Vol. 10, No. 1

WILDLIFE JOURNAL

Journal of the International Wildlife Rehabilitation Council



Raising Wrens

WILDLIFE HOTLINE! A Little Help From Your Friends!

Wildlife emergencies usually happen at the most inconvenient times — leaving many rehabilitators feeling isolated and helpless. Are you a rehabilitator who can't reach your veterinarian? Are you a veterinarian who can't reach your rehabilitator? The WILDLIFE HOTLINE was designed to help people in such instances by offering advice, or referring you to an expert who can. Whether it's a "strange" animal you've never seen before...or a "problem" you've never dealt with...the WILDLIFE HOTLINE is open 24 hours a day — manned by experts who care. (And the WILDLIFE HOTLINE is not limited to emergencies. It is also available for questions regarding any kind of wildlife care. Non-emergency calls should be made during regular hours; Pacific Time.)

CALL (707) 426-8757; listen for three beeps and then punch in your area code and phone number. If you have a rotary phone, have the operator punch in the numbers. You will hear eight beeps followed by a busy tone. Hang up. The WILDLIFE HOTLINE will return your call COLLECT and help you with your problem.

Another service of the International Wildlife Rehabilitation Council.

Need Some Help?



GUIDELINES FOR AUTHORS

The following is a guideline for articles to be submitted to the WRC Journal. All manuscripts submitted to the Journal are subject to review and revision by our editors.

1. Submissions should be typed and double-spaced, with 1 inch margins.
2. Full length articles run between 1500 and 2500 words.
3. Fillers and short articles run between 500 and 1500 words.
4. The writer's name and address and organization should be typed on the first page, and name and page number should appear on all consecutive pages.
5. It is the writer's obligation to obtain permission or reprint rights if submitted copy has been published elsewhere.
6. Provide a stamped, self-addressed envelope if you wish manuscript and/or photos returned.
7. We accept black and white glossy photos only, preferably 8 × 10.
8. We pay $25 for any feature article accepted; $5 for any fillers and "Handy Hints" under 500 words.

Articles should be mailed to: Editor, WRC Journal, P.O. Box 3007, Walnut Creek, California 94598.

WILDLIFE JOURNAL

Spring 1987 Vol. 10, No. 1

EDITOR
Jan White

ASSISTANT EDITOR
Susan Brain

ASSOCIATE EDITORS
Susan B. Kelly
Kirstine Thorne
Kathy Hobson
Debbie Marcum

EDITORIAL ADVISORY BOARD
James Hill, D.V.M.
Veterinary Pathology Consultant
Lynne Frink
Wildlife Rehabilitator

REGIONAL NEWS INFORMATION
Debbie Marcum
112 Springside Ave.
Georgetown, KY 40324

MARKETING & ADVERTISING
IWRC Journal - ADS
Jan White
1114 Cypress Lane
Davis, Ca 95616

Printing By Peninsula Blueprint
Mountain View, California

Typesetting by Ancona Graphics
San Mateo, California

Features

HAND-REARING CAROLINA AND BEWICK'S WRENS
Paul and Georgean Kyle
Wildlife Rescue, Inc., Austin, Texas 4

AVIAN NECROPSY RESULTS
Meryl Faulkner
Project Wildlife, San Diego, California 9

Departments

Editorial 2

Letters To The Editor 16

Cover Photo By Paul and Georgean Kyle.

● The IWRC Journal is designed so you can use a 3-hole punch and store back issues in a binder for easy reference.

The *Wildlife Journal* (ISSN: 0893-6560) is published quarterly by the International Wildlife Rehabilitation Council, P.O. Box 3007, Walnut Creek, CA 94598
© 1987 All Rights reserved. No part of the issue may be reproduced in any part without permission of the publisher. Advertising rates are available on request.

EDITORIAL ...

Taking another Step with the *Wildlife Journal*

A little over four years ago IWRC decided to upgrade our quarterly journal from a typewritten format to a typeset format. At that time we asked our editor, Gary Bogue, to design the new format beginning with Volume 5, No. 4. Soon it became apparent that the job required more than volunteer effort for the editor and with the increased cost of production, more funds would be required. At that time, there was not enough money to cover our costs in our operating budget, so Gary, Jay Holcomb (our President at that time), and myself, approached the *Animal Protection Institute* for grant assistance. Belton Mouras, then in charge, shared our vision and provided our organization with $5,000 a year for two years, to help fund the publication.

Gary had other job commitments and I then assumed the position of editor for the publication. Susan Kelly, then assistant editor, and myself spent the next two years trying to encourage rehabilitators to write up what they were learning. We then gleaned through the materials submitted trying to edit and print the best efforts. We continued refining the format and layout. The biggest challenge was convincing people in the field to write up their current efforts so that the information would be shared. There were many times when we did not have enough articles submitted to take an issue to press. Still we persevered and took pride in our work.

As we approached the end of Volume 8, a new volunteer, Susan Brain, who had expertise in biologial editing, came onto the journal committee and soon became the assistant editor. She recruited more active rehabilitators and thus increased our network of reviewers. Susan Kelly then was able to devote more of her time to the important details of journal layout and production matters. This shift allowed us to spread the work out more efficiently and let the committee volunteers work on areas that were of the most interest to them.

As we went to press on the Volume 9 series, I felt that it was time to take yet another step in our endeavor to produce the best journal possible. While for many years, committee members have been reviewing the content as well as grammar presented, I felt it was time to officially become a reviewed publication. We began looking beyond our committee and organization for people in our field or related disciplines to pick through materials submitted and give us ideas on how to make them as accurate as possible. It is very important that we use the scientific method when studying methods of care and that our conclusions be based on the data we have collected. These reviewers point out not only where we might be weak, but also where and how we can improve on our efforts. Authors reviewed in this way have found the input helpful.

It may take us a while to get all of our feature articles in each issue reviewed, but beginning with Volume 9, No. 3 we have included such articles. We plan to note the articles that are reviewed in each issue and will list our reviewers annually in the last issue of the year (Number 4).

We feel that upgrading the journal to a reviewed publication is just one more step in the professionalization of wildlife rehabilitation. We hope that our members will recognize our continued efforts to bring them the most up-to-date information in our field.

Jan White

Board of Directors

President
Kirstine Thorne
San Rafael, California

Vice-President
Lisa Hoefler
Monterey County SPCA
Monterey, California

Secretary
Michelle Green
Wildlife Rescue, Inc.
Palo Alto, California

Treasurer
Jan White
Suisun Marsh Natural History Assoc.
Suisun, California

Curt Clumpner
Progressive Animal Welfare Society
Lynnwood, Washington

Susan Brain
Wildlife Rescue, Inc.
Palo Alto, California

Margie Comstock
Peninsula Humane Society
San Mateo, California

Diana Granados
Alexander Lindsay Jr. Museum
Walnut Creek, California

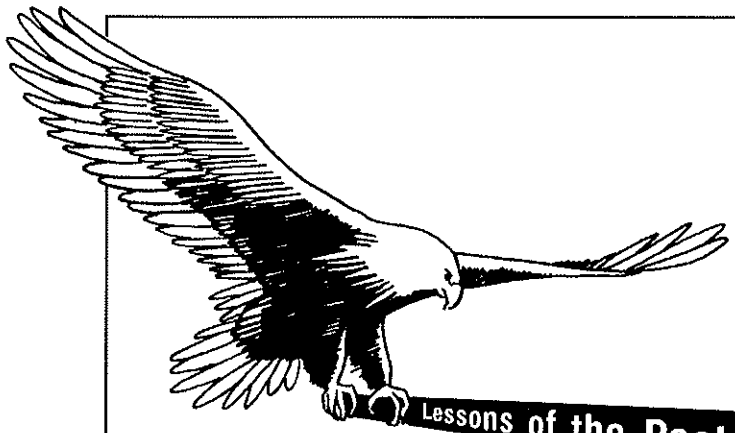
Elizabeth Daugert
Peninsula Humane Society
San Mateo, California

Jay Holcomb
International Bird Rescue
Berkeley, California

Kappy Sprenger
Wildlife Rescue, Inc.
Palo Alto, California

Dianne Pearce
Chesapeake Wildlife Sanctuary
Bowie, Maryland

NWRA Board Representative
Elaine Thrune
St. Cloud, Minnesota



Lessons of the Past—Pathways to the Future

Join
Wildlife Rehabilitators across America

Participate
in the 1988 IWRC Wildlife Rehabilitation Conference coming . . .

January 29-31, 1988
(Skills Seminars Jan. 27-28)

Tour of Elephant Seal Rookery
Advanced
Wildlife Center Displays
Raffle
Wet Labs
Tour of Wildlife Care Centers
Rehabilitator Networking Reception
Gala Banquet
Ethics
Wildlife Issues
Techniques
Back to Basics
Tour of California Academy of Science
Workshops
Commercial Displays
Poster Session
Skill Seminars

★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Plan to register before December 31, 1987, to guarantee place + discount on Conference

For more information please contact Conference Coordinators:

Margie Comstock
260 LaCruz Avenue
Millbrae, CA 94030
(415) 697-8531

Shape the Future

Curt Clumpner
P.O. Box 5574
Lynnwood, WA 98046
(206) 743-1884

CALL FOR PAPERS

Persons interested in presenting papers for the 1988 IWRC Conference please contact:

Curt Clumpner
P.O. Box 5574
Lynnwood, WA 98046
(206) 743-1884

For Paper and Presentation Guidelines

Hand-Rearing Carolina and Bewick's Wrens

Paul and Georgean Kyle
Wildlife Rescue, Inc.
Austin, Texas

Wrens are "plump, stumpy, energetic" little birds with up-cocked tails and long, slightly down-curved beaks. The most common nesting species in the central Texas area are Bewick's (*Thyromanes bewickii*) and Carolina (*Thyrothorus ludovicianus*).

The 13 mm to 14 mm (5" to 5½") adult Bewick's is grey to grey-brown with a white breast, a conspicuous white eye stripe and white corners on the outer tail feathers. The adult weighs about 12 grams (0.4 ounces) and has an average wingspan of 18.4 cm (7").

The 14 to 15 mm (5½" to 6") adult Carolina is a slightly larger, stockier bird and reddish brown in color with a buff-colored breast. It also has a white eye stripe, but lacks the white tail corners of the Bewick's. The adult weighs about 16 grams (0.56 ounces) and has an average wingspan of 18.5 cm (7.25"). Both sexes of each species are outwardly identical in appearance.

These species of wrens nest in rural and urban areas, often in close proximity to or actually in man-made structures. Favorite nest sites include nest boxes, hanging plants, pockets of clothing, grills of automobiles, motor boats and sometimes even hollow trees. Pair bonding and nest building begin in March and continue throughout the summer. The male Carolina will build several nests, and the female will line the one of her choice before setting in to lay her eggs. Both species will lay three to nine white eggs with brown speckles (Bewick's 16 x 13 mm, Carolina 19 x 15 mm). Incubation is by the female and takes 12 to 14 days. The young are fed by both parents.

EGGS

Because of their indiscrete nesting habits, an entire clutch of eggs—nest and all—is often "rescued" by the public. If replacement is not possible, the eggs should be placed in a small, tissue-lined basket in a commercial incubator with a constant temperature of 95 to 100 degrees F with a constant humidity source. They must be carefully turned ¼ turn every hour until hatched.

Note: Birds which are less than three days of age may not have received necessary antibodies or a normal balance of beneficial flora from the parents and lack sufficient immunity to common bacterial infections. At the time of this writing, no positive solution to this problem exists, except proper hygiene.

DESCRIPTION OF NESTLINGS

- Altricial with sparse, grey down on head, back and thighs.
- Pale yellow gape flanges with brighter yellow mouth.
- Dark, narrow, pointed beak.
- The tip and spurs of a Carolina wren's tongue are dark. Bewick's wrens lack these markings.

DEVELOPMENT

The average growth rate for hand-raised wrens should be about 0.5 to 1 gram of body weight per day for the first two weeks. A weight gain of less than 0.3 gram during this period may indicate a metabolic problem usually related to a systemic infection. However, a sharp weight loss directly after a bird fledges is normal.

2 days—Pin feathers begin to develop on the wings.
5-6 days—Pin feathers on the wings and tail are prominent, and the eyes are open.
10 days—Wing and tail feathers are breaking out of the sheaths, and the body pin feathers are prominent.
14 days—All feathers are out of the sheaths, and the birds are hopping out of the nest.
21 days—Birds are able to fly well and are pecking at everything. A Bewick's tail will be noticeably longer than a Carolina's at this age. Both species will begin to experiment with a variety of vocalizations by three weeks.
30 days—Wrens should be well on the way to self-feeding.

NESTLING HOUSING

The babies should be placed in a berry basket or margarine tub lined with unscented white facial tissue. The tissue should be changed whenever soiled. Wrens are very susceptible to problems related to drafts, temperature fluctuations and dehydration. A heating pad alone *is not adequate.* They must be housed in an incubator/brooder or "hospital box" with constant temperature (88°F), humidity (60% to 70%) and indirect sunlight until fully feathered.

NATURAL DIET

Wrens eat spiders, flying insects, ants, beetles, scale insects, grasshoppers, caterpillars, etc. Less than three percent of the diet may include some fruits and berries.

NATURAL HABITAT

Woodlands with thick underbrush, rotting wood and a good water source will usually have a strong wren population.

CAPTIVE CARE

SUBSTITUTE DIET

Small mealworms (not the jumbo kind from bait stores which contain steroids) are drowned in a small amount of:

1 Tbsp. Avimin liquid mineral supplement
¼ tsp. Plex-sol C (or ½ tsp. Avi-Con) powdered vitamin supplement (high in folic acid)
8 oz. distilled water

The mealworms must then be sprinkled with Plus Yeast protein powder (for essential amino-acids) and dipped in a 50/50 mixture of full-strength Nutri-cal and plain, active-culture yogurt. Once feathers begin to unfurl, part of a small piece of soaked-until-soft Purina High-Protein Dog Meal should be added to each feeding. Both the yogurt/Nutri-cal mix and the soaked dog food must be prepared fresh every two hours to prevent spoilage. When feeding unfeathered birds, the mealworms must first be "tenderized" by pinching the head and all along the body with tweezers. If this is not done, the birds may have difficulty swallowing or digesting the foods, and will sometimes pass a mealworm whole.

FEEDING

Because a wren's mouth is so tiny, the use of tweezers (with rounded tips) is strongly recommended. Their mouths will open readily when they are stimulated, but close quickly. Each gaping bird should be fed as many mealworms (prepared as described in "Substitute Diet") as it wants every 30 minutes from sunrise until 9:00 p.m. to 10:00 p.m. (25 to 30 feedings per day) until feathered and picking up food on its own, then every hour until completely self-feeding. One or two drops of *distilled* water from a curved irrigating syringe should follow each feeding. Place the drops of water on the bird's beak; never put water or any liquid directly into a bird's throat. *See Special Problems section.

FLEDGLING HOUSING

Once wrens are feathered and out of the nest, a 2' x 2' x 4' long wire cage is minimum. Fiberglass window screening is preferable because it will "give" when the birds become excited and frantically bounce off the walls—as they quite often do. Also, moths and other small flying insects can be contained to encourage self-feeding. The only drawback to window screening is that it provides no protection for the birds from predators, and such a cage cannot be safely left outdoors.

Because wrens are such nervous, inquisitive little birds, careful attention must be paid to their environment to ensure them a safe, secure environment until the time of release. The habitat should have a paper-lined floor, smooth and rough perches, a potted plant and a "brush pile" of small branches with the leaves still attached. Young wrens like to sleep high in the cage and in a pile, so a sleeping shelf in a darkened upper corner will be well-used.

While Carolina wrens are fond of splashing around in a shallow dish of water, Bewick's wrens are partial to dust baths in loose, fine soil. Both water and soil should be provided as well as live food and some full sun for basking.

Once completely self-feeding, wrens should be allowed at least one week of exercise in a flight aviary measuring at least 4' x 4' x 6' tall prior to release.

Note: No more than six or seven wrens should ever be housed together and then only birds of the same age. Young or mature, they are quarrelsome even in a large flight aviary and have been known to kill a cagemate in over-crowded conditions.



One day old Carolina Wrens.



10 day old Bewick's Wren.

RELEASE, BACK-UP FEEDING AND SUPPORT

It is very common for young wrens to return to the aviary for a few nights until they find another suitable roost, so ideally their final housing situation should be at the release sight. Wrens can be released at seven to eight weeks of age when they no longer wish to be hand fed. Carolina and Bewick's wrens should weigh about 15 gm and 11 gm (respectively) at the time of release. The approximate wing cord (length of the wing measured from the epaulet to the tip of the longest primary) should be about 55 mm for Carolina and 50 mm for Bewick's. They are very territorial and should be released where some of the same species reside but density is low. Wrens will revert somewhat when released and must have back-up feeding for as long as two weeks or more in the form of mealworms and small pieces of soaked Purina High-Protein Dog Meal.

*SPECIAL PROBLEMS

A healthy nestling wren's fecal sac is very large and *dark* brown in color. If yogurt is not added to the diet, the color will become progressively lighter (possibly indicating poor digestion) and the bird may die within 24 hours. Additionally, wrens raised on a diet lacking the protein powder have suffered from poor feather development. Yogurt and protein powder are essentials in the diet—not extras.

Wrens have an extremely high metabolism and must be fed more frequently for a longer term than larger species of the same age. If a wren has gone a long time without food, it must be rehydrated before feeding—failure to do so will usually result in the death of the bird. To be safe, any incoming baby wren should be given several drops of a 10:1 Gatorade:Nutri-cal mix (warmed) every 15 minutes until a wet stool is observed. Feeding can then be gradually started and fluid continued until a normal, well-contained stool is observed.

Wrens which have not been fed a proper diet may exhibit poor equilibrium or seizures due to low blood sugar or calcium deficiencies. If caught in time, this can sometimes be turned around. Treatment consists of one drop of dexamethasone (2 mg/ml) orally and Nutri-cal/Gatorade fluid therapy as mentioned above. Check with your veterinarian before using any medication.

Because wrens are so prone to dehydration, they must have a constant water supplement. Even if a nestling skips a feeding (not uncommon), it should still be given a drop or two of water. Distilled water contains no suspended particles and will minimize problems of aspiration. Early signs of dehydration may be a lack of mucous around the fecal sac and incomplete explusion of fecal material.

Wrens are nervous and high-strung. They should be transported as little as possible and not subjected to loud noises, music or too much disturbance around their cage. Wrens are also curiously disturbed by boldly striped or patterned clothing.

TABLE 1

WREN DISPOSITION IN TEXAS
(Bewick's and Carolina)

	RELEASED	EXPIRED	TOTALS
1978-1984[1]			
Miscellaneous diets	38	51	89
Percent	43%	57%	
1983-1984[2]			
Substitute diet[3]	23	11	34 (8)[4]
Precent	68%	32%	
1985[2]			
Substitute diet[3]	31	11 (7)[4]	42 (4)[5]
Percent	74%	26%	

[1] Statistics from Texas Parks and Wildlife Department, active Scientific Permit files, September, 1985.

[2] Statistics taken from Animal Care and Research Committee archives, Wildlife Rescue, Inc. of Austin, Texas.

[3] Mealworms, Purina High-Protein Dog Meal, yogurt, Nutri-cal, Plus Yeast Protein Powder, Avimin, Plex-Sol C (or Avi-Con), prepared as described.

[4] Less than 2 days of age when acquired.

[5] Ill or injured when aquired.

TABLE 2

GROWTH RATE OF HAND-RAISED WRENS
(Bewick's and Carolina)

DAYS OF AGE	AVERAGE WEIGHT IN GRAMS		DEVELOPMENT
	Bewick's[1]	Carolina[2]	
1	1.1	1.5	Sparse down on head, back, and thighs.
2	1.5	2.0	Pin feathers show on wings.
3	1.9	2.3	
4	2.2	3.5	
5	2.4	4.5	Eyes open.
6	2.5	5.5	Pin feathers on wing and tail prominent.
7	2.9	6.5	
8	3.7	7.5	
9	3.8	8.5	
10	4.7	9.5	Wing and tail feathers opening.
11	5.8	10.5	Body pin feathers prominent.
12	6.7	11.4	
13	7.2	12.4	
14	7.3	13.8	Completely feathered.
15	8.0	14.4	Out of the nest.
16	8.7	15.2	
17	9.2	15.8	
18	9.4	16.6	
19	10.0	17.0	
20	9.5	17.5	
21	9.9	18.2	Flying well, pecking at food.
22		19.3	
23		19.0	

[1] Average of 13 individuals/9 broods
[2] Average of 7 individuals/4 broods



Carolina Wrens at 21 days old.

IMPLICATIONS FOR OTHER SPECIES

While the care techniques detailed in this paper are specifically for Carolina and Bewick's wrens, the basic substitute diet has been used successfully with other avian insectivores including titmice, chickadees, nightjars, woodpeckers, chimney swifts, swallows and yellow-billed cuckoos. Even omnivores and seed eaters such as jays, blackbirds and finches have done well on the diet as nestlings, but must have a greater variety as they begin to self-feed. Mockingbirds and flycatchers required additional calcium.

Financial and technical assistance with wren care and research were provided in part by Wildlife Rescue, Inc. of Austin, Texas, and its members, Katherine A. Van Winkle, DVM, of Barton Creek Animal Clinic, Austin, Texas, and the Avian Diagnostic Lab, Texas A&M University, College Station, Texas.

This paper is a revised edition of *Care of Orphaned Carolina*

and Bewick's Wrens, copyright by Paul and Georgean Kyle (1983).

All charts and photography courtesy of Paul and Georgean Kyle.

Editor's note:

Please note that the diet as presented in this paper and in the "Hand-Rearing Chimney Swifts" in Vol. 9, No. 2 contain the same diet information. The diet as presented does not have a balanced Calcium:Phosporus ratio. Diets should contain ratios of between 1:1 to 2:1. This diet has approximately a 1:4 ratio (it can be a little better depending on the Calcium:Phosphorus ratio of the particular batch of worms). We highly recommend that Calcium be added.

SOURCES FOR PRODUCTS AND SUPPLIES MENTIONED

Avi-Con: Vet-A-Mix, Inc., Shenandoah, Iowa 51601 and available from veterinarians.

Avimin: Lambert-Kay, Cranbury, New Jersey 08512 and pet stores.

Berry baskets: grocery stores (used to package strawberries, cherries, mushrooms, etc.)

Brooders: Sears, Roebuck and Company and local feed stores.

Gatorade: Stokely-Van Camp, Inc., Chicago, Illinois 60654 and grocery stores.

Hospital box: A "hospital box" is a ventilated enclosure which provides an environment with a constant air temperature and relative humidity. A satisfactory set-up can be made by laying an aquarium on its side on a heating pad and taping a flap of clear plastic to the open side to act as a door. A damp sponge placed in the corner will act as a good humidity source. The temperature in an improvised system must be constantly monitored with a thermometer placed on the same level as the nest of baby birds. With the door on the side rather than to top, less heat escapes during the frequent feedings, and the environment remains more stable. If condensation begins to appear, the humidity is too high and must be adjusted. The ideal hospital box will have an automatic thermostat which can be set for the desired temperatre. The heating element and thermostat for such a system will be available at feed stores specializing in poultry equipment.

Hygrometers: Sears, Roebuck and Company and local feed stores.

Incubators: Sears, Roebuck and Company and local feed stores.

Mealworms: Rainbow Mealworms, 126 E. Spruce Street, Compton, California 90224, 213/635-1494. Do not use jumbo or mealworms from bait shops because they contain steroids.

Nutri-cal: Evesco Pharmaceuticals, Buena, New Jersey 08310 or your veterinarian.

Plex-Sol C: Vet-A-Mix, Inc., Shenandoah, Iowa 51601 and available from veterinarians.

Plus Yeast Protein Powder: Plus Products, Irvine, California 92714 and health food stores.

Purina High Protein Dog Meal: grocery or feed stores.

Syringes (curved irrigating), Monoject #12: available at pharmacies.

Thermometers: Sears, Roebuck and Company and local feed stores.

REFERENCES

HICKMAN, M. and Guy, M. 1973. *Care of the Wild Feathered and Furred.* Unity Press, Santa Cruz.

KYLE, Georgean, 1984. An Introduction to the Role of Vitamin, Mineral and Amino-Acid Supplements in the Avian Diet. Animal Care and Research Committee Archives, Wildlife Rescue, Inc., Austin, Texas.

LYONS, Jane, 1979. Supplement to Care of Orphaned or Injured Birds. *Wildlife Rehabilitation Course Manual.* Wildlife Rescue, Inc., Austin, Texas.

PETERSON, R.T., 1963. *A Field Guide to the Birds of Texas.* Houghton Mifflin Co., Boston, Massachusetts.

TERRES, John K., 1982. *The Audubon Society Encyclopedia of North American Birds.* Alfred A. Knopf, New York.

WELTY, Joel C., 1982. *The Life of Birds.* Saunders College Publications, Philadelphia.

Errata

Due to an error in layout, we inadvertently left out a reference in the "Hand Rearing Chimney Swifts" article in Vol. 9, No. 2. We apologize for our ommission. The reference is as follows:

LYONS, Jane. 1979. Supplement to Care of Infant or Injured Birds. *Wildlife Rehabilitation Course Manual,* Wildlife Rescue, Inc., Austin, Texas.



Yellow Pansy

Avian Necropsy Results

Meryl Faulkner
Project Wildlife, San Diego, California

INTRODUCTION

Project Wildlife is a non-profit, all volunteer wildlife rehabilitation organization run on an out-shelter basis in San Diego County, California. The volunteers treat a variety of mammals and land- and seabirds. Birds which die from causes other than obvious injury are necropsied by comparative pathologists. This report presents the results of 223 necropsies performed on songbirds, pigeons and doves. Twenty-five species are represented. The data collected are presented to document trends in mortality among species to help rehabilitators recognize conditions which might be treated antemortem.

MATERIALS AND METHODS

Pathology Sources Utilized

From 1980 to 1985 Project Wildlife was fortunate to have had the volunteer services of Dr. Gerald Cosgrove and the staff of the Pathology Department of the San Diego Zoological Society. Gross necropsies were performed on Project Wildlife specimens. Histological examination and bacterial cultures were rarely possible because of financial constraints. From 1985 onwards, selected animals were sent for more detailed necropsies to the pathology laboratory of the San Diego County Veterinarian's Office. Pathologists Dr. H.C. Johnstone, Dr. K. Mahoney and staff provided results of tissue histology, bacterial cultures and also bacterial sensitivity to antibiotics. Since these more detailed necropsies are expensive for our organization, we now screen cases submitted for necropsy more rigorously.

Criteria For Selection of Animals For Necropsy

1. Animals which die unexpectedly with no obvious antemortem sign of disease or injury.
2. Species which have proved difficult to raise or maintain in captivity. For example, in 1985 as many mockingbirds as possible were necropsied; in 1986 goldfinches and rabbits were monitored.
3. Animals which have undergone surgery or treatment of a disease and have died unexpectedly during or after the recovery period.

Presentation of Data

The detailed information from each necropsy is listed in tables. Information such as unusual or significant symptoms, or detailed bacterial findings, cannot easily be tabulated, so these findings are mentioned in the discussion, but not listed in a table. Although necropsies have been performed on a variety of landbirds, seabirds and mammals, this discussion and review of results will cover those species known as songbirds and also doves and pigeons. These data are summarized in Tables 2-5.

RESULTS

General Information

Large numbers of immature songbirds are raised by our organization each year, about 2500 in 1985. This is reflected in our necropsy figures where 70% of the birds are classified as juvenile. The most numerous species necropsied were pigeons (44), Northern Mockingbirds (36) and House Finches (29). These are among the most common species treated by Project Wildlife. In cases where the sex was determined, 99 were males and 66 were females. As would be expected, many of the birds (over 40%) were severely malnourished. There were a few cases of well nourished birds: two pigeons suspected of having been poisoned, one mockingbird with a protozoan infection, a crow and two Cedar Waxwings with internal injuries. Project Wildlife does not intentionally send accident cases for necropsy, but in the case of the crow and Cedar Waxwings there were no signs of external trauma.

Oral, Crop and Gastrointestinal Problems (Tables 1 and 2)

This classification included enteritis, esophagitis, crop impactions, gastrointestinal ulcers. One or more of these problems were most commonly found in over 40% of the pigeons, Mourning Doves and House Finches necropsied. Examination of those cases listed in Table 2 showed that in 29 cases symptoms of oral or gastrointestinal distress (such as regurgitation, reddened crop wall, reluctance or refusal to swallow food) were mentioned in the history submitted by volunteers. These cases were diagnosed with the diseases shown in Table 1.

Sometimes symptoms are not obvious before death. Six other House Finches diagnosed post mortem with yeast infections of the crop were in all but two cases, self feeding juveniles that lost weight and died suddenly in volunteers' aviaries. In both cases yellow deposits were noticed in the crop wall. No obvious signs of regurgitation were seen in these birds, they had not been treated with antibiotics.

Because of these tabulated findings, we attempt to check (by microscopic examination) the throat and crop of pigeons, doves and songbirds with symptoms of regurgitation or impaction. If a throat swab is not feasible, treatment with nystatin oral suspension is begun. Trichomoniasis of House Finches

Table 1. Oral, Crop and Gastrointestinal Problems

Species (N)	Undetermined cause of death	Yeast infection	Trichomoniasis	Bacterial infection	Coccidiosis/ Other
Pigeons (8)	0	6	1	1	0
House Finches (6)	1	0	5	0	0
Lesser Goldfiches (3)	1	2	0	0	0
Mourning Doves (12)	2	6	1	2	1

is unusual in our area; in this case all five birds were infected at one volunteer's home, the infection having begun with one infected bird whose history of infection was unknown.

The relatively few pigeons diagnosed at necropsy with trichomoniasis reflects the easy antemortem detection of this disease, and its treatment if caught early enough. Pigeons that die of severe trichomoniasis are often not submitted for necropsy.

Respiratory Problems (Table 3)

Pneumonia and airsacculitis seem relatively uncommon on necrosy of land birds, perhaps because birds with respiratory distress are treated promptly. However, four out of five crows necropsied were found to have airsacculitis.

Viral Infections (Table 3)

Our only diagnosed viral infection is avian pox, which in San Diego County seems to be more prevalent among mockingbirds than any other species brought to Project Wildlife volunteers. A total of 17 birds necropsied were affected of which seven were mockingbirds, two were Lesser Goldfinches. In the case of the mockingbirds, some were recovering pox cases and died of other infections because of compromised immune systems. In two cases the birds were euthanized because of the severity and disabling nature of the lesions.

Fungal Infections (Table 3)

Twenty birds were found to have yeast infections. In seven cases the yeast was characterized as *Candida albicans*. One mockingbird had candidiasis of the gizzard and the feet. Six of the 20 birds had received oral antibiotic therapy before death. Eight birds were diagnosed with mold infections. In two cases (mockingbirds) *Aspergillosis fumigatus* was cultured from lung tissue. Two House Finches had mycotic gastritis; a pigeon and a blackbird had mycotic oral abscesses.

Protozoan Infections (Table 4)

An unusual kind of coccidiosis occurred in 1985 in six mockingbirds, two sparrows and one House Finch necropsied. The coccidia, microscopically identified as *Isospora serinii* (or a closely related organism) by Dr. Chris Gardiner*, leave the intestinal epithelial cells and then go into the lamina propria and finally to all organs of the body. The birds affected die suddenly, sometimes in good nutritional condition, with no warning symptoms. There were 30 cases of the more typical enteric coccidiosis affecting mainly mockingbirds, pigeons, sparrows, and House Finches. Some of these birds had been diagnosed and treated for the disease, but a variety of drugs and differing regimens were unsuccessful. Some birds seem to have no resistance to this parasite and are severely debilitated by it.

Avian malaria affected a surprising number of our bird patients who subsequently died. Forty-two were detected on necropsy, some mild cases, others severe. The species of malaria parasite was not determined. In nine necropsies this disease was the only pathologic condition found. The species with the highest incidence were pigeons (15), House Finches (9) and Scrub Jays (4). In one case (a raven), the severe malaria seemed to have caused neurological problems since the bird was unable to stand. In two cases the only symptoms associated with the malaria were an enteritis resulting in tarry stools before death. This was not noted in any other case. Some birds had pale mucous membranes.

Bacterial Infections (Table 3)

Thirty cases of bacterial infections were observed during gross necropsies. In 16 cases the San Diego County Veterinary Laboratory identified the location of the infection and the type of infecting organism using standard cultures and staining techniques. Antibiotic sensitivity assays were also performed if the bird had been housed with others.

In 14 of the 16 cases examined the birds were nestlings or fledglings. In five cases (one dove, one White-throated Swift, three mockingbirds) *E. coli* was cultured from the gut and internal organs. In the swift, the coliform infection was a secondary septicemia resulting from a compound fracture of the tibiotarsus. In one case (another mockingbird) *E. coli*, along with *Pseudomonas aeruginosa* and a heavy growth of *Aspergillus fumigatus*, was detected in the lung. *Pseudomonas aeruginosa* was also cultured from the liver of another mockingbird. These two birds and one of the mockingbirds in the first group also suffered from a protozoan infection. Another mockingbird suffered a *Pseudomonas* septicemia with bacterial abscesses in the lungs, kidney, liver and breast muscle. In three cases (two House Finches and a Lesser Goldfinch) *E. coli* was cultured in the gut only, one of the House Finches also had a yeast infection of the crop. A Loggerhead Shrike was found to have a purulent sinusitis near one eye from which *E. coli* and *Pseudomonas* were cultured. The original cause of the

*Dr. Chris Gardiner, Head, Department of Parasitology, Department of Navy, Naval Medical Research Institute, APO Miami, FL 34031, personal communication to San Diego County Veterinarian's Office.

Table 2
Summary of necropsy data obtained for Project Wildlife from 223 land bird specimens between June 1980 and January 1986

Group (Species)	(N)	Sex M/F	Age Adult/Juv	Cause of Death Euthanasia	undetermined	Malnutrition	Trauma	Gastrointestinal Problems*
Pigeons	44	24/13	20/17	3	11	12	8	20
Mourning Doves	19	9/7	8/11	4	4	13	6	10
Nighthawks (Lesser)	1	0/0	1/0	0	1	0	0	0
Swifts (White-throated)	1	1/0	0/1	0	0	0	1	1
Hummingbirds	3	1/0	1/2	0	1	1	1	2
Woodpeckers (Acorn)	1	1/0	1/0	0	0	0	0	0
Swallows (Cliff)	9	3/1	0/9	0	6	1	0	1
Jays (Scrub)	10	6/3	3/7	1	2	5	4	1
Jays (Steller's)	1	1/0	0/10	0	0	0	0	0
Crows (American)	5	1/4	3/2	2	1	1	1	1
Ravens (Common)	1	0/0	0/1	1	0	1	0	0
Titmouse (Plain)	1	1/0	1/0	0	0	0	1	0
Robins (American)	1	1/0	0/1	0	0	1	1	0
Shrikes (Loggerhead)	3	0/2	0/3	0	1	1	1	0
Mockingbirds (Northern)	36	14/6	1/35	3	11	18	3	11
Cedar Waxwings	2	1/1	2/0	0	0	0	2	0
Starlings (European)	12	4/1	2/10	2	2	6	2	2
Towhees (Brown)	1	1/0	0/1	0	1	0	0	0
Meadowlarks (Western)	1/0	0/1	0	0	1	1	0	1
Blackbirds (Brewer's)	10	2/7	2/7	3	5	3	2	2
Cowbirds (Brown-headed)	1	1/0	0/1	0	1	0	0	0
Orioles (spp.)	3	2/2	0/3	0	2	2	0	1
House Sparrows	21	11/5	3/18	0	8	9	4	6
Goldfinches (Lesser)	8	3/3	0/8	1	4	3	0	2
House Finches	29	10/12	1/26	0	9	16	2	14
Totals	223	99/66	49/165	20	71	94	39	75

*esophagitis, ulcers, enteritis

Table 3
Infections in 223 land birds necropsied for Project Wildlife between June 1980 and January 1986

Groups	(N)	LOCATION			ETIOLOGY			
		Internal (liver, spleen kidney)	Respiratory				Fungal	
			Lungs	Airsacculitis	Viral	Bacterial	Yeast	Mold
Pigeons	44	7	2	1	1	4	6	2
Mourning Doves	19	1	1	1	1	4	7	0
Nighthawks (Lesser)	1	0	0	0	0	0	0	0
Swifts (White-throated)	1	0	0	0	0	1	0	0
Hummingbirds	3	0	0	0	1	0	0	0
Woodpeckers (Acorn)	1	0	0	0	0	0	0	0
Swallows (Cliff)	9	0	0	0	1	0	0	0
Jays (Scrub)	10	0	1	0	0	0	0	0
Jays (Steller's)	1	0	1	0	0	0	0	0
Crows (American)	5	0	0	4	0	0	0	0
Ravens (Common)	1	0	0	0	0	0	0	0
Titmouse (Plain)	1	0	0	0	0	0	0	0
Robins (American)	1	1	1	0	0	0	0	0
Shrikes (Loggerhead)	3	0	1	1	1	1	0	0
Mockingbirds (Northern)	36	1	4	1	7	8	2	2
Cedar Waxwings	2	0	0	0	0	0	0	0
Starlings (European)	12	2	0	2	1	3	0	0
Towhees (Brown)	1	0	0	0	0	0	0	0
Meadowlarks (Western)	1	0	0	0	0	0	0	0
Blackbirds (Brewer's)	10	2	2	1	0	0	0	1
Cowbirds (Brown-headed)	1	0	0	0	0	0	0	0
Orioles (spp.)	3	0	0	0	0	0	0	0
House Sparrows	21	1	2	1	1	4	0	0
Goldfinches (Lesser)	8	0	0	0	2	1	2	1
House Finches	29	2	1	0	1	4	4	2
Totals	223	17	16	12	17	30	21	8

Table 4
Parasitic infections in 223 land birds necropsied for Project Wildlife between June 1980 and January 1986

Groups	(N)	Protozoan				Helminths				Ectoparasites
		Trichomoniasis	Coccidiosis/ Isospora	Malaria	Histoplasmosis/ Trypanosomiasis	Cestodes	Nematodes	Trematodes	Acantho-cephalans	
Pigeons	44	2	11/0	15	1/1	0	12	0	0	16
Mourning Doves	19	1	1/0	3	0	0	1	0	0	4
Nighthawks (Lesser)	1	0	0/0	0	0	0	0	0	0	1
Swifts (White-throated)	1	0	0/0	0	0	0	0	0	0	0
Hummingbirds	3	0	0/0	0	0	0	0	0	0	1
Woodpeckers (Acorn)	1	0	0/0	0	0	0	1	0	0	0
Swallows (Cliff)	9	0	2/0	0	0	0	0	0	0	2
Jays (Scrub)	10	0	1/0	4	0	0	0	1	1	3
Jays (Steller's)	1	0	0/0	0	0	0	0	0	0	0
Crows (American)	5	0	0/0	1	0	1	3	1	0	4
Ravens (Common)	1	0	0/0	1	0	0	1	0	0	0
Titmouse (Plain)	1	0	0/0	0	0	1	0	0	0	1
Robins (American)	1	0	0/0	0	0	0	1	0	0	0
Shrikes (Loggerhead)	3	0	0/0	0	0	0	0	0	0	0
Mockingbirds (Northern)	36	0	4/6	4	0	3	2	0	4	7
Cedar Waxwings	2	0	0/0	0	0	0	0	0	0	2
Starlings (European)	12	0	2/0	0	0	1	0	0	0	1
Towhees (Brown)	1	0	0/0	0	0	0	0	0	0	0
Meadowlarks (Western)	1	0	0/0	0	0	0	1	0	0	1
Blackbirds (Brewer's)	10	0	2/0	2	0	1	0	0	0	3
Cowbirds (Brown-headed)	1	0	0/0	0	0	0	0	0	0	0
Orioles (spp.)	3	1	0/0	0	0	0	0	0	0	1
House Sparrows	21	1	4/2	3	0	2	0	0	0	4
Goldfinches (Lesser)	8	0	0/0	0	0	0	0	0	0	1
House Finches	29	5	4/1	9	0	0	0	0	0	9
Totals	223	10	31/9	42	1/1	9	22	2	5	61

Table 5:
Miscellaneous problems and diseases in land birds necropsied for Project Wildlife from June 1980 and January 1986

Groups	(N)	Gout (visceral)	Feathers abnormal	Anemia	Edema	Bone deformities	Tumors
Pigeons	44	1	0	5	0	0	2
Mourning Doves	19	1	0	0	0	0	0
Nighthawks (Lesser)	1	0	0	0	0	0	0
Swifts (White-throated)	1	0	0	0	0	0	0
Hummingbirds	3	0	0	0	0	0	0
Woodpeckers (Acorn)	1	0	0	0	0	0	0
Swallows (Cliff)	9	2	3	0	0	0	0
Jays (Scrub)	10	0	0	1	0	0	0
Jays (Steller's)	1	0	0	0	0	0	0
Crows (American)	5	0	0	0	0	0	0
Ravens (Common)	1	0	0	0	0	0	0
Titmouse (Plain)	1	0	0	0	0	0	0
Robins (American)	1	0	0	0	0	0	0
Shrikes (Loggerhead)	3	0	0	0	0	0	0
Mockingbirds (Northern)	36	0	0	1	3	1	0
Cedar Waxwings	20	0	0	0	0	0	0
Starlings (European)	12	2	0	0	0	0	0
Towhees (Brown)	1	0	0	0	0	1	0
Meadowlarks (Western)	1	0	0	1	0	0	0
Blackbirds (Brewer's)	10	0	0	1	0	0	0
Cowbirds (Brown-headed)	1	0	0	1	0	0	0
Orioles (spp.)	3	0	0	0	0	0	0
House Sparrows	21	0	0	2	0	0	0
Goldfinches (Lesser)	8	1	0	0	0	0	0
House Finches	29	0	0	2	0	0	0
Totals	223	7	3	14	3	2	2

sinusitis could not be found. A starling with kidney failure (cause unknown) had an associated enterococcal infection. *Salmonella* was cultured from the gut and internal organs of a pigeon and two starlings.

Helminthic Infestations (Table 4)

Helminths found included *Syngamus* (one case in a robin); *Capillaria* in mockingbirds (1), robins (1), crows (1) and pigeons (3); acanthocephalans in mockingbirds (4) and jays (1); *Tetrameres* in a meadowlark and a pigeon; flukes (biliary) in one jay. Other helminths detected were acuarids, ascarids and cestodes.

Miscellaneous (Table 5)

Two mockingbirds had edematous wings, both died. The fluid was collected from one bird before death, but culture of the fluid was negative. One bird on necropsy had splenomegaly associated with avian malaria, but gross necropsy revealed no cause for the edema.

One mockingbird with leg weakness (this bird left the nest in this condition) showed no improvement after dietary and antibiotic treatment. On necropsy (after euthanasia) the only finding was edema of the brain, all other cultures and histologic procedures were negative.

Three swallows with abnormal feathers died, two of the birds were found to have coccidiosis, in the other case there were no significant findings. Necropsy procedures are unable to detect environmental or dietary influences on development of abnormal plumage. The comparative pathologists who necropsy our animals do not screen tissues for environmental pollutants.

Tumors

The only tumors found in our necropsied birds were both in pigeons. One bird was found to have a malignant synovioma, the other, a bird which died a week after being cleaned of a sticky bird repellent, was found to have a carcinoma of the pancreatic acini.

CONCLUSIONS

Necropsies provide a base of information which helps us understand the susceptibilities of the various species to infection. Small numbers of birds make it impossible to draw any statistical conclusions but there are trends in the results which help us to anticipate future problems. Pigeons and doves seem more likely to suffer from yeast infections, mockingbirds are more likely to be suffering from coccidiosis and/or bacterial infections. In San Deigo County, mockingbirds seem a very disease-susceptible species.

Our aim is to continue to obtain necropsy data on differing species of wildlife. As the information accumulates we hope that it will help us understand the disease processes and complications of injury in the wild birds and mammals that are brought into Project Wildlife. We also hope to continue making the results of these necropsies available to other rehabilitators.

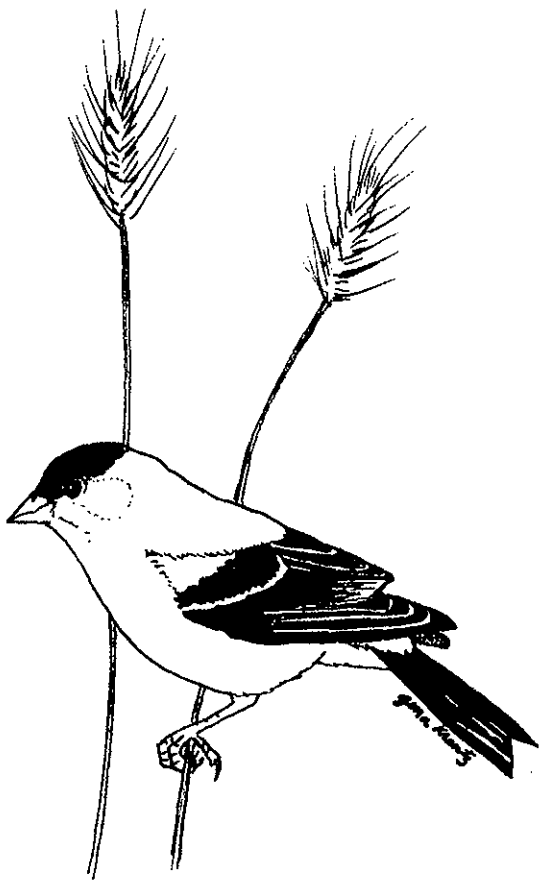
ACKNOWLEDGEMENTS

I would like to thank the staff of the Pathology Department of the San Diego Zoo, particularly Dr. Gerald Cosgrove. I would also like to thank Dr. Linda Lowenstine, School of Veterinary Medicine, University of California, Davis, and Dr. Geraldine A. Tomlinson, Santa Clara University, for their many helpful comments on the manuscript. Simone Hardy, student intern at the San Diego Zoo, provided technical assistance with data collection. The San Diego County Veterinarian's Office provided us with detailed and explanatory laboratory reports, and often provided follow-up reports on additional specimens at no extra charge.

Note added in proof:

In 1985 and 1986, 28 juvenile goldfinches were necropsied by San Diego County pathologists. In seven cases the cause of death was undetermined, 16 juveniles had coliform infections, one had an infected abscess, two had *Pseudomonas* infections of the internal organs, and two died of injuries.

Dr. H.C. Johnstone, pathologist at the San Diego County Veterinarian's Office, states, "Coliform infections are considered pathogenic to most small seed and fruit eating birds as opposed to most other animals. From an evolutionary basis, mammals and ground birds have become genetically accustomed to ingesting coliform organisms with food, as opposed to fruit and seed eating birds that have not developed genetic resistance to these organisms." Project Wildlife volunteers hope to improve our goldfinch release rates in 1987 by changing our feeding and housing methods so that exposure to coliform bacteria in food and water is minimized.



Letters To The Editor. . .

Dear Jan:

As you will recall, I am the person whom you helped when I wanted to work towards a ban of the sale of raccoons in Connecticut. I am happy to report that it passed! I am sorry to have to write this letter to you since your organization does such fine work—but I am really offended.

I was appalled to read Kirstine Thorne's book review of "The American Hunting Myth" in the last IWRC *Wildlife Journal*. It is obvious that her intent was to poke fun at and completely discredit the author while neglecting any real discussion of the book's content and value (which is the supposed purpose of a book review!)

Why waste valuable writing space to mention the "unusual features" of the book such as the listing of the titles under the author's name? And why devote *one third* of the review to what animals the author thinks are worthy of ethical consideration? The subject matter of the book is *hunting* and an examination of the "myths" perpetuated to support and defend this recreational activity, yet Ms. Thorne instead decides to attack Mr. Baker for one statement which is completely irrelevant to a book review on the subject of hunting.

Instead of open-mindedly discussing Mr. Baker's nontraditional perspective on hunting and discussing the merits of his arguments, the wide range of expert testimonies and statistics (which include statements by wildlife biologists such as Ms. Thorne) which support his contentions, Ms. Thorne belittles his data instead. She states, "each quote supports Mr. Baker's anti-hunting point of view" as if Mr. Baker merely plucked favorable newspaper quotes and only talked to people who agreed with him. This man spent years thoroughly researching the ecology of hunting and built a case against sport-hunting based on evidence, (i.e., data) not hearsay. A well-documented and enlightened book is the result, which should be applauded by wildlife professionals, not nit-picked to death!

As you can tell, I found this book review to be compeltely unsatisfactory and more of a personal vendetta than a book review. I am asking you to please print my letter in your next *Wildlife Journal* as an open letter to your members since such a biased review deserves some kind of response to balance it.

Sincerely,
Laura Simon

Dear Laura:

The purpose of this part of the Wildlife Journal *is to allow our members to take issue with the publication or show support for it. You should feel free to write us. The book you mentioned was sent to us by the publisher asking us to review it. I sent the book to Kris because she is a biologist and has been taught the current theories of wildlife management. She read the book cover to cover and felt that the main tenets put forth were not well supported or documented. When I saw her review, I sent the book to a wildlife center director in a large humane society for an alternate point of view from a non-biologist rehabilitator. The director declined to write a review because she too felt that the positions as stated were not well supported by the author. With that input I printed the first review. You are certainly welcome to provide your comments and/or review. It is not our intent to offend you.*

Jan

Dear Jan:

Some months ago, I attended IWRC's Basic Wildlife Rehabilitation 1AB class held in Bowie, Maryland. Though I enjoyed the lectures and labs, I doubted that I'd actually have the chance to practice what I'd learned, as I'm an independent and "small-time" rehabber.

Recently, I was presented with a hypothermic and very shocky raccoon. He recovered because you gave me the skills and confidence to act calmly and intelligently.

So thanks to you at IWRC! You made my day, and I hope that this letter brightens yours.

Pat Barbosa

Dear Pat:

When I get a letter like yours, I am reminded of just how much good these classes are both for the rehabilitator and for the animals. Although we are always looking to improve them, it is nice to know that they do what we intend them to: teach skills and allow for supervised learning opportunities. Thank you so much for your letter. You made my day and the Skills Seminar Committee members do really appreciate your taking the time to tell us how you feel.

Jan

Dear Jan:

The Vermont Raptor Center at the Vermont Institute of Natural Science is in the process of acquiring permanently injured, non-releaseable raptors for display in the "living musuem" public education facility. The Raptor Center also includes an extensive rehabilitation facility, which will be closed to the public. The public section is scheduled to open on July 30 of this year. I hope to establish all of the display birds in their new homes by late spring, to give them as much time as possible to adjust to their new environment before the opening.

We have acquired most of the 23 species of raptors that we need to fully represent birds of prey of the northeastern United States, including common breeders and rare visitors. A list of the species still needed is enclosed. Many of the birds already in residence came from our own rehabilitation program, which has been in existence since 1974. Rehabilitators throughout North America have provided us with some of the birds that we need. We still need the following species: Saw-whet Owl, Boreal Owl, Hawk Owl, Long-eared Owl, Peregrine Falcon, Merlin, Goshawk, and Northern Harrier (male).

We would prefer to display birds with some flight ability, but more seriously crippled birds can be considered on a case-by-case basis. If you have a raptor that needs a home, or can suggest a potential source, please let us know. I would like to emphasize that every bird here receives individual consideration. The "flight habitats" of the Vermont Raptor center are designed to provide safe, secure, spacious environments for birds of prey, while providing a valuable opportunity for people to learn about raptors.

By the way, we get the *Wildlife Journal* and think the organization is terrific!

Sincerely,
Nancy Read
Vermont Institute of Natural Science
Woodstock, Vermont 05091
(802) 457-2779