of heavy metal contaminants in these products have been measured.

Other compounds, such as calcium gluconate or calcium citrate, should work well for most uses, but they should be additive free, and the amounts used must be calculated on the basis of elemental calcium.

Eggshells can be washed, boiled, and then dried in a slow oven to sterilize them. They can be ground to a fine powder and serve as an inexpensive source of calcium carbonate. Remember that only 40% of the eggshell is actually elemental calcium. You will have to calculate the amount required to correct a food, and then weigh the powdered eggshell to make sure you are using the required amount. Again, the correct amount cannot be measured using teaspoons, as a teaspoon of calcium carbonate will rarely contain the same amount each time (because of compression through settling, etc.). It must be weighed.

Making No Bones about It

Calcium should never be "guesstimated." If you are careful to provide the correct amount of calcium in a powdered and highly bioavailable form, and make sure that dietary vitamin D_3 is supplemented if full sunlight is not provided daily, you will ensure that your charges do not develop problems related to calcium deficiency. JWR

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

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COLUMN

Operating Instructions

THINGS THAT GO BUMP IN THE NIGHT

by Nathalie Karvonen

If you operate a hotline, you surely receive calls about "nuisance wildlife." With all the calls you receive about sick and injured animals, and the incessant ringing of "baby season" phone lines, it's tempting to consider wildlife conflict calls a low priority. Don't make that mistake.

Why should conflict calls be a high priority for your telephone staff? I'll give you five good reasons:

1. **Good Public Service.** Wildlife conflict resolution is one of the best ways to build credibility for your organization as *the* wildlife experts in your community. It is also a great way to cultivate future donors!
3. **Wildlife Injury Prevention.** The most common public reaction to a wildlife conflict solution is fear. Certain that the animal poses a grave risk to human life or health, people often respond with violence. By providing factual information and a calming influence to these callers, hotline staff can prevent wildlife injuries and deaths. This same information can help callers who have a "live and let live" attitude from unintentionally harming wildlife.
3. **Wildlife Orphan Prevention.** Trapping activities tend to increase during baby season, and in my experience, the animal trapped is usually a mother with dependent young. These babies are either never found (and subsequently die), are euthanized by animal control agencies, or become the responsibility of wildlife rehabilitators. Offering trapping alternatives means less work for you and your staff.
4. **Long-term Solutions.** When a member of the public calls about a conflict situation, they want the problems solved *now*. But we can help the caller understand that, with a little patience, they can achieve a long-term *humane* solution. This, in turn, helps prevent injuries and orphaning of wild animals.
5. **Promote Ethical Wildlife Removal Companies.** The number of wildlife conflict incidents continues to increase, and a growing number of private companies are stepping in to provide solutions—for a price. Although ethical wildlife removal companies do exist, Toronto Wildlife Centre's experience has been that the vast majority are *not* what we call humane. If the public doesn't get the help it needs from your organization, they'll look elsewhere. At the very least, you need to point them in the right direction.

Wildlife conflict calls are important, but so are the calls about injuries and orphans. So you need to develop protocols for dealing with nuisance calls effectively and efficiently:

Be a Good Listener. Let the caller talk freely about the situation (and vent their frustration, if necessary). Take notes and ask questions to prompt them for more information.

Provide an Explanation. Callers often feel they have been singled out for torment by a wild animal or group of animals. By explaining why an animal is denning under the deck or roosting on the balcony, you build empathy for the animal(s) and help the caller understand that this is not a personal attack.

Offer Understanding. Tell the caller you understand how they are feeling and share similar experiences. For example, "When I had a raccoon knocking over my garbage last year..." or "Four other people have called today about armadillos digging up their lawns...."

Think Short-Term. Offer a detailed explanation of how to handle the immediate situation—e.g., how to safely get the squirrel out of the fireplace.

But Don't Forget Long-Term. Explain how to prevent the situation from happening again—e.g., "once the squirrel is back outside, you should think about having your chimney capped."

Warn When Appropriate. It can be helpful to explain why callers should be cautious of private wildlife removal companies, and offer advice on how to choose a good one. Explain why trapping is rarely a humane or even permanent solution. Remind callers always to keep their own safety in mind.

Y'all Call Back. We give callers a lot of information to digest. Make sure the caller feels free to call back if they have any further questions or forget something you have told them.

Put It in Writing. Written instructions are usually easier to remember. If possible, mail the caller an information package (electronic or postal) or direct them to your website.

Use Your Lifelines. There will always be situations you are not expert at handling. Don't improvise! Use other resources and phone the caller back or refer them directly to another agency/organization/individual.

Follow Up. If possible, call back to find out if the situation has been resolved. Despite your best efforts to provide instructions the caller may not have understood fully. Or the situation may have changed.

Helping the public with wildlife conflict situations is one of the most important functions of a wildlife hotline. At the Toronto Wildlife Centre we consider helping nuisance calls so important we have run expensive ads in our local telephone directories under the "Wildlife Removal/Control Companies" section for the last eight years. We offer "FREE HELP" with nuisance situations, and the ad has been responsible for saving countless lives.

Every nuisance situation you resolve represents patients you won't have to admit, and huge amounts of time and money saved. It also provides the best possible solution for wildlife. JWR

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

COLUMN

By the Book

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

This column will appear in each issue of the Journal of Wildlife Rehabilitation, *volume 24. We invite readers to submit questions regarding wildlife law that they would like addressed.*

Question

We were looking through the IWRC website and were surprised to find specific dietary/raising information for robins. Is it IWRC's intention to provide this kind of information to the general public? We are under the impression that those caring for migratory birds must have a federal permit.

This information you are providing to the public will give them the tools to raise these birds without being associated with a wildlife rehabilitation center or in possession of proper permits. Is this breaking the law?

Answer

Posting specific bird-raising information on the IWRC website for the benefit of licensed rehabilitators is a good way to disseminate information. This is neither illegal nor improper. There are thousands of websites that provide information that can be used for both "good" and "bad."

Many law enforcement agencies provide updates on the latest type of criminal behaviors and weapons. Officers as well as the public can use this knowledge to increase their awareness and better protect themselves. Criminals can use this same information to commit crimes.

As an enforcer, I often look at a person's *intent* when deciding criminal culpability. In the example given, IWRC's intent is information transfer for members, most of whom are licensed wildlife rehabilitators.

IWRC also provides information explaining that a permit is required to rehabilitate migratory birds, including American robins. I found this by clicking the "Wildlife Emergency" button on the home page and scrolling to the end. It might be a good idea to have a "Legal Requirements" button so this information is more prominent and easily found.

Question

Are permitted rehabilitators breaking the law if they directly (in person or on the phone) give an unpermitted person information on raising or rehabilitating a protected bird?

Answer

The answer to this question requires a different approach. I know it is common for someone to declare that the bird they found is "theirs" and they are going to raise it themselves. My recommendation is to explain to the caller the permit requirements, why strict diets are critically needed for proper health and growth, and that feeding intervals for baby birds are very short.

By elaborating on things like the proper calcium-phosphorous ratio and other esoteric facts, their misdirected insistence may be overwhelmed, especially if you appear knowledgeable and credible.

If callers insist on raising the bird themselves, they should simply be told to do what is *best for the bird* and take it to a rehabilitator at once.

Knowingly giving an unlicensed person information to raise a migratory bird in their possession would be aiding and abetting them to violate federal law. This would make it a criminal act for the rehabilitator as well, akin to driving the getaway car. If you aid a person in any way to commit a crime, then you too are committing the same crime. However, it is legal and quite proper to advise a finder how to *temporarily* care for a migratory bird until it can be transported to a licensed facility.

This is often a very emotional issue for many rescuers. This may be their first encounter with an animal in need. You are the one who can make a positive impact on their attitude toward wildlife and help explain the importance of the laws that protect it. JWR

Rob Lee has been a special agent for the United States Fish & Wildlife Service (USFWS) for fourteen years. Prior to that he served as a refuge manager with USFWS for eight years. He is a certified wildlife biologist and has a master's degree in biological science from California State University, Sacramento. Comments and questions for Rob Lee should be sent to runmuki@aol.com or to By the Book, c/o Marianne Skoczek, 837 14th Street, San Francisco, CA 94114, USA.

NEWS BRIEF

USGS Issues Alert for Deadly Disease in Birds

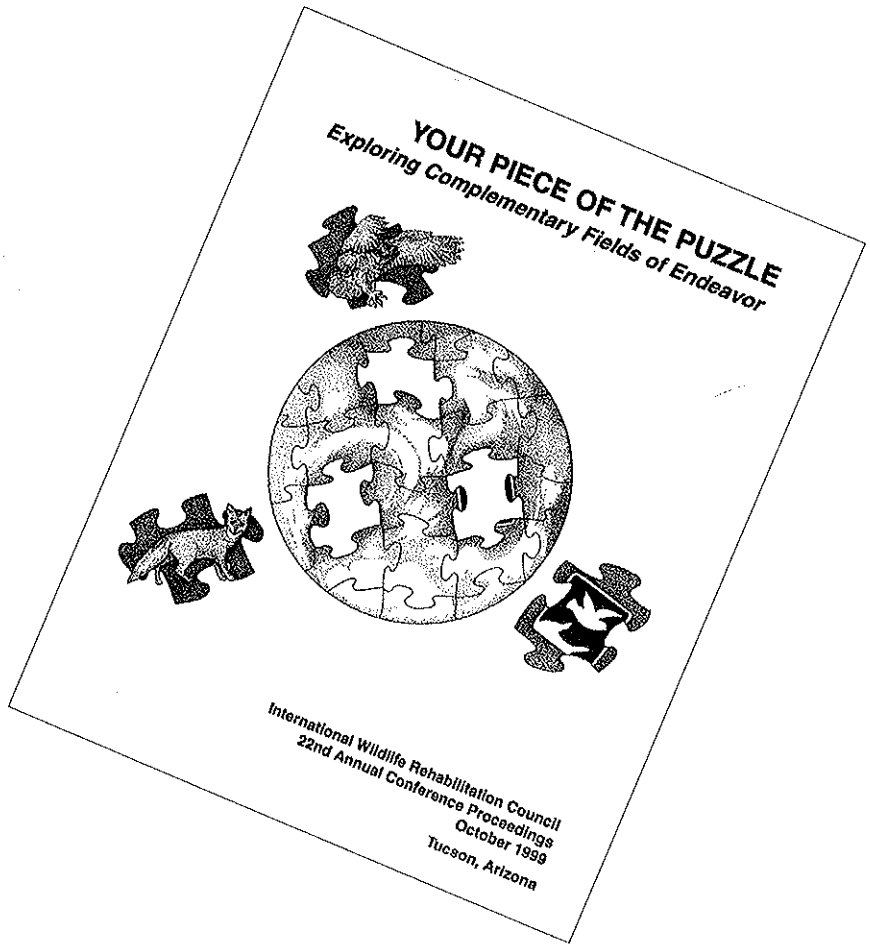
A deadly bird disease, avian vacuolar myelinopathy (AVM), is affecting mallard ducks, coots, bald eagles, and Canada geese in Georgia and the Carolinas, in the United States. The disease has not previously been confirmed in Canada geese. Pathologists at the USGS National Wildlife Health Center (NWHC) and the Southeastern Cooperative Wildlife Disease Study (SCWDS) made the diagnoses.

Affected birds may fly erratically or not at all. They may crash land, swim tipped to one side with legs or wings extended, or may be in the water on their back. On land, birds may stagger and have difficulty walking (appear intoxicated). Birds are usually alert and may bite even if unable to escape capture.

Research efforts indicate the cause is most likely a chemical substance, either one that is naturally occurring or human-made. Many agencies are continuing their efforts to determine the cause of the disease.

The risk AVM may pose to humans is unknown. Avoid handling wildlife that have died from unknown causes, or do so with caution using waterproof gloves or an inverted plastic bag. Keep freshly dead birds chilled on ice or refrigerated, but not frozen, and contact the NWHC (608/270-2400) or the SCWDS (706/542-1741). JWR

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FROM THE LAST ISSUE...
CASE XIV

A Question of Finality

The loosely associated group of rehabilitators at the local Wildlife Intake Center were saddened by the need to take two young raccoons to the vet to be prepared for rabies "testing." The animals had been brought into the state without a permit and then illegally sold to a member of the public who had raised them for about a week, until one of the animals had bitten a child. They weren't sure which animal had done it. At this point, the "owners" felt the raccoons should be turned over for rehabilitation. To make matters worse, when the animals were brought into the center, the staff member in charge had not followed established protocol.

The center's protocol was to put incoming mammals in a quiet, dark place, then contact a mammal rehabilitator. Regional endemic zoonoses included plague, rabies, and hanta virus. Rehabilitators skilled in caring for certain mammalian species were acutely aware of the fatal potential of any of these diseases and were familiar with preventive measures. Some had received the pre-exposure vaccinations for rabies. Others were not vaccinated, preferring to risk exposure to the disease over the risk and cost of taking the pre-exposure vaccine.

Rebecca, the center manager, had hastily instructed George, another staff member and avian rehabilitator, to "make sure the raccoons were hydrated and put them in the dark room." George tried to offer them water, and was promptly bitten by the young male. Now both animals were on their way to be euthanized so their brains could be examined for the inclusions that signify rabies.

Meanwhile, Josephine, another member of the rehabilitation group, was reading an ad in the local newspaper offering to sell baby "orphaned" raccoons. Even one case of introduced raccoon rabies in this state—in which raccoon rabies had not yet been reported—could precipitate an extreme public reaction. Jo was afraid that notifying the state wildlife agency might result in immediate sacrifice of the baby raccoons, so she called Rebecca.

QUESTIONS FOR DISCUSSION

1. **What factors should an organization keep in mind when considering whether to require pre-exposure rabies vaccination for those rehabilitators who wish to work with rabies vector species (RVS)? What are the risks involved in receiving, and not receiving, the vaccinations? Who is "at risk"?**
2. **How can wildlife rehabilitators best protect themselves from potentially fatal zoonoses?**
3. **What kinds of public reaction could be precipitated by a human case of raccoon rabies?**
4. **Health departments have strict rabies reporting protocols. How can rehabilitators best help implement these?**
5. **Wildlife agencies have laws relating to importation of animals from out of state and the handling of some individual species. How can rehabilitators best help wildlife in the implementation of these laws?**
6. **What would you do if you heard of a rehabilitator accepting raccoons for care in a state where this is prohibited, then transporting them across state lines to be released in another, prohibition-free, jurisdiction?**

RESPONSES

I.

Nancy L. Hawekotte
Species specialist, carnivores and opossums
Nebraska Wildlife Rehab, Inc.

Once the damage is done in a case like this, it is essential to review the event critically and to survey the established protocol for loopholes and errors. Fix what needs to be fixed and train or retrain your personnel, emphasizing the gravity of understanding and following correct procedures.

In this case a series of mistakes in domino fashion occurred, even when protocol had been developed to provide redundant "speed-bumps" along the way—a good policy but obviously not foolproof when real life plays its hand.

Why did this happen? First of course, was the transportation of the animals across state lines. This state was apparently bordered by areas of known endemic rabies (and other life-threatening zoonoses). While we can hardly expect the public "rescuer" to carry equal responsibility to ours for knowledge of permit laws, most of us have procedures for defusing like situations. Our conservation agencies expect us to use them with the public, and most of us do. Our concern for wildlife mandates our activism in public education on these issues.

On intake, the facility was obviously unprepared for the animals' arrival and management. The haste of the center manager led to her forgetting or sidestepping both protocol and common sense.

Her first error was the transfer of the raccoons into the hands of an avian rehabber, when established protocol declared that only mammal rehabilitators handle rabies vector species (RVS). George was probably untrained and inexperienced in proper handling and restraint of mammals of any kind. Now he has in hand one of the most challenging RVS, and with an individual history of biting. The first speed bump was hardly noticed.

Secondly, the manager requested the raccoons be rehydrated, when protocol clearly stated no handling (speed bump #2). George was simply following instructions, but in his position he, too, should have known protocol, and should have refused or found a proper handler. George himself should have been the third speed bump.

Finally, one must assume George was not vaccinated. Pre-exposure vaccine and its requirement for handling all mammals at the center should have been an additional safety redundancy.

Obviously, both protocol and real-time center operations need to be revisited. Of the many questions one can ask, most important is, Why did the protocol fail? At the center of this is Rebecca, the manager. Why did she fail to follow standard practice, endangering all involved with this case? Questions that need to be asked while reviewing the situation include:

Center Operations

- Was the center inadequately staffed? Were there mammal specialists available, and if not, why?
- Was Rebecca in the midst of another emergency, or five? Was there a plan in place for decision making in the case of critical overflow?
- Did Rebecca have adequate administrative support from the board?
- Were the board's priorities clear, and had these been clarified to the center manager? Were their expectations of Rebecca realistic, allowing her to perform correctly vs. quickly?

Education and Training

- Was protocol clearly explained, and regularly reinforced, to be certain all understood both the content and the purpose of these procedures?
- Were *all* personnel trained? As an avian rehabber, did George even know of the protocol for potential mammal zoonoses?

Responsibility

- Were all center volunteers taught that it was as much their responsibility as the directors' to ensure that protocol is followed? Was George aware that he could refuse to take on this task, or find a mammal rehabber to do it, without fear of recrimination?

Vaccination Requirements

All individuals volunteering in the center should indeed have the right to opt out of pre-exposure vaccination. However, they should not then have the right to perform the same duties as those who have been vaccinated. The risk is too great not only for the individual caregiver, but for the center as a whole. Liability is one concern, public relations another. But the greatest is the personal responsibility should an individual contract the disease through inadequate oversight of center management. Volunteers who opt out of pre-exposure vaccination, and those who are not trained for handling mammal cases, should be limited to avian care. No exceptions should be made.

Wildlife rehabilitators can protect themselves only if they fully understand the risks: risks of contracting disease, risks of disease occurrence in particular species, risks of injurious behavior in those species. They should know how the disease itself progresses. They should fully understand protocol and be encouraged to follow it under all circumstances, acting as safety brakes when others do not.

Reinforcing Reporting Protocols and Implementation of Laws

While many rehabilitators shine in their ability to care for individual animals, all should recognize when these animals (and those as yet undiscovered) can affect entire populations and/or communities of species throughout their state and region. Legislation has been born of the growing awareness of this mechanism (not, as some have suggested, to thwart rehabilitators!). As hard as it is to submit a suspected individual for testing, when conditions require it, it is essential to follow through. Know your local agencies and who has a balanced and informed understanding of the disease. Generously share any information you may have that they don't. Don't sidestep your local officials, but be vigilant with protocol. It is possible that they will call you when trying to determine how to disseminate public information. Present yourself as their ally. In the long run, it pays off in ways you might be unable to foresee while in the midst of the situation.

Reporting Rehabilitator Infractions

Certainly we all share intense concern for the reputation of our organizations and the freedom to do our work. But most of us are familiar with situations in which the illegal activities of one rehabilitator have led to censure of all in the state, often meaning one to several species no longer legally receives our aid.

We also suffer largely from fear of our regulators and perhaps from past unpleasant experience with them. Their backgrounds are very different from ours, generally, and perceived gender bias can also play a role. Again, we must present ourselves as their allies and as their co-workers in resolving problems.

In the case of an acquaintance with the individual(s) involved in illegal transport, personal contact is in order first to be certain you understand the situation and to be sure they know the regulations. Perhaps they know the regs but do not know the endemic conditions of your area. Sensitive communication might be all that is necessary to convince them of the danger of their activities.

The above method being unsuccessful or inappropriate, reporting the knowledge to one's facility would be the next step. If you *are* the facility, it is your responsibility to contact the rehabilitator, prior relationship notwithstanding, to be certain you are not promoting rumors and to carefully measure the situation. If their position is intractable, there is no choice but to report to other authorities.

RESPONSES

II.

Kathy Van Buer, DVM
Davenport, Iowa

Factors to Consider Regarding Pre-Exposure Rabies Vaccinations

It is essential that people working with wild mammals obtain pre-exposure rabies vaccinations. Who is "at risk" for rabies? Anyone with exposure to potential rabies carriers: rehabilitators, veterinarians, animal health technicians, animal control personnel, and rabies diagnostic laboratory technicians are in the "frequent" risk category as classified by the U.S. Department of Health and Human Services (USDHHS). The USDHHS recommends a course of pre-exposure rabies vaccine followed every two years by a blood serology test and, if necessary, a booster shot.

In the United States, the raccoon, skunk, bat, and red fox are the species most commonly affected by rabies. However, rabies has been reported in most mammals, including cats and dogs, squirrels, groundhogs, beaver, white-tailed deer, opossum, otter, bobcats, and coyotes. While there is a great deal of information on rabies in domestic species, in wildlife there is no exact duration of onset from infection. Many animals may be carriers of the virus for extended periods without *any* clinical signs.

Human exposure to rabies is defined as an animal bite, scratch, or contamination of mucous membranes or un-intact skin by saliva or nervous tissue. Even careful rehabilitators get scratched or bitten at some time. Most of us rarely have completely intact skin. While the virus is most commonly spread in the saliva, rabies may also be spread across the placenta or through the mammary glands,

infecting immature animals who may present to rehabbers as orphans and subsequently exhibit clinical signs.

In animals, the primary clinical signs of rabies are usually abnormal behavior or altered disposition and progressive paralysis—sometimes the very reasons these animals are brought in for rehab! However, symptoms vary tremendously and may resemble other conditions such as head trauma or canine distemper. An already debilitated, rabid animal may be presented as hit-by-car or animal bite.

Finally, there is no definitive test for rabies in a living animal. The only method of diagnosis is through testing of fresh or cooled (not frozen) brain tissue.

Risks Involved in Receiving the Vaccinations

The costs of vaccinations vary depending on 1 ml IM (intramuscular) vaccine vs. 0.1 ml ID (intradermal) vaccine. They are high, but can often be offset by group purchase and vaccination. Risks are increased in individuals who are immunosuppressed, pregnant, or already in a diseased state. In otherwise healthy individuals, the most common reactions to the vaccine include swelling, redness, itching, or pain at the injection site. Additional possible systemic reactions include headache, nausea, muscle aches, abdominal pain, and dizziness. Finally, immune complex complaints, such as rash, nausea, vomiting, fever, fatigue or arthritis, can occur between two and twenty-one days following booster doses; these occur in up to 6% of recipients. No reaction has been life threatening.

In a case of potential rabies exposure and with pre-exposure immunizations, the individual would receive rabies vaccine (1 ml IM) on Days 0 and 3 in the deltoid region of the arm.

Risks Involved in Not Receiving the Vaccinations

Human rabies is fatal. The only treatment is prevention. Avoiding contact with the virus is the obvious best means of prevention. Transmission to humans is most often due to virus in the saliva of an infected animal coming into contact with nerve tissue of a susceptible host via a bite. However, transmission can also be via airborne passage of the virus or via blood on a raptor's talons or via handling of virus infected tissues during surgery or necropsy or exposure to virus via animal fluids. Because (a) animals can be asymptomatic carriers of rabies virus, (b) there is no positive test for rabies in live animals, and (c) testing is involved as well as costly, many potential rabies carriers are never even tested for rabies. There is a huge potential for unknown rabies exposure.

In cases of potential rabies exposure and without pre-exposure immunization, the following treatment protocol will be as follows: Rabies immunoglobulin (20 IU/kg body weight) will be given on Day 0 in divided doses around the bite wound and/or buttocks followed by rabies vaccine (1 ml IM) given on Days 0, 3, 7, 14, and 28 in the deltoid muscle of the arm. Without the pre-exposure vaccines, there is the need for the initial globulin injection, greatly increased cost, more time, inconvenience, and mental anguish concerning possible unknown exposure.

I have received rabies pre-exposure vaccinations. I have had my titer checked regularly and it has stayed at high levels. Because I work with a wide variety of animals, including pets and wildlife, having the protection of pre-exposure vaccinations gives great peace of mind. Although I am still careful to minimize my exposure to zoonosis, I feel much more comfortable working with at-risk species. Pre-exposure vaccination helps ensure that the one time you slip up won't be your last!

Current Recommendations for Pre-Exposure Rabies Vaccination

Human Diploid Cell Rabies Vaccine (manufactured by Pasteur Merieux Serums, distributed by Connaught Laboratories, Inc., Swiftwater, PA; 1/800/822-2463) is given in a series of three injections on Days 0, 7, and 21 or 28. Injections can be given as 0.1 ml ID or 1.0 ml IM.

The Centers for Disease Control recommends that persons have a serological test in lieu of routine rabies boosters every two years. If the titer has fallen below 1:5, a booster injection is given. Both ID and IM vaccines produce good results. The ID does not produce as long-lasting titers as IM. However, recipients of ID will have a good anamnestic response after a booster. The test requires that 2 ml of serum be shipped on ice overnight to your local or state Department of Health or to the Department of Veterinary Diagnosis, Veterinary Medical Center, Kansas State University, Manhattan, KS 66506. Call 785/532-5650.

How Can Rehabilitators Best Protect Themselves from Potentially Fatal Zoonoses?

First, the wildlife rehabilitator must be aware of the potential zoonotic diseases that they may encounter, know how transmission occurs, and be constantly aware of preventative measures that can reduce the likelihood of exposure. Inform your physician of zoonoses that you may be exposed to.

Isolate the possible host and use proper disinfection methods, careful disposal of wastes, and parasite control. Decrease the contact potential via the use of adequate ventilation, use of gloves/masks/protective clothing, and meticulous hygiene. Increase the resistance of the hosts by vaccinating high-risk groups and providing proper wound treatment, excellent nutrition, and maintaining good overall health. Minimize contact with potential source species. Restrict exposure to knowledgeable, properly trained and protected/vaccinated individuals.

RESPONSES

III.

Maggie Smith
Wildlife rehabilitator
Wildcare, Inc.
Dallas/Fort Worth, Texas

While cleaning the outside raccoon cage this past fall "Jaws," one of a litter of five, escaped. As I hadn't planned to release her on the property I reflexively tried to catch her, whereupon she bit me, several times, on my hand. Next time I'll let go faster.

My hand swelled and I thought I might need an antibiotic, so I called my doctor who, due to a change in insurance, didn't know me. She insisted that I follow the rabies protocol and get the post-exposure shots, even though I had rehabbed Jaws for five months and felt certain she didn't have rabies. So I went to my local ER and explained the situation, asking again just for an antibiotic if it was indicated. The ER doctor also insisted on following the protocol, so I took the shots, one in each hip.

To avoid returning to the ER (this was not an emergency after all), I called

the health department as I knew they had the pre-exposure shots. Their first comment was "What! A rehabber without her pre-exposure shots?" Ouch.

I made arrangements to pick up the vaccine and take it to my doctor, however my insurance company nixed the idea, explaining that it was inappropriate for me to transport it. Didn't matter that it was much more cost effective. So over several weeks I returned to the ER for my next four shots, each one given according to protocol in my deltoid. The only thing really hurt was my pride. It would have been easier to get the pre-exposure shots.

RESPONSES

IV.

Lee Theisen-Watt
Volunteer
Wildcare, Inc.
Dallas/Fort Worth, Texas

The most critical issue of this case is the responsibility of wildlife rehabilitators working with RVS. When an RVS has bitten a person, the decision is not in question. The animal must be tested.

The responsibility of the wildlife rehabilitator is clearly one of science, law, and ethics. Scientifically, RVS can carry and transmit the rabies virus. If the virus is transmitted and symptoms develop, the disease is always fatal. If prophylactic measures are properly administered, before or after exposure, the disease is preventable.

Legally, the policy of the USDHHS does not allow for quarantine of wildlife; the animal must be tested. Ethically, the decision to respond responsibly and professionally is incumbent upon any person who chooses to work in the field of wildlife rehabilitation and with RVS.

Minimizing the potential of transmission is crucial. Proper handling of an *animal* only when necessary benefits both the handler and the animal. Proper handling of a *situation*, when a RVS has bitten a person, protects human life. The potential for rabies transmission, though minimal, has a fatal consequence. Proper handling of this situation also results in respect from professionals in related fields who may be involved: veterinarians, physicians, public health officials. Finally, the species benefits: should a person die from the negligence of undiagnosed rabies, the public's knowledge could predictably result in fear-response eradication of the species in the area and a state-wide rabies quarantine preventing rehabilitation of that species.

Every bite is accidental. The goal and passion of wildlife rehabilitators is to rescue and save the animals in their care—not to euthanize and test for rabies. However, the right to make a decision regarding human life is not for us to make. Nor is the decision to risk human life to save an animal. The decision was made the second the animal bit someone. Thankfully all veterinarians we work with know and follow protocol for this situation. One may call one's vet and take the animal to his or her office to be tested.

The above is the hard-line. Is this always the best action? No one should be criticized for following the safest procedures regarding a fatal virus. One who does follow the safest procedures should be appreciated and recognized for making a difficult decision and braving possible disapproval from others who may choose to not follow public health protocol or behave irresponsibly.

I have been told by many experienced rehabilitators and veterinarians in the field that the following considerations may be evaluated:

- Who was bitten? A child? The rehabilitator who has current pre-exposure vaccination? Consider the life, responsibility, and liability. If a neighbor's child has been bitten, your responsibility to ensure the child's welfare is paramount. Do not gamble.
- Has the animal just arrived? Did you receive the animal because it was exhibiting signs of illness? Even if the animal arrived due to a physical injury, that may be secondarily caused from viral paralysis. Consult your veterinarian; make the right decision.
- Is the animal from a region where rabies is prevalent? Some countries and regions do not have rabies: know your area. The Department of Health can provide you with this information, including species of greater concern.

The only animals that may be quarantined are dogs, cats, ferrets, hooved stock, and some exotics. Dogs, cats, and ferrets are quarantined for ten days, larger animals for thirty. This is due to extensive testing of the rabies virus in these animals. Wildlife has no conclusive laboratory testing that allows for quarantine.

Rabies facts: The rabies virus travels up the peripheral nerve to the brain at a rate of approximately 1 cm per day. Once in the brain and salivary glands the animal is "shedding virus" and will transmit the virus through saliva. The animal may at this point exhibit a change in behavior—aggressiveness, paralysis or rigidity, and may drool, unable to swallow. The only conclusive evidence of rabies is to have the animal tested. Fluorescent antibody can be seen in the animal's brain.

We must always be cautious and not careless. Our field is demanding and requires sound judgment and critical decision making. Consult with your veterinarian and public health officials. Gain more information by contacting your local Department of Health; tell them you work with wildlife and would like to request information on rabies and RVS in your region. In the United States, one may also contact the National Center for Infectious Diseases, CDC at 404/639-1050 during working hours or 404/639-2888 nights, weekends, and holidays.

NOTE: The IWRC does not endorse any particular answer or viewpoint presented in these responses.

IWR

The Journal of Wildlife Rehabilitation's *"Up For Discussion" column comes to an end with this discussion of Case XIV, A Question of Finality.*

"Up For Discussion" has run in each issue of the journal for the past three volumes. It was developed and has been written by rehabilitators and authors Allan and Shirley Casey. Recognizing that wildlife rehabilitators' interests range far beyond the direct care and handling of wildlife, "Up For Discussion" has provided a forum for the discussion of the standards, ethics, policies, and community involvement that have a direct impact on the work rehabilitators do every day.

The Journal of Wildlife Rehabilitation *thanks Allan and Shirley Casey for their commitment to broadening the important and ongoing dialogue among rehabilitators.*

Conservation Classics: *Desert Solitaire*

by Edward Abbey
Reviewed by Kieran Lindsey

New York: Ballentine Books, 1991
337 pp; $6.99 U.S.
ISBN: 0345326490

Edward Abbey often has been compared to Henry David Thoreau, but I suspect he would have found Mark Twain a more kindred spirit. While works by all three men display irreverence and a keen and subtle sense of humor, there's an earthiness about Ed that Twain would have appreciated, I think. I'm not so sure about Henry.

Suffice it to say, if you enjoy Twain's work you might find Abbey a good fit. Then again, maybe not. Both authors shared an ability to polarize and inflame their readers.

When *Desert Solitaire* was first published in 1968, people weren't quite sure what to make of the book or its author. *Solitaire* is by turns rude and sensitive, analytical and mystical, full of love and rage. The same characteristics have been used to describe Edward Abbey, a man who, despite a fierce and passionate love of wilderness, could never have served as the environmental movement's poster child. I doubt he would have accepted the job if it had been offered.

The book grew out of three seasons Abbey served as a park ranger at Arches National Monument in southeastern Utah. On 1 April 1956, Abbey woke up in the cold government housetrailer he would call home for the next six months, crammed his feet into frozen hiking books, and stepped out into "the most beautiful place on earth." It was the beginning of a life-long love affair with the red-rock deserts of the American West.

It was also the beginning of a love-hate relationship with his employer, the National Parks Service. In one of the book's best-known chapters, "Polemic: Industrial Tourism and the National Parks," Abbey serves up a no-holds-barred critique of a Park Service policy that caters to cars and the tourism industry by covering the very places it is supposed to protect with an ever-increasing supply of asphalt. The trend toward development is understandable in a chronically underfunded agency, Abbey explains.

> "Old foot trails may be neglected, back-country ranger stations left unmanned, and interpretive and protective services inadequately staffed, but the [Park Service] administrators know from long experience that millions for asphalt can always be found: Congress is always willing to appropriate money for more and bigger paved roads, anywhere—particularly if they form loops."

The result has been the evolution of national parks into parking lots.

Abbey proposed a simple—and controversial—solution: keep automobiles, motorcycles, and all their motorized relatives out of the parks.

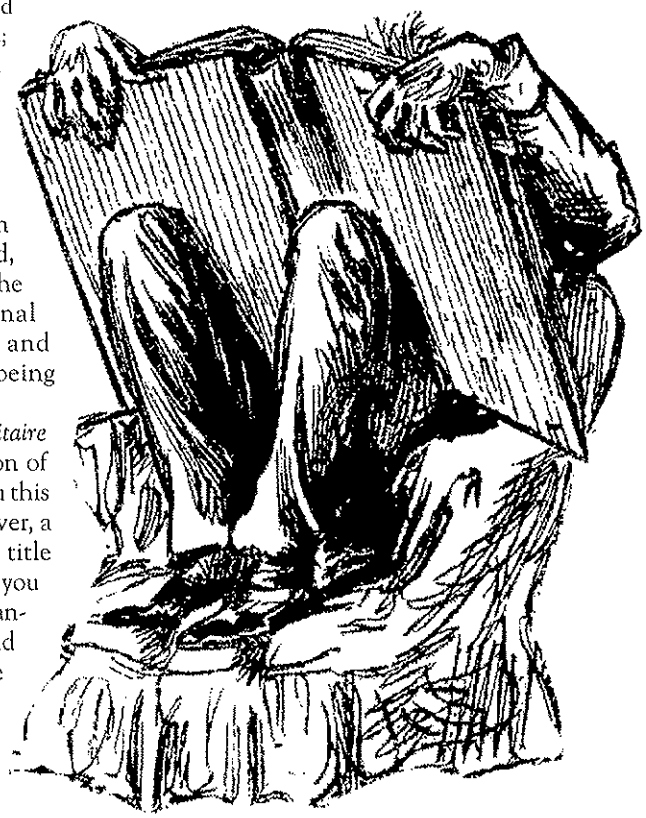
> "The Developers insist that the parks must be made fully accessible not only to people but also to their machines.... [but] We have agreed not to drive our automobiles into cathedrals, concert halls, art museums, legislative assemblies, private bedrooms and other sanctums of our culture; we should treat our national parks with the same deference, for they, too, are holy places.... Therefore let us behave accordingly."

Sadly, Abbey died too soon to see his ideas implemented, but plans to restrict traffic in the most heavily visited national parks, including Yosemite and Grand Canyon, are finally being given serious consideration.

Lest you think *Desert Solitaire* nothing more than a collection of gripe sessions, let me assure you this is not the case. It is not, however, a book about the desert, as the title might lead you to believe. Yes, you will find cliffrose and cactus, canyons and clouds, snakes and cattle and cowboys and Native Americans between the covers, but this book refuses to fall neatly into any one category (as evidenced by the fact that it can be found shelved in a variety of locations in bookstores and libraries... biography, biology, travel, nature—take your pick).

Since "you cannot get the desert into a book any more than a fisherman can haul up the sea with his nets," Abbey tried "to create a world of words in which the desert figures more as medium than as material." Tucked in the nooks and crannies of Abbey's desert landscape you'll find observations and ideas as relevant today as the day they were written. When he stepped outside his trailer that April morning, Edward Abbey found "a vast world, an oceanic world, as deep and complex and various as the sea." Somehow, he also found a way to place a little of that vastness inside the pages of a book. JWR

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



Veterinary Acupuncture: Ancient Art to Modern Medicine
(2nd Edition)
Edited by Allen M. Shoen, DVM, MS

St. Louis: Mosby, 2001
628 pp; U.S.$99 (hardcover)
ISBN: 0-3230-0945-X

This book serves as a comprehensive and sophisticated reference text in veterinary acupuncture. It was written for an audience of veterinarians and veterinary students who are trained and certified in the veterinary acupuncture discipline. Notwithstanding, those interested in the principles, scientific basis and practice of acupuncture will find this book well worth reading. However, the reader is advised that extensive formal education is necessary before one would be considered competent to practice any form of acupuncture. Most state and national laws consider veterinary acupuncture an act of veterinary practice, and these laws should be observed.

The editor is a well recognized instructor and authority in veterinary acupuncture. His second edition of the book is well organized. It is divided into three units and forty-four chapters. Dr. Schoen begins this edition with a brief treatise on the controversy of the efficacy of acupuncture that is meant to pre-empt skepticism and provide the reader with an opportunity for open-mindedness.

The first unit of the book covers the fundamentals of veterinary acupuncture, including the history of the discipline, Eastern concepts, anatomy of acu-points, neurophysiologic basis for acupuncture, basic techniques and instrumentations, and global acupuncture research studies. The next two units focus on acupuncture in small and large animals, respectively. These chapters are very comprehensive and detailed. Specific body systems and disease conditions are discussed relative to acupuncture treatment modalities. Musculoskeletal, neurologic, cardiovascular, respiratory, gastrointestinal, reproductive, immunologic, and dermatologic disorders are separately reviewed. There is a specific chapter on acupuncture for the avian patient that should be of interest to many wildlife rehabilitators and avian veterinarians. The chapters on large animal veterinary acupuncture are biased towards the equine patient. This is understandable considering the wide use of acupuncture in equine veterinary medicine.

The book's final unit discusses failures in veterinary acupuncture, and conjunctive modalities of acupuncture and manipulative therapy. In the reviewer's opinion, it is praiseworthy to have included a candid discussion on reasons why animals may not respond to acupuncture therapy. It provides a stable balance to the science and art of all facets of veterinary medicine and animal care. It requires objectivity and sensibility to critique the diagnosis, technique, mode of therapy, and dynamics of the patient's medical condition.

Those interested in a current, comprehensive overview of veterinary acupuncture will find this a highly valuable reference. Perhaps it may inspire its readers to pursue formal training in the discipline, or, at least, be more comfortable seeking veterinary acupuncture as an additional mode of therapy for use in wildlife rehabilitation.

Reviewer Patrice N. Klein, DVM, is a veterinarian with the Humane Society of the United States and serves on the IWRC's Veterinary Committee.

JWR

Small Animal Anesthesia and Analgesia
(2nd Edition)
by Diane McKelvey and K. Wayne Hollingshead

St. Louis: Mosby, 2000
334 pp; U.S.$34
ISBN: 0-3230-0273-0

Small Animal Anesthesia and Analgesia is a practical, informative, and easy-to-read reference book. The text includes information for both the practicing veterinarian and the veterinary nurse/technician. It may also be useful for laypersons who assist their veterinarian on occasion. This is a well-balanced book that covers both the science and art of anesthesia. Each chapter begins with a list of learning objectives and concludes with a short review and a series of self-assessment questions. There are multiple tables and charts that highlight important information contained within the text. The high-quality black and white photographs enhance the learning experience; some are labeled to illustrate specific points.

The book discusses how to prepare patients for anesthesia; proper use of equipment; mechanism of action and undesirable side effects of anesthetic drugs; workplace safety; monitoring using both electronic equipment and the anesthetist's eyes, ears, and hands; and analgesia. This book covers these subjects in just enough detail as not to overwhelm the reader. It is not a comprehensive anesthesia reference, but certainly is a practical and useful guide for the everyday practice of small animal anesthesia and analgesia.

The book covers anesthetic care of dogs and cats, with no specific reference to avian or wildlife patients. However, the principles of sound anesthesia practice are presented and the information is applicable to all anesthesia patients. This useful, affordable book would be a practical addition to any rehabilitator's reference library.

Reviewer Victoria M. Lukasik, DVM, DACVA, serves on the IWRC's Veterinary Committee.

JWR

The Rarest of the Rare: Vanishing Animals, Timeless Worlds
by Diane Ackerman

New York: Vintage Books, 1997
208 pp; U.S.$23 (hardcover)
ISBN: 0-6797-7623-0

I should preface this review by admitting I'm a big Diane Ackerman fan. While I've not read everything she's written, I've loved everything I've read, including *The Rarest of the Rare*.

I enjoy reading Ackerman for two simple reasons. First, she is an extraordinary wordsmith, and as a writer I find inspiration in her adept handling of prose. And as a wildlife biologist, Ackerman's books allows me to travel vicariously to exotic lands and explore

the world of field research. Her books remind me of the myriad reasons I chose my current career—and all the reasons why I did not choose the life of a field biologist.

In *Rarest*, as in her earlier work, *The Moon by Whale Light*, Ackerman visits with leading researchers on their own turf: William Gilmartin, director of the Monk Seal Project, at French Frigate Shoals; Hiroshi Hasegawa, a researcher of short-tailed albatross on Torishima Island, Japan; and Chris Nagano, chief entomologist for the Monarch Project in Southern California. While Ackerman reports on her experiences tagging butterflies and monk seals, she gives her readers a glimpse into the lives of those who work to preserve these disappearing animals.

Of particular interest to wildlife rehabilitators is the chapter on the National Zoo's (Washington, D.C.) efforts to return captive-born golden lion tamarins (GLT) to life in the rainforests of Brazil. In 1995 about four hundred GLTs could be found in the wild. The National Zoo wanted to raise that number by augmenting wild populations with zoo-reared individuals. The Reserva Biológica Poço Das Antas serves as a kind of halfway house for city tamarins. The National Zoo tamarins have been allowed to roam freely along rope pathways strung through the park's treetops, but they still have a lot to learn before they are ready for life in the rainforest.

Twice a year, Ben Beck flies south with complete GLT families, or with a spouse for a Brazilian GLT that has come of age. Upon arrival, the tamarins are placed inside cages filled with branches, bromeliads, and lengths of bamboo. Shoebox-shaped wire traps hold bananas, and will be used to catch the primates when it is time for release. Nest boxes complete the accommodations—tamarins prefer duplex homes, so the next boxes have been divided into upper and lower rooms.

Zoo-born tamarins become disoriented and helpless when set free in the rain forest. They lose their way in dense thickets. Not knowing how to find food or return to their families, many starve. As Ackerman explains, "Zoo animals have not learned how to forage, elude predators, be spatial, decipher their surrounding. Place a banana in front of them and they won't know how to open it... . They must also learn that some frogs and snakes are poisonous... . And they must learn about falling. In zoos, they ran along study branches, bars, or ropes; they clung to cage wires... . In the rainforest, twigs may snap, slime-coated vines may send them skidding, not all branches will hold their weight." Those of us working to return less exotic wildlife to a natural life also must keep these things in mind.

Before you consider trading in your current job for the glamorous and safe-but-exciting career of a nature writer, you'll want to pay close attention to Ackerman's account of traveling to Torishima by boat, plagued with seasickness. Later, attempting to climb down into the short-tailed albatross rookery fortress, Ackerman misses a foothold and slams into the cliff, breaking three ribs in the process. Not only must she continue down the cliff, she must later that day climb back to the top, where she will wait, delirious with the onset of pneumonia, for emergency transport to the nearest hospital, eighteen hours away by fishing boat. It will be months before she is able to lie down or stand up by herself.

If this sounds like just the life for you, I look forward to reading the accounts of your adventures soon. As for me, I'll continue my exploration of wild and dangerous places through the eyes and ears of Diane Ackerman.

Reviewed by Kieran Lindsey.

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SELECTED ABSTRACTS

MAMMALIAN SPECIES

Factors Influencing the Location of Deer-Vehicle Accidents in Iowa

Michael W. Hubbard, Brent J. Danielson, and Richarch A. Schmitz

J. Wildlife Mgmt. 64(3): 707–13

Half a million deer-vehicle accidents (DVAs) occur annually on North American roads, yet the possible factors associated with these accidents are not well understood. The authors examined the influence of landuse patterns and highway characteristics on Iowa DVAs from 1990–97. More than 25% of DVAs occurred at 3.4% of all mileposts in Iowa. Annually, the greatest number of DVAs occurred in May and November. The authors examined 2.59 km^2 areas around a set of randomly selected milepost locations (n = 1284) to identify factors that may have influenced DVAs. Stepwise logistic regression produced a 6-variable model (X^2_6 = 331.543, P = 0.001) that included 4 landscape variables, the number of bridges, and the number of lanes of traffic. A factor classification tree constructed from these variables revealed that 97% of mileposts associated with ≥ 4 bridges were "high" DVA sites (≥ 14 DVAs). The logistic model correctly classified 63.3% of 245 sites in a validation data set. The results suggest that mitigation of DVAs should be focused on areas with a high number of bridges.

Field Anesthesia of Wild Arctic Fox (*Alopex lagopus*) Cubs in the Swedish Lapland Using Medetomidine-Ketamine-Atipamezole

A. Alonso Aguirre et al.

J. Zoo and Wildlife Med. 31(2): 244–46

A safe and effective anesthetic regimen for use in arctic fox (*Alopex lagopus*) cubs was developed. During July 1996, six free-ranging 6–8 wk old cubs were captured near their den in Vindelfjallen Nature Reserve, Sweden. Medetomidine and ketamine HCl, followed by atipamezole, were selected for the anesthetic trial because of the

(continued on next page)

well-documented safety and efficacy of this drug combination in a broad range of species. The dosage regimen used was 50 g/kg medetomidine combined with 2.5 mg/kg ketamine followed by reversal with 250 g/kg atipamezole. Induction was rapid, with a mean induction time of 1 min and 32 sec (range: 58–150 sec). The cubs were anesthetized for a mean time of 18 ± 5 min (range: 13–25 min). Serially recorded heart rate, respiratory rate, temperature, and pulse oximetry were stable throughout the anesthetic period for all cubs. Anesthetic depth was suitable for safe handling and minor clinical procedures, including venipuncture. Following atipamezole, all cubs were standing within 12 ± 7 min (range: 5–24 min) and fully recovered at 27 ± 5 min (range: 19–36 min). This information will be useful for future captive breeding and management programs involving the endangered arctic fox.

Collisions Between Ships and Whales

David W. Laist et al.

Marine Mammal Sci. 17(1): 35–75

Although collisions with motorized ships are a recognized source of whale mortality, little has been done to compile information on the frequency of their occurrence or contributing factors. The authors searched historical records and computerized stranding databases for evidence of ship strikes involving great whales (i.e., baleen whales and the sperm whale). Historical records suggest that ship strikes fatal to whales first occurred late in the 1800s as ships began to reach speeds of 13–15 kn, remained infrequent until about 1950, and then increased during the 1950s–1970s as the number and speed of ships increased. Of 11 species known to be hit by ships, fin whales (*Balaenoptera physalus*) are struck most frequently; right whales (*Eubalaena glacialis* and *E. australis*), humpback whales (*Megaptera novaeangliae*), sperm whales (*Physeter catodon*), and gray whales (*Eschrichtius robustus*) are hit commonly. In some areas, one-third of all fin whale and right whale strandings appear to involve ship strikes. To assess contributing factors, the authors compiled descriptions of 58 collisions. They indicate that all sizes and types of vessels can hit whales. Lethal or severe injuries are caused by ships 80 m or longer; whales usually are not seen beforehand or are seen too late to be avoided; and most lethal or severe injuries involve ships travelling 14 kn or faster. Ship strikes can significantly affect small populations of whales, such as northern right whales in the western North Atlantic. In areas where special caution is needed to avoid such events, measures to reduce the vessel speed below 14 kn may be beneficial.

AVIAN SPECIES

Effects of Timber Harvests on Invertebrate Biomass and Avian Nest Success

Jeffrey P. Duguay, Petra Bohall Wood, and Gary W. Miller

Wildlife Society Bulletin, 2000 23(4): 1123–31.

Concerns over declining songbird populations have led to investigations of effects of various timber management practices on breeding songbirds. The authors assessed the influence of two types of practices, two-age and clear-cutting, on invertebrate biomass and avian daily nest survival in the Monongahela National Forest of West Virginia during summers of 1995 and 1996. They also examined relationships between invertebrate biomass, avian daily nest survival, and wood thrush (*Hylocichla mustelina*) nestling growth rates. Mean total invertebrate biomass collected per sample day and litter-dwelling invertebrates collected per sample day were 0.0614 g and 0.0254 g greater ($P \leq 0.10$), respectively, in the unharvested than clearcut treatment late in the season (2 June to 12 July) when most birds had young in the nest; whereas invertebrates that hide under tree bark during the day had greatest biomass ($P = 0.003$) in the two-age treatment during this same time period (0.1355 g greater than clearcut and 0.0616 g greater than unharvested). In addition, daily nest survival rates (216 nests) were greater in the unharvested than two-age treatment ($P \leq 0.05$). The lesser daily nest survival rates of birds breeding in the harvested treatments may be due to increased predator activity within these areas and/or reduced food supplies. Significant positive correlations between invertebrate biomass and daily nest survival rates of breeding birds, and faster growth rates of wood thrush nestlings in stands with a greater invertebrate biomass, suggest that changes in invertebrate biomass caused by silvicultural practices have an influence on breeding birds within these areas.

HERPETILE SPECIES

Habitat Use by Three Species of Snakes at the Middle Fork Fish and Wildlife Area, Illinois

W. Lawrence Keller and Edward J. Heske

J. Herpetology 34(4): 558–64

The authors used radiotelemetry to determine habitat use by 11 black rat snakes (*Elaphe obsoleta obsoleta*), five fox snakes (*Elaphe vulpina vulpina*), and four blue racers (*Coluber constrictor foxii*) at the Middle Fork Fish and Wildlife Area in east-central Illinois in 1997 and 1998. Black rat snakes selected forested habitats, whereas fox snakes and blue racers selected old fields and prairie restorations. No consistent association with forest-field edges was noted for any species. Fox snakes and blue racers were primarily terrestrial, whereas black rat snakes used all categories of vertical space but were primarily arboreal. Snakes were tracked to three hibernation sites, including an abandoned railroad trestle and two abandoned trash and construction-material dumps. These data provide the first comparative, quantitative descriptions of habitat use for these species in sympatry, and one of the few descriptions of hibernacula in a region dominated by row-crop agriculture.

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Are You My Mother?



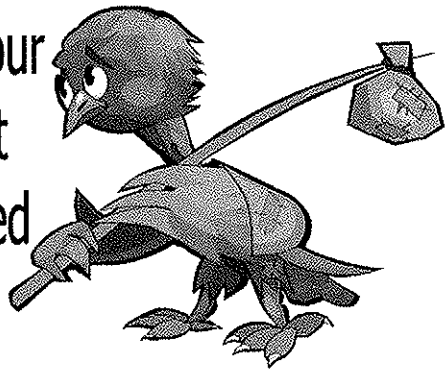
That's what those bright young eyes seem to ask. When you don't see the parent it's easy to assume you've got an orphan on your hands. Not so fast! Ask yourself...

Does the baby really need to be rescued?

- The mother usually is nearby but out of sight--give her a chance to retrieve the baby before you attempt to help.
- Injuries may require treatment by a wildlife rehabilitator.
- If you aren't sure what to do, call us for advice first.

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

Would you kick your kid out of the nest because he smelled funny?



Of course not. But thousands of nestlings are kidnapped each year based on this old wives' tale. Don't believe what you've heard--birds will not reject their offspring if they've been touched.

If the nestling is uninjured, put it back.

- If you can safely reach the nest, place the baby inside
- If the nest has been destoyed, use a basket or plastic planter as a substitute and hang it from a tree branch.
- If the parents don't return by nightfall, call a wildlife rehabilitator for advice.

If the nestling has been injured...

- Place it inside a box or paper sack.
- DO NOT feed the bird or offer it any water.
- Keep the nestling in a warm, quiet place away from radios, TVs, and curious children.
- Call a wildlife rehabilitator for help.

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TAIL END

by Astrid MacLeod



PHOTO: BLACK-TAILED PRAIRIE DOG (*Cynomys ludovicianus*) ©1997 THE LEARNING COMPANY, INC.

"We all get claustrophobic now and then, Pearl. Just take deep breaths."

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