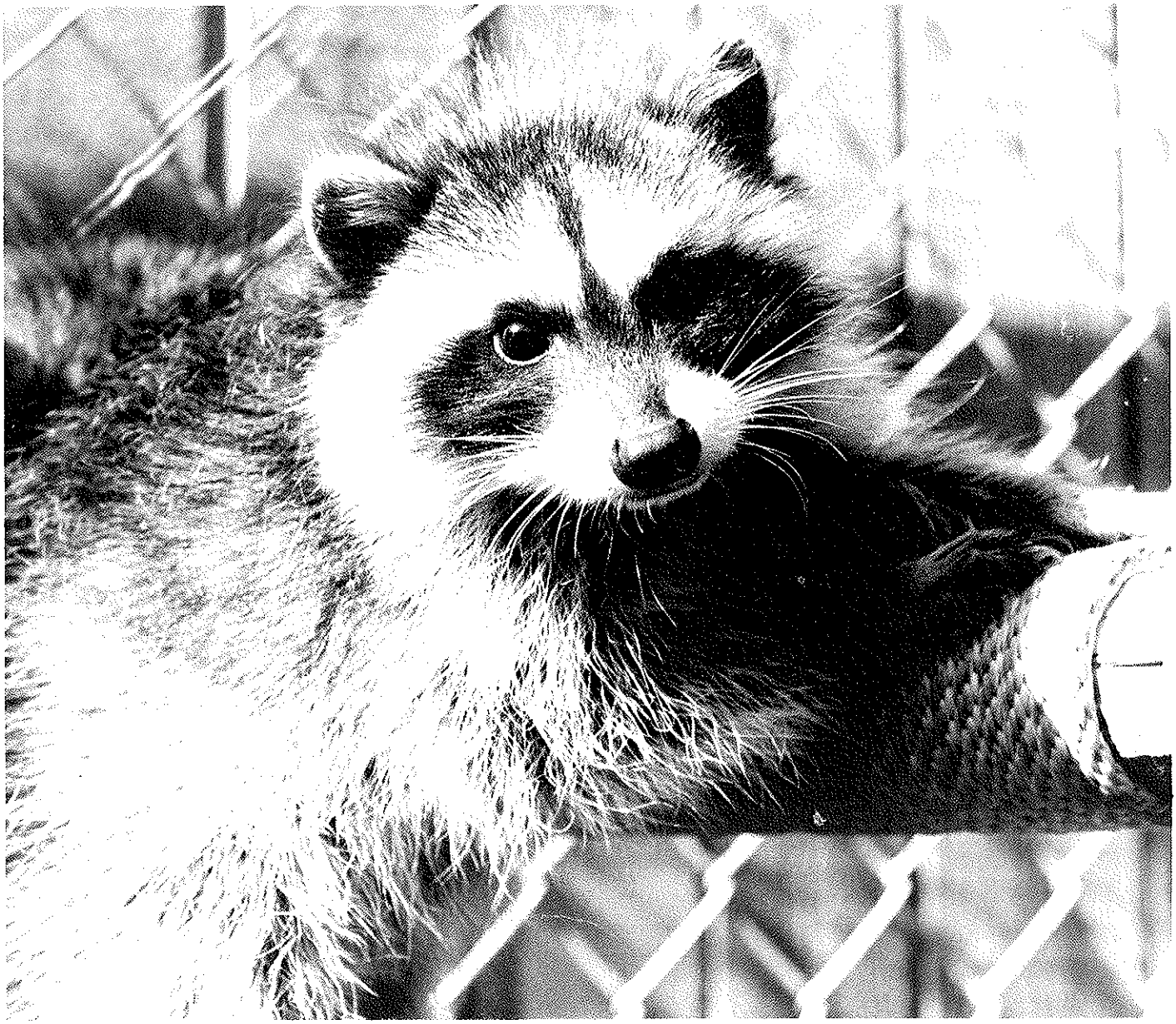
Vol.9, No. 3

WILDLIFE JOURNAL

Journal of the International Wildlife Rehabilitation Council



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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.)

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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.
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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

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

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EDITORIAL . . .

Research in Wildlife Rehabilitation

What a relief it is to reach fall and to release the last of the season's baby birds. The numbers of incoming animals decline as the season changes and we begin to think of what we need to do next. Our list of priorities shifts to getting some much needed rest for our tired bodies, our psyches, and re-establish more normal contact with our families. Once we feel human again, we begin to think about putting away our summer equipment, cleaning, sorting and the inevitable reviewing of the summer's efforts. (We do this despite having to cope with the difficult fall and winter cases of emaciation, frostbite, car injuries, accidental shooting, and many other combinations of problems that debilitate wildlife.)

What worked this year and what did not? Did we do better this year than last? What completely stumped us? In what areas can we be better prepared? What can we do next year to minimize our labors? We all begin to make a list of things to work on before the next busy season.

So in between our fall and winter cases, our family duties, and outside jobs, we ponder over how to make next year's efforts more efficient, more successful, and less painful. Before going too far in this process, we need to compile our statistics and review our records. Our memories cannot be relied upon to provide all of the answers we need.

An example of the importance of a records review can be obtained from my own wildlife center in Suisun, California. Years ago most rehabilitators that raised raccoons switched from feeding Esbilac to KMR (Kitten Milk Replacer). We came to a consensus on this because we felt that KMR was more palatable, produced better stools, and because we had some isolated reports of cataracts in raccoon pups fed a strict Esbilac diet to the age of 10-12 weeks (they should be introduced to other foods at four weeks of age). Additionally, KMR became available in powdered form which brought the cost per animal down considerably. We operated less from fact than from suspicion and we liked the results. But it was some four years later that a University of California, Davis student and rehabilitator working on a project comparing the growth rates of raccoons raised on the two milks found some key differences. While both groups grew similarly until solid foods were introduced, the raccoons fed KMR grew faster during and after weaning. Further work by Dr. Dick Evans (Tree House Wildlife Center, Brighton, Illinois) showed that KMR-fed raccoons better approximated the growth curve observed in wild raised raccoons. Looking back, it became clear we should have done some of this work years before we did.

Our continuing problems rearing rabbits and hares exemplify the multiplicity of variables involved. The problem is that we have no perfect milk substitutes, and further that we have an animal group that responds severely to stress for various reasons (i.e., changes in normal gut flora, parasite loads, changes from natural milks to substitute milks, and social stresses). When trained veterinarians are frustrated in their attempts to sort through the variables, what is the average rehabilitator to do? Well, it is going to take coordinated teamwork between veterinarians and the rehabilitators to find a set of conditions under which most rabbits presented as healthy "orphans" can be successfully reared. Rehabilitators offer careful observations on these cases and practical ideas on their care. When so inclined, they can keep careful records,

I think in order to find some of these answers we must be careful not to change two or more variables at the same time (i.e., formula and feeding frequency or housing and formula). We need to think about what variables should be changed and try different combinations. We have to write down what was changed and what was not. Then we have to compare our results with previous attempts (by ourselves and others). We cannot rely on memory. It may be subtle improvements that will lead us to a better method. We then

(continued on page 11)

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For the New Rehabber:

The Slit-Wrap Wing Wrap

Joan Priest, Wildlife Department
Humane Society of Santa Clara Valley, Santa Clara, California

The Slit-Wrap is an alternative wrap to the more commonly used figure eight-wrap. It has been used at the Humane Society of Santa Clara Valley's Wildlife Department since 1983. This wrap has also been used successfully by falconers for many years.

It has been very successful on the following species, to name a few: American Kestrel, Red-tailed Hawk, Barn Owl, Great Egret, House Finch, Goldfinch, Ring-billed Gull, California Gull, Burrowing Owl, Great Horned Owl, Screech Owl, Pied-billed Grebe, Scrub Jay, Northern Mockingbird, American Crow, Acorn Woodpecker, House Sparrow, American Robin, Rock Dove, Cedar Waxwing, Dark-eyed Junco, Killdeer, and European Starling.

ADVANTAGES

— Easy to apply using Vetrap®.

— Minimizes handling of the bird and the injured wing.

— The wing is easily kept in a normal position.

— No bulky padding is needed to prevent circulatory obstruction. This allows the bird to bathe. There is also less weight to throw the bird off balance.

— The Slit-Wrap allows better circulation than the standard figure eight-wrap by not applying cross tension pressure to the wing. This promotes healing and should be more comfortable for the patient.

— Because the wing is wrapped to the body, rather than to itself, the danger of cutting off circulation caused by the bird chewing the Vetrap® is lessened. All wings bandaged with Vetrap® should be checked regularly for snugness, however.

— The wing will not slip, as it often does with a standard wrap-around body wrap.

DISADVANTAGES

— Large birds which are strong in the shoulders and are very active and uncooperative may slip the wrap or pull it partially off. Tape over the wrap from the keel to the back often helps this situation.

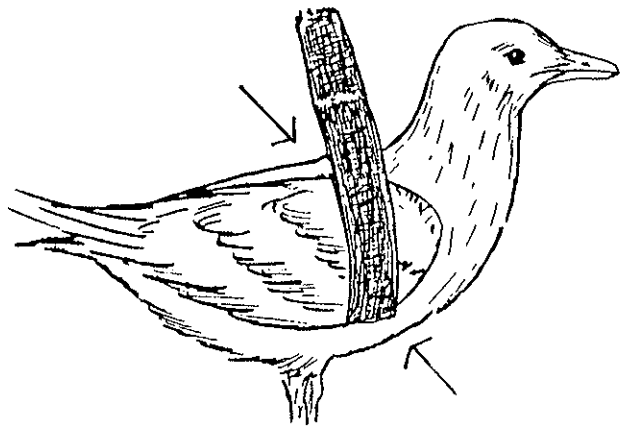
— Open wounds in the proximity of the wrist area may require some additional wrapping to the wound. However, in some cases, cleaning and flushing may be done without removing the wing wrap. This minimizes stress to the patient, and eliminates disturbance of the fracture site by having to unwrap and rewrap the wing. (This does not apply to growing nestlings or fledglings when the wrap must be changed regularly to comply with the growth of the bird.)

LENGTH AND WIDTH OF WRAP

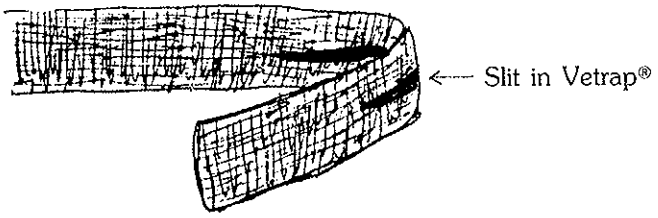
Length: Approximately 1½ times around the entire body, wings in normal position, without stretching the wrap. If a double body wrap is needed, measure 2½ times around.

Width: Approximately ½ to ⅓ the distance of the elbow to the wrist on a normally folded wing seems to work well. Too narrow a width may not give enough support to the wing. Too wide a width may hamper the birds ability to stand or interfere with the crop.

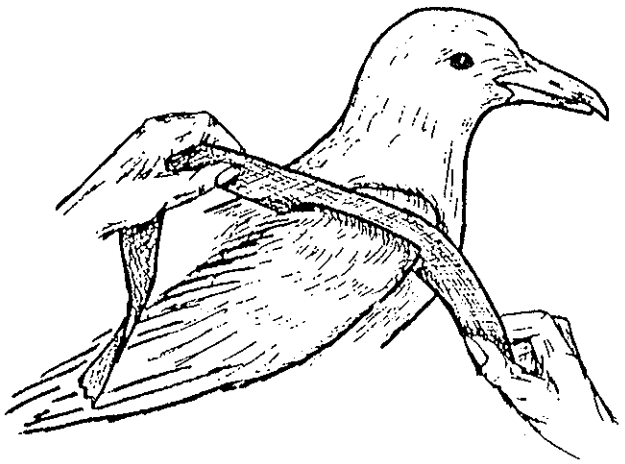
PROCEDURE



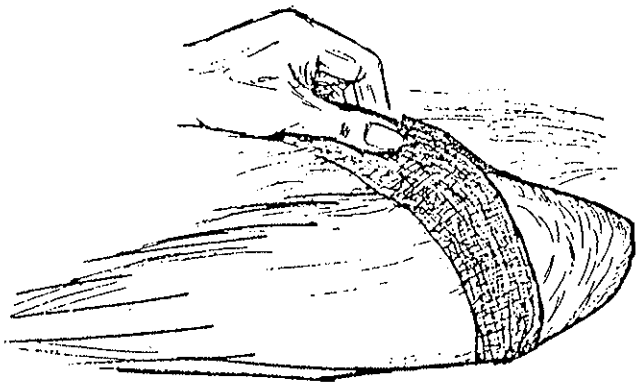
Step 1: After cutting the width and length of wrap needed and with the wing in a normal position, measure the Vetrap® from the shoulder straight down to the lower edge of the wing.



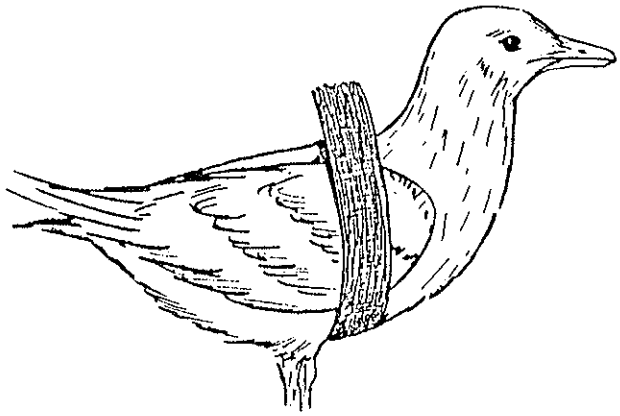
Step 2: Fold the wrap gently and cut slit lengthwise to fit comfortably over the wrist without binding.



Step 3: With the short end down, slip the slit over the wrist to the inner elbow. The slit should fit snugly, but NOT TOO tightly. Too large a slit may allow the wing to slip. Too small a slit will hamper circulation. To test: when the slit is slipped over the wing it should hold the wing in normal folded position. If the wing hangs from the wrist it is too loose. If the wing overlaps itself, it is too tight.

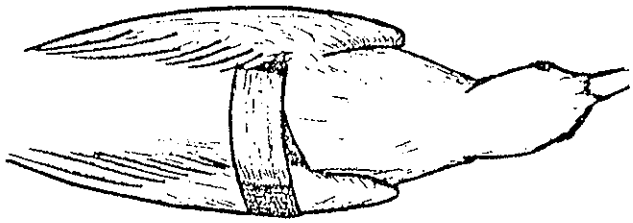


Step 4: Slip the short end under the wing and behind the elbow, bringing it to meet the long piece. Pinch together. The wrap cannot slip forward or backward.



Lateral View

Step 5: Wrap across the back, under the opposite wing, behind the shoulder, across the keel, and over the fractured wing to mid back.



Dorsal View

Step 6: Press the Vetrap® together and reinforce the seam with tape. For large, active birds the wrap may be re-enforced with tape over the wrapped wing from the breast to the back.

To test for snugness on the body wrap you should be able to slip a finger under the Vetrap® at the breast and feel some slight snugness and stretch to the Vetrap®. If it feels very tight to your finger it probably is too tight for the bird. If your finger slips in easily and there is no snugness to the wrap, it is probably too loose.

If the wrap slips from its proper position on the keel, put a piece of tape across the Vetrap® at the breast, overlapping the width of the wrap ⅛ inch to adhere to the feathers. When removing the tape, gently peel it back toward the tip of the feathers. We have had not problem with feather damage using this method.

A simple fracture of the metacarpals or the radius may heal well without using the body wrap. In this case

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Rehabilitation Notes: American Robin: *(Turdus migratorius)*

Marty Johnson
Wildlife Rescue, Inc., Palo Alto, CA

INTRODUCTION

Found in virtually every corner of North America, the robin is truly one of the most ubiquitous of songbirds. Unlike many species, this largest member of the thrush family has adapted quite equably to suburban lawns and gardens, so successfully in fact that there are more robins in America today than in Colonial times. The robin is the state bird of Connecticut, Wisconsin, and Michigan, bearing testimony to both its popularity and distribution. As the traditional "harbinger of spring", the robin brightens our yards with his lovely brick-red breast, and delights our ears with his melodic "cherriup, cherrily, cheeriup."

Within the range of *Turdus migratorius*, from the northernmost continental America to Guatemala, five sub-species of robins are recognized: Western (*Turdus migratorius propinquus*), Northwestern (*Turdus migratorius caurinus*), Southern (*Turdus migratorius achrusterus*), Eastern (*Turdus migratorius migratorius*), and Black-backed (*Turdus migratorius nigrideus*). Slight variations in size, coloration, and breeding range account for the differences in the subspecies.

In winter robins leave Canada and the colder northern United States and migrate to the warmer southern states, returning north to breed in the spring. In California most robins remain year-round in all but the highest elevations - their numbers increasing in the winter months as migrating flocks from the north arrive to feast on berries and insects.

Suburban areas have proven to be an ideal habitat for robins - parks, orchards, golf courses, lawns, and gardens all providing adequate food sources and refuge. Robins are found in almost any open grassy areas near woodlands, including mountain meadows, and are especially numerous where water is plentiful.

DESCRIPTION

Adults: The adult male robin has a rich, dark, brown to brick-red breast, gray back, and a dark (almost black) head, wings and tail. His lower belly is white; his beak, yellow. Females are similar, but paler. Both sexes have white eye rings, white throats with broken black stripes, and white-cornered outer tail feathers. Most western birds are duller overall than the northwestern and eastern sub-species and have less conspicuous white corners on their lateral tail feathers (retices).

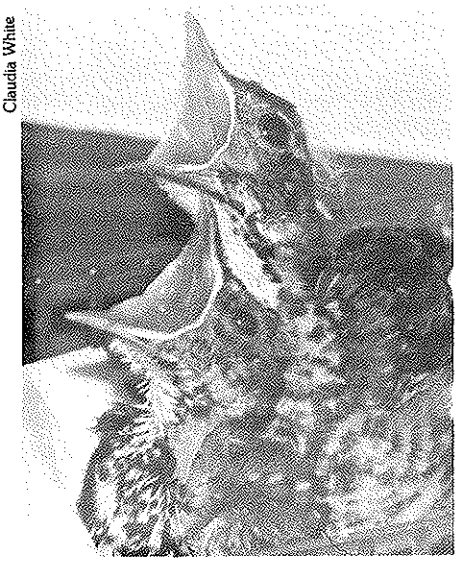
The total length of the adult bird is 9-11 inches with a wingspan of 14¾ to 16½ inches. Adult weights range from 63 to 103 grams, the average weight of 401 Pennsylvania robins being 77.3 grams (Dunning, 1984).

Juvenile: Juvenile robins are distinguished by their speckled black and white breasts. The sides of the breast are rufous, the number and intensity of the orange-tipped feathers varying greatly from bird to bird.

The post-juvenal molt takes place from August-October and involves all the contour plumage, the wing coverts, and tertials. Wear produces the first nuptial (breeding) plumage after which the breast becomes redder, the head blacker, and the chin more distinctly black and white. Adults complete their post-nuptial molts between August and October.

Robins on the wing can be identified by the long straight line of their backs and tails. The wings move rapidly and regularly with little evidence of soaring or sailing. They fly at a rate somewhere between 25 and 35 m.p.h. (Bent, 1964). When foraging for food, robins run along the ground with their heads down, stopping abruptly and striking a distinctly upright pose.

The life span can be up to 17 years in captivity with one wild, banded robin having been reported to survive for 11 years, 8 months (Terres, 1980). Hunters used to be responsible for a high mortality rate among robins; but, today, cats are



Claudia White

Fledgling Robins.

undoubtedly the greater enemy. The number of cat-caught robins presented for rehabilitation is a testimony to the perils of existence in suburbia.

NATURAL DIET

The staples of a robin's diet are fruit, insects, and worms. The exact proportion of animal to vegetable matter in the diet varies with the season and subsequent availability. Overall, robins will consume about 60% vegetable matter and 40% animal matter. In the fall and winter, however, when insects are less plentiful, the ratio changes to 80% vegetable versus 20% animal matter (Martin, Zim, Nelson, 1951). The opposite is true in the spring and early summer.

The chief items of animal food are: beetles, caterpillars, and earthworms. The balance is flies, sowbugs, snails, spiders, termites, and destructive insects like the alfalfa weevil. The vegetable diet is comprised of fruit of the: peppertree, privet, grape, prune, cherry, raspberry, strawberry, olive, mistletoe, apple, cononeaster, serviceberry, fig, buckthorn, manzanita, madrone, blackberry, pear, eugenia, camphor, and pyracantha plants and trees.

Contrary to a long-held belief, robins locate earthworms by sight rather than by sound. The familiar head-cocking motion is performed because a robin's eyes are located on the sides of his head (Harrison, G., 1984). An adult robin may eat as much as 14 feet of earthworms in a single day!

BIRTH AND YOUNG

Territory and Courtship: The breakup of the large social flocks of robins which have gathered during late September and remained together through February signals the beginning of the breeding season. Robins who were previously sharing a food source begin to stake out individual territories in preparation for mating and nest building. While mockingbirds will vigorously defend their breeding territories, robins define more "fluid" boundaries, insisting on only about a third of an acre for their own. Both males and females generally return to the same breeding area year after year; however, they do not necessarily breed with the same mate. Even during the breeding season, male robins flock to a communal roost at night, returning to the area of their nests by day. An estimated 165,000 birds were observed in one such communal roost in Lakeside Park, Oakland, California (Bent, 1964).

Except for the lovely spring song of the male robin, reliable courtship data is scarce. Observers have reported everything from wild "chasing" of females, to pompous "strutting," to a motionless style of lovesick "gazing." Certainly there is no consistently obvious courtship behavior.

Nesting: In a site selected by the female robin (typically a horizontal branch or building ledge 5 to 20 feet above the ground), a nest of grasses, strips of cloth, string, and weed stalks is constructed. The female robin carries mud on her breast to form the inside of the nest. It is shaped like a deep, tidy cup. While the male may interrupt his singing to bring materials to the nest site, the female does the bulk of the construction.

The breeding season throughout the continental United States extends from April to July. Robins may have 2 to 3 broods a year. The female lays 3-6 eggs, 4 being the most common clutch size. Eggs are laid one at a time on four consecutive days. They are oval and smooth. The eggs are "robin's egg blue", an accepted color standard. The female does all of the incubating for a period of 12-14 days leaving the nest for short periods to feed each hour.

A newly hatched robin chick (approximately 5 grams) is blind and naked except for a few tufts of cream-colored down on his head, back, and wings. His skin often has a yellowish tint. The inside of his mouth is yellow as are his gape flanges. A newborn robin is wholly dependent on his parents for food and warmth. Although he cannot stand or sit upright, he will gape readily when stimulated. With luck, he will leave his nest (fledge) at about 13 days weighing more than ten times what he did at birth (Harrison, G., 1984). Male robins assume the feeding duty for fledglings as the female is often out looking for another nest site. The age of first flight for young robins is approximately 14-16 days.

HOUSING

Newborns: *(1-4 days post hatch)*: Newborn robins cannot thermoregulate and must be kept warm and humid artificially. A simple, economical version of an incubator can be constructed by placing the birds in a tissue-lined berry basket or other small container such as the kind sour cream comes in. When using berry baskets, the plastic mesh sides and bottom must be completely lined with tissues to prevent injuries. The container is then placed inside a plastic bag (not sealed) and put on a towel-covered heating pad set on low. Moisture may be introduced to the "incubator" by the addition of a small baby food jar containing wet cotton or Kleenex. Care must be taken to ensure that the water jar is not touching the nest since capillary attraction could cause the birds to get wet. Temperature in the incubator should be 90 degrees F. Monitor with a thermometer.

Young Nestlings: *(5-9 days post hatch)*: As soon as a robin chick's eyes have opened - approximately day 6 - he can be moved out of the incubator. He should still, however, be housed in a small nest. If the nest becomes too small for the rapidly growing birds, move them to a larger container. Margarine tubs, shallow plastic bowls and cereal dishes work well. Whatever the container, robins should be high enough in their nest so that they can back up and defecate over the edge. A normal nestling dropping is encapsulated and contains both stool (the dark matter) and urates (the white). Keep nest and environs scrupulously clean at all times. Drafts can be minimized by placing the nest in a small box. Young nestlings should still be placed on low heat except during the hottest summer weather. As feathers start to appear, the heat may be decreased. A panting bird is too warm.

Nestling/Fledglings: *(10-14 days post hatch)*: By the 10th day young robins are fully feathered except for their abdomens. They often have the remnants of down "antlers". Their

tails are less than an inch long. Toward the end of their second week of life, they will leave their nest preferring to perch for limited amounts of time. This departure necessitates a different kind of housing. The heating pad is no longer needed. Instead, place the nest inside a medium-sized cardboard box with the top and at least one side removed. Cover the top and side with fiberglass screening. The screening can be attached with duct tape, clothespins, or small metal clips. An access door is a must. The bottom of the box can be lined first with aluminum foil, then several sheets of newspaper, covered with paper toweling. Newspaper alone is too slippery; paper towels give the birds more "purchase". Change the papers often.

The box should have a perch available placed a few inches off the bottom and enough forward so that the rapidly growing tails won't scrub against the back of the box. Before choosing a perch, look carefully at the birds' feet. Robin feet are big and require a perch at least as big around as a thumb. Don't handicap a beginning percher with a perch that is too small in diameter. Place food dishes along the front of box where droppings will not land in them. Birds almost always face the open, screened side of the box, which puts their droppings behind the perch.

Even after the young fledglings have left their nest, leave it in the box for a few days. Fledglings often "take to their nest" for a nap, or, more typically, for the night. If possible, place the box in front of a window so the birds can look out. Don't place them where you are in view all the time. Having as little human contact as possible may be the key to their successful rehabilitation.

Fledgling/Juveniles *(15+ days post hatch)*: The activity level of robins seems to be directly proportional to the size of the box in which they are housed. For robins over two weeks of age it is imperative to have as big a box as is practical. A TV carton or paper towel box is ideal. The bottom should be prepared with layers of foil, newspaper, and paper towel as before. The aluminum foil is particularly helpful in preventing the bottom of the box from becoming soggy as the robins bathe. Position perches about half way up the sides and allow plenty of tail and head room. Again, place the food and water dishes in such a way that they will not get fouled with droppings.

Begin the process of acclimatization by placing the box in front of an open window. As the robins become self-feeding, place them outdoors for an hour or so each day - weather and local predators permitting. The vitamin D3 produced by natural sunlight is critical to good feather development. The sun, the winds, and the sounds of other birds are all important aspects of a young bird's outdoor familiarization.

Robins often seem to become very excited toward the end of the day. They vocalize, clack their beaks together, and jump up against the top of their box becoming very hyperactive as sunset approaches. This is normal behavior. Perhaps it has something to do with the fact that, in the wild, they are among the last birds out foraging for a final worm.

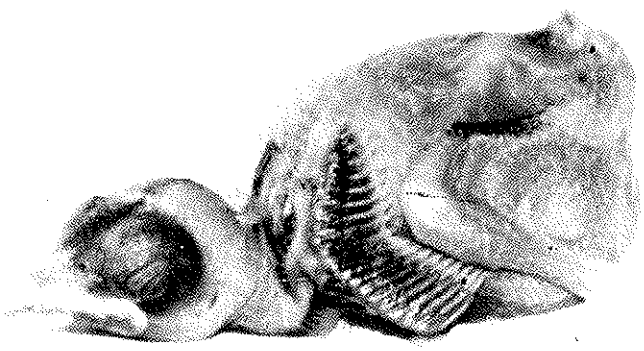
A robin who has been self-feeding for at least a week and who has been acclimated to the outdoors is ready for an aviary. Aviaries for robins should be at least 6'x6'x8'. Providing a variety of natural perches is important as is offering a sheltered place to hide near the top of the aviary. Many birds will run and hide in shrubs or bushes if plants can be successfully grown inside dirt-floor aviaries. Since robins like both to drink and to bathe in their water, more than one large dish is desirable. Water needs to be changed often.

DIET

Newborns/Young Nestlings: Feeding protocols and diets for infant robins vary amoung different rehabilitation organizations. Many groups prefer to start very young birds on a special high-protein, high-calcium diet. This insect-eater type diet is then replaced with a more general nestling diet when the birds' eyes have opened. The Basic Nestling Diet presented in Table I has been used successfully by Wildlife Rescue volunteers for robins of all ages including the very young. Because research has indicated that newborn birds need more moisture than older nestlings (Roudybush, 1986), the Basic Nestling Diet should be diluted with additional water when feeding birds less than 5 days old (eyes still closed). Roudybush's study on the nutrient requirements of cockatiels suggests that, "The most important change in diet composition will be the ratio of water to solids in young chicks." A suggested ratio would be 90% water/10% solids from hatching to approximately 5 days, changing to 70% water/30% solids thereafter.

A 1cc eye dropper with a smooth, tapered end is an ideal feeding implement for young robins. The dropper must be inserted past the glottis to avoid aspirating the food and far enough down into the back of the mouth to trigger a swallowing response. Frequency and duration of feeding are the keys to successful rehabilitation of infant robins (Beaver,

Lauren Van Zandt



Newborn Robin.

1985). Newborns should be fed every 15 or 20 minutes for a minimum of 14-16 hours daily. Newborns will respond to nest jiggling with a brief feeding gape.

Feedings can be spaced out to every half hour as birds approach their 10th day of life (fully feathered except for abdomen), but they should still be fed for a minimum of 14 hours. Since a robin's eyes are located close to the hinges of his beak, care must be exercised to make sure food does not accumulate in the gape flanges. Eye infection could result from careless feeding. At this age robins gape readily. Unlike finches and other species that tend to overeat, robins will stop gaping when they are full. Weigh the birds as often as possible. Young robins will gain up to 6 grams a day.

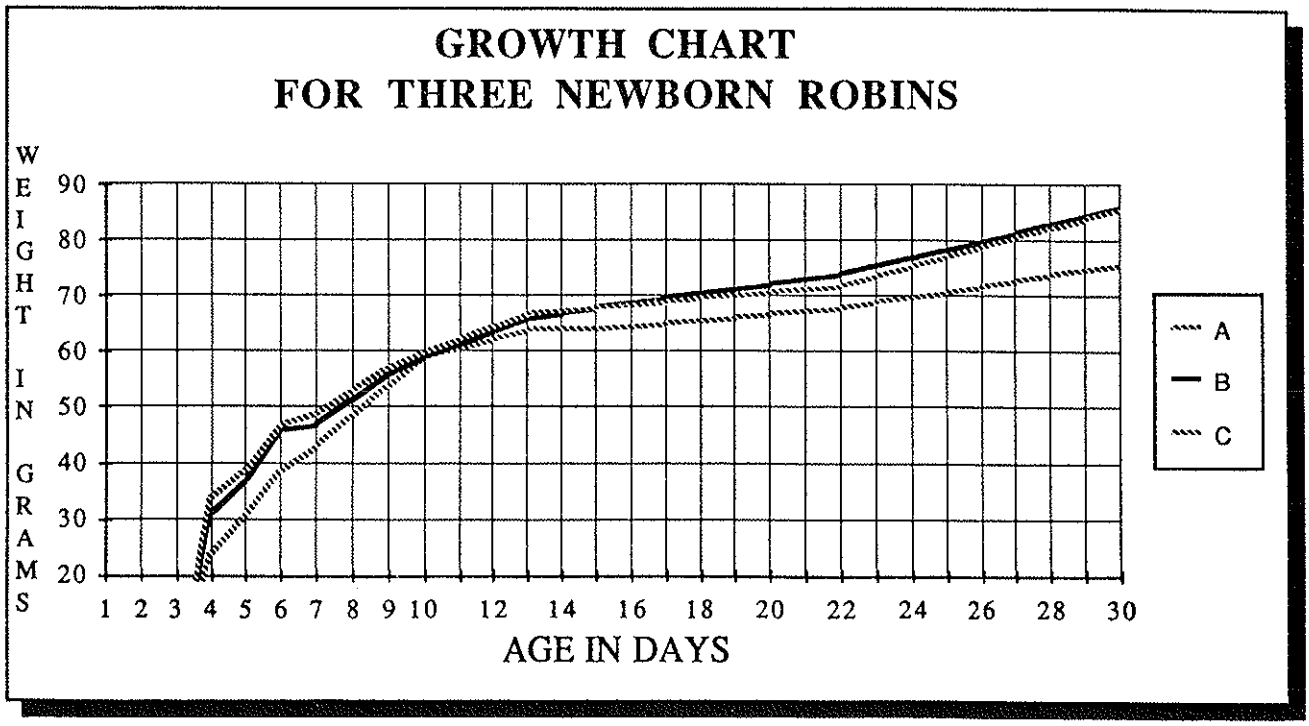
Once a robin's eyes are open, it is important for him not to be raised as an "only bird." Togetherness not only helps to keep infant birds warm, it also serves to inhibit imprinting. Mockingbirds and robins can be raised very successfully together.

Nestlings/Fledglings: As robins approach the end of their second week of life, feedings of Basic Nestling Diet may be administered every 45-60 minutes throughout the day. Now is the time to introduce the birds to "real" food. As soon as fledglings are routinely perching, add small weighted dishes of chopped fruit and mealworms (dusted with calcium to improve the Ca/P ratio). The birds are not expected to eat by themselves at this stage, but it is important for them to know that good things are coming from the various dishes in their box. This process can be hastened by picking up small bits of food with a blunt-ended pair of tweezers and hand feeding them to the birds. A few bites of natural foods along with the nestling diet are an important first step toward self-feeding.

Even young robins love water - a characteristic they never outgrow. Add a wide, shallow dish of water to the box. A metal pie plate or microwave dinner tray works well. Most likely the robins will not drink the water, but, rather, will jump in and start bathing. The dish should be heavy enough - or weighted down with a stone - so that they cannot tip it over.

Fledgling/Juveniles: Hand feedings of nestling diet for birds over two weeks of age should be no more often than 60-90 minutes. Water and food dishes should be in the box at all times. Favorite foods include Peanut Butter Mix (see Table 2), mealworms (with added calcium), and chopped fruits including cherries, berries, apples, pears, grapes, plums, peaches, apricots, wedges of melon, and soaked currants. To encourage foraging behavior scatter leaves or pine needles over the bottom of the box. Robins are curious and will spend lots of time rummaging through the vegetation. Occasionally their efforts will unearth errant mealworms.

Hand-feeding young robins too long is probably the most common mistake new rehabilitators make. Robins begin to self-feed more readily than do many other species, and hand feeding them for too many weeks only makes them dependent. Space out the feedings especially in the morning when the birds are the hungriest. One must be somewhat hard-nosed if the birds are to make the transition to self-feeding. A hungry bird is more likely to become interested in his natural foods than a stuffed bird. Weigh birds often to see if they are gaining satisfactorily. Expect a weight "plateau" as the robins begin the self-feeding process. If you are uncertain as to whether a bird is self-feeding or not, try putting only chopped red cherries in his fruit dish. A bird who has eaten red cherries, or any other dark fruit, will produce




Claudia White

Gaping newborn Robins.

purple droppings. Purple droppings, therefore, are an indication that the bird is eating on his own.

TABLE 1
Basic Nestling Diet

1 jar (3.5 oz.) strained baby meat -chicken or turkey
1 cup Feline Science Diet Maintenance Formula - slightly rounded
1½ cups warm water
½ teaspoon Super Preen vitamins
½ teaspoon brewer's yeast - not baking yeast

Put warm water in blender. Add Science Diet and soak for 20-30 minutes. Blend until smooth. Add meat, vitamins, and brewer's yeast. Blend Again. Store in refrigerator or freeze for future use.

% Protein (wet) – 10
Ca/P ratio – 1.36:1.0
Kcal/gram - 1.1

TABLE 2
Peanut Butter Mix

1 cup peanut butter
1 cup wheat germ
2 cups powdered Feline Science Diet
2 tablespoons Super Preen vitamins
2 tablespoons brewer's yeast - not baking yeast

Mix well with hands. Can be made in food processor if peanut butter is melted. Mixture should be crumbly not sticky. Add more wheat germ if necessary. Store in refrigerator or freezer.

RELEASE

A number of considerations determine when robins are ready for release. They should be at least five weeks old and should have been in an outside aviary for a minimum of seven days. They should be fully self-feeding and eating a variety of their natural foods. Their weight should be 70+ grams and their feathers should be in good condition. Blood work should indicate a packed cell volume of 40-45% and a plasma protein value of 3.0g/dl (White, 1986). Birds should be able to sustain short to medium flights without panting. They should also be waterproof. It is extremely important for them to be properly fearful of both humans and pets.

Also important is a proper release site with food, a water source and other robins. Golf courses often satisfy these site requirements. Robins are diurnal and should be released early in the day when the forecast is for prolonged good weather.

DISEASES

A routine fecal examination in robins of all ages is virtually guaranteed to reveal a host of endoparasites. Robins are susceptible to coccidia, capillaria, hookworm and, especially, gapeworm (*Syngamus trachea*). They should also be screened for *Plasmodium* and *Haemaproteus* (White, 1986). Whether or not these parasites require treatment is a matter of some judgement. The number of ova in the specimen (except in the case of coccidia) and the general physical condition of the bird are determining fractors. Since traces of one or more of the above parasites are endemic to robins, it is only when significant amounts of ova are found that treatment is prescribed. Birds showing signs of emaciation or listlessness need immediate treatment. Undersized or debilitated robins with any of the parasitic disorders seldom seem to be hardy enough to survive even with treatment. Normal sized, robust robins, however, gain weight and thrive - often without treatment - even though traces of ova continue to show up in their fecal exams. Consultation with a veterinarian is helpful in determining if the bird's symptoms (if any), weight, and behavior indicate the necessity for treatment.

The protozoan coccidia may be treated by the addition of amprolium to the drinking water. The treated water must be given orally to young robins since they do not drink on their own. Amprolium may be added to the drinking water until the number of ova is reduced. Trichomoniasis, another common avian protozoan disease, is almost never found in robins. None of the more than 400 robins presented for rehabilitation in the past two years has been diagnosed as having trichomoniasis.

Hookworm and capillaria, endoparasitic worms, respond to treatment with piperazine. Piperazine is administered orally in a single dose and repeated in two weeks if fecal examinations reveal more than traces of ova.

Robins are particularly susceptible to gapeworm (*Syngamus trachea*), a threadlike red nematode which attaches itself to the trachea. This is because infective larvae are swallowed by earthworms, flies and other arthropods which are eaten by this species (Soulsby, 1982). Symptoms of the disease include emaciation, droopiness (the head often hanging in advanced cases), open-mouthed breathing, and a certain hoarseness of voice caused by the rapidly growing worms. Any bird whose vocalizations sound "different" should be tested for gapeworm by means of fecal floatation in sodium nitrate solution under low power. Since the treatment is an IM injection of Ivermectin, judgement is again required to determine whether or not a bird showing fecal signs of the disease should be treated. An otherwise healthy robin of good weight, revealing few traces of gapeworm ova in his fecal examinations and showing no symptoms of the disease, does not need immediate treatment. It is unlikely that the disease will become a problem. Careful monitoring and fecal re-checks are important. A weak or thin bird may well need the

help of Ivermectin to combat gapeworm. Equine Ivermectin is diluted at a ratio of 0.25 cc to 10 cc of saline solution. The diluted medicine is then administered IM at a dosage of 0.25 ml/kg. Bovine Ivermectin, diluted 0.25 cc in 10 cc propylene glycol can also be used with effect. It is given orally at 0.25 ml/kg.

Two additional treatments for gapeworm have been used with some success by Tri-State Bird Rescue and Research, Inc. of Wilmington, Delaware (Frink, 1984). Oral delivery of thiabendazole at 0.12 to 0.25 mg/gram of body weight for 3 days followed by a single dose 12 days later proved to be partially successful although some birds still exhibited signs of infestation. Fenbendazole delivered in a single oral dose at 100 mg/kg of body weight proved to be very successful. Birds showed definite improvement in 5-7 days.

Lesions around the eyes, beak, or feet of a bird are often indicative of Avian Pox. Treatment for pox is primarily isolation and good supportive care. Idoxuridine Stoxil® may also be applied to the lesions (White, 1986).

Occasionally robins with mites (ectoparasites) are received for rehabilitation. Birds with mites should be treated with a pyrethin-based bird spray. Never spray the bird directly. Instead, spray a tissue and then wrap the bird in it, making sure that his head is uncovered and ventilation is adequate.

About one in four robins "sneezes", making an explosive sound somewhere between a cough and a sneeze. In most cases this sneezing goes away spontaneously. If, however, the sneezing persists, birds should be referred to a veterinarian to determine the nature of the illness. Respiratory infection, gapeworm, or nasal trichomoniasis are common findings.

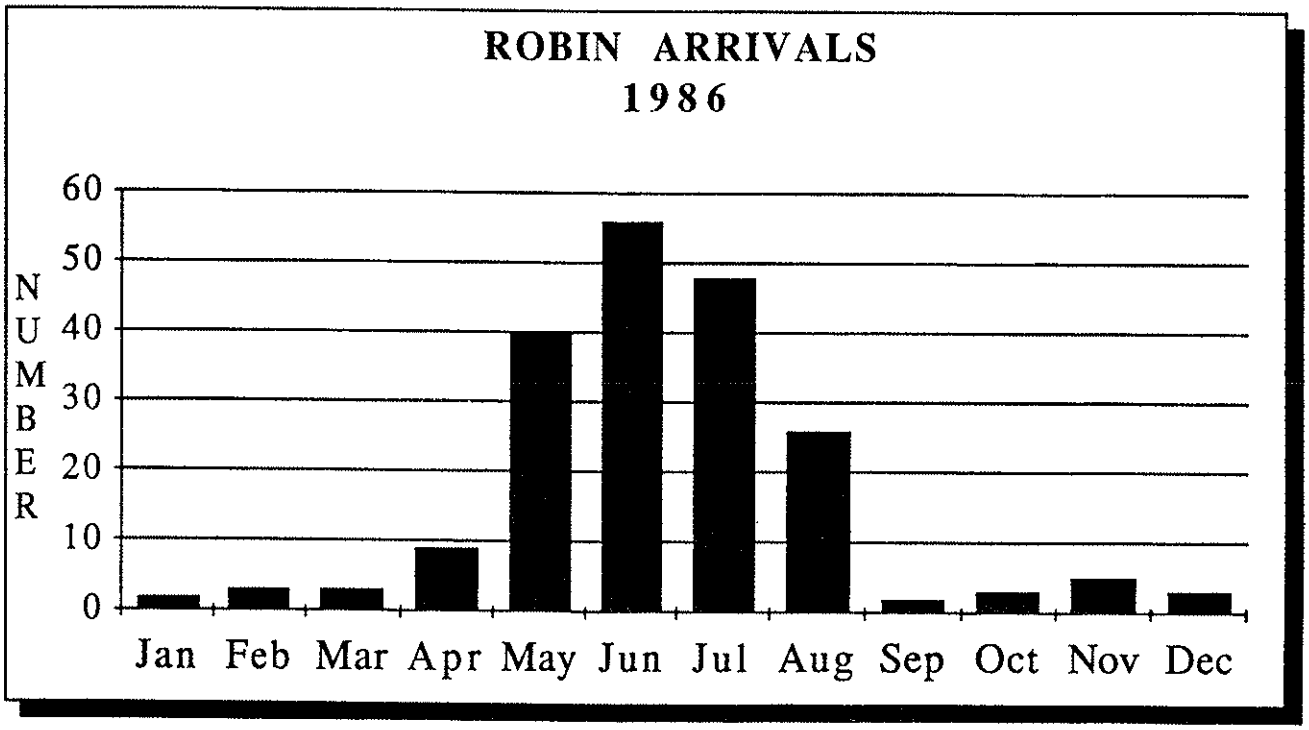
In the winter months all the robins received for rehabilitation are adults. Many, having eaten quantities of fermented berries, are intoxicated and have fallen prey to cats or flown into windows. A few years ago very few cat-caught adult birds were ever released. Most died within three days. Some, without a mark on them, declined for no apparent reason. Traditionally these winter casualties were kept alone and quiet.

In 1984, a "group convalescence" experiment was tried, combining six cat-caught robins with a variety of fractures, wounds, and air bubbles. They were placed together in a large cage in a garage and disturbed only for food and medication. All six were released! Since robins travel in flocks in the winter, perhaps putting them together to heal created a more normal situation. At least for this group the distractions seemed to prevent the fatal depression that often sets in.

STATISTICS

Wildlife Rescue, Inc. receives approximately 200 robins for rehabilitation each year. In 1986:

- 85% of all robins arrived in May, June, July, and August - June being the busiest month.
- The overall release rate for robins of all ages was 39%.
- Approximately 6 out of 10 birds received were nestlings or fledglings.
- 52% of the young birds and 16% of the adults were released.
- Young robins who survived their critical first 3 days enjoyed an 82% release rate.
- 30% of all robins received were animal caught. 22% of this group were released.



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Editorial . . .

need to share what we have learned with both other rehabilitators and health professionals.

We need to consult veterinarians and other trained investigators on what variables to change as well as interpretation of the results. Because of their training, they can offer insights from their respective backgrounds.

Who has the time for this, or the money? What usually happens is that our level of frustration regarding a particular problem (coupled with sheer curiosity) overcomes our lack of time and money. It seems to me that we need to reevaluate our priorities and do something to make our problem-solving attempts more feasible.

We all feel the animals we care for are our primary responsibility. The difficult question is whether or not we take time away from our regular animal care duties to do the necessary investigation and data recording to improve our efforts for future animals? I ask you, where would wildlife rehabilitation be today if its pioneers had not done some investigative work? While everyone benefits when we find the answer, who is responsible for doing the work? It is easy to say let someone else do it, but do they have the same opportunity to work with the species that you are having trouble with? Is it their responsibility in the first place?

In my opinion, all rehabilitators should pick a particular problem that they keep good records on. Those records should be made available to others if they are willing to work on the problem. This takes cooperation and trust between the people involved. If you are thinking to yourself, "I don't have time to do research, nor am I qualified" — try to do more than complain about your unresolved rehabilitation problems. You could free up some time by delegating tasks that others can do leaving to yourself only tasks that they cannot. A less experienced rehabilitator could help an inquisitive team member who would like to pursue identified problems by freeing them from the daily animal care.

Our efforts to find the answers need not prevent us from carrying out our wildlife mandates. With proper management of volunteers, staff, funds and time, we can do both our rehabilitation and some problem solving without sacrificing one for the other. As our workload grows, we streamline our methods of data collection and become more efficient.

As for funding, while much can be done with little cash, we should strive to make more funds available to facilitate research efforts. Currently, the National Wildlife Rehabilitator's Association offers an annual grant of $1,000 for research efforts in our field. It is the only such program specifically for funding wildlife rehabilitation research. Outside of this program, we must currently look to other related fields, such as veterinary medicine for research funding.

As a new profession, we had our hands full trying to become established. Now a quarter of a century later, it is time for us to recognize this need to do more about it. We have two organizations (IWRC, and NWRA) to represent our needs to others. We should recruit someone to forage for funds to be channeled into needed research in wildlife rehabilitation. IWRC should at the least include the need for research funds into planning documents for the next five years.

Wildlife will continue to face increasing challenges from man's intervention in the biosphere. They are going to need every assistance that we can offer and practical research can offer solutions to many of the problems that rehabilitators face today. This will give us the tools that we need to meet the challenges of tomorrow.

Jan White

Baylisascaris procyonis and the Wildlife Rehabilitator

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The raccoon, *Procyon lotor* ranges from the south of Canada to the north of South America. Consequently, many rehabilitators are actively involved in the rehabilitation of the raccoon, *Procyon lotor.* Most are cautious while handling these animals and are aware of such immediate dangers as the scratching, biting, and escape artistry of these curious omnivores. There are, however, other potential dangers this animal can present.

Rabies, toxoplasmosis, distemper, panleukopenia, bacterial, viral and parasitic infections are known in the raccoon. The purpose of this article is to center on one parasitic infection that can be pathogenic or even fatal to other animals in wildlife centers, including the human handlers.

The following story is one that many can identify with. After the story, a discussion of what should or shouldn't have been done will be presented.

A male raccoon cub is presented to a rehabilitation center. He was one survivor of a family that had just been killed on a country road by a passing truck. During the physical exam, a distended abdomen is noted, but that is given low priority because of other more life threatening problems. The animal is hypovolemic, hypothermic, and shocky from acute blood loss. He needs to be catheterized, started on fluid therapy and incubated. This you do.

The next day, he looks much better. His mucous membranes are pink, his eyes are bright, skin turgor has returned to normal, capillary refill time is one second, and he is attempting to rip out his catheter! After being disconnected from the infusion apparatus, you let him crawl around a bit while the incubator is washed with soap and water, then sprayed with dilute Roccal (as per product instructions) and dried. The feces on his feet leave little tracks on the floor, which you likewise wipe up. In a few days, he no longer needs incubation; in a couple of weeks, he is moved outside.

Now you focus on the distended abdomen. Suspecting worms, you run a fecal. You find an average of ten ova per low power field of what looks like *Toxocara canis* ova. You calculate the dose of piperazine and dose him. The next day, about a cup of ascarids are seen in the feces. The abdominal distention goes down. The raccoon learns to hunt and is released. Total time in the center: two months.

A problem now arises with the quail that has been put in the incubator that had held the raccoon. Though not presented ataxic, the animal has become so. You note dyspnea also. The animal dies. The next rabbit that goes into the incubator also starts showing central nervous system (CNS) disturbances before he, too, dies. You submit the carcasses to a pathologist. The findings indicate cerebrospinal nematodiasis caused by *Baylisascaris procyonis.*

Cerebrospinal, ocular, and visceral nematodiasis has been documented in an ever increasing number of species after their having been housed where once raccoons lived. The use of raccoon contaminated straw, bedding, or food also has been incriminated in the etiology of this disease. Squirrels, mice, woodchucks, rabbits, nutria, emus, quail, chickens, partridges, dogs, pigs, subhuman primates, and human primates have had cause of death diagnosed as *Baylisascaris* larval migrans.

Baylisascaris procyonis is an intestinal roundworm parasite of raccoons. There is also a *Baylisascaris columnaris* whose definitive host is the skunk and whose larvae can also be pathogenic. We will consider only the raccoon species here, but the danger and the preventative precautions should be heeded when dealing with skunks, also (as well as other well understood precautions!).

Most parasites have evolved with their definitive hosts, and cause minimal pathogenesis in this host species. The survival of the host is imperative to the survival of the parasite. There are, of course dangers of intussusception, blockage, and malnutrition in excessive parasite loads of intestinal nematodes, but these are the exception rather than the rule.

To assure its survival, the *Baylisascaris* ascarid has evolved the use of paratenic hosts. The range of types of species infected is very wide and varied. It would appear that most domestic and wild species of mammals and birds can be affected. These animals ingest the infective ova containing second stage larvae. Vegetation, soil, bedding, food, or any area once soiled with raccoon feces is a source of infection. The larvae do not generally mature in this paratenic host, but migrate through the host's body, encysting in tissues, and waiting to be eaten by a raccoon. The debilitation and

death that the parasite causes in the paratenic host is more assurance of the parasite's survival. The raccoon is able to catch the ataxic animal more easily, or scavenge on a dead one, and the parasite is able to complete its life cycle within the raccoon.

It is the migratory behavior of the larvae that causes the pathogenesis. After ingestion, the larvae penetrate the gut wall, then migrate to the lungs and liver. Needless to say, bacterial infection can accompany this migration: the coliform and other gut flora multiplying in the lungs or liver, decreasing function of these organs. Inflammatory responses of the host to the presence of the parasite can also diminish the animal's ability to escape. In the lungs, liver and muscles, the larvae often encyst, creating granulomatous lesions that can lead to dyspnea, or liver dysfunction.

The central nervous system complications, however, are the most characteristic of the *Baylisascaris* infection in the paratenic hosts. Some of the larvae do not encyst in the lungs, liver or muscle, but enter the general circulation and terminate in many organs. There is a predilection for the CNS. Here they create cerebrospinal nematodiasis. The number of larvae reaching the brain appear to be proportional to the total number ingested. Just a few larvae in the CNS can cause some clinical symptoms which also appear in rabies, tetanus, CNS trauma, and other debilitating neurologic disfunctions. The symptoms of ataxia, circling, torticollis, opisthotonos, loss of vision, extensor rigidity, paralysis, or abnormal behavior can appear individually or in combinations in mammalian and avian species.

The migration tracts of the larvae in the CNS consist of microcavitation foci with accompanying malacia, perivascular cuffing, gliosis, astrocytosis, inflammatory cell infiltration, an influx of macrophages, lymphocytes, plasma cells, and eosinophils. These tracts scatter through the spinal cord and cerebrum, cerebellum, midbrain, and medulla and are often hemorrhagic. There is often accompanying demyelination, degeneration of neurons, and general necrosis of tissue.

Baylisascaris larvae seem to display an affinity for the retina of the eye. Retinal detachment is sometimes seen with the presence of larvae in the eye. Dr. Kevin Kazacos innoculated squirrel monkeys to study the pathogenesis of the nematode to establish guidelines for diagnosis of human cerebrospinal nematodiasis. He noted the visual disturbances in these subjects from the retinal detachment. (Let me mention here that because of Dr. K. Kazacos' outstanding research, several cases of human Baylisascariasis have been diagnosed based on the patients proximity to raccoon populations and the presence of the ascarid in the eye.)

A two-year-old Pennsylvania boy was the first proven human fatality. He lived in an endemic area for the ascarid and the host, and had possessed a pet raccoon. On autopsy, large numbers of *Baylisascaris* larvae were isolated from his brain, spinal cord, heart, lungs and other tissues.

The problem, then, is one which wildlife rehabilitators must heed as a public health issue as well as a potential danger to the wildlife presented to the centers. Most of the animals are received immunocompromised by trauma, fear, and disease...their defenses are down. We, who have undertaken the role to assist these animals in need, owe them the consideration of good husbandry techniques.

Incidence

Studies done in Indiana reflected that 88% of the juvenile raccoons and 70% of the adults were infected with *Baylisascaris*. It is not uncommon! It has appeared in many areas of the country. Since the symptoms are often non-specific, a paratenic host's death is often attributed to unknown etiology. The author believes that the incidence is much more widespread than is realized.

Prevention

Ideally, it would be good to have housing that is only intraspecific: raccoons only follow raccoons in cages and pens. Realistically, this is almost impossible for most centers. Therefore, proper decontamination procedures must be employed.

The ova are very resistant to disinfection, drying, and time. Embryonated ova have been kept viable for more than 12 years under refrigeration in laboratories. It is believed that in most natural situations, the ova may remain viable for months to years. An infected raccoon is capable of shedding millions of ova per defectation! These ova will stick to cages, the floor, dirt, skin, under fingernails, and to just about anything they contact. Soap and water washing will not decontaminate! Our raccoon cub in the beginning of the article was spreading ova with each step. The handler was not wearing gloves. The incubator, cage, and pen were not disinfected correctly for this parasite, thus explaining the mortalities of the animals housed in these enclosures following the raccoon.

Recommended decontamination procedures are autoclaving, flaming with gasoline, propane, or fuel oil, boiling in lye water (1 lb/20 gal. water), boiling in lysol, or soaking in a 1:1 solution of xylene and absolute alcohol with adequate contact time. Enclosures, especially soil-based ones are best decontaminated by using a portable propane torch which will bring the soil temperature up to a point where the heat will kill the ova. Since these torches are often used by farmers to burn weeds or construction companies to dry cement, they can usually be obtained from construction rental companies. Any of the procedures described above can present hazards to rehabilitators and should be done using appropriate safety precautions. All feces, including feces that may be mixed in with bedding materials should be burned. Handlers should always wear gloves and masks when decontaminating. It is possible to inhale dry feces.

Raccoons should be routinely screened for parasites at intake. Fecal flotation with or without centrifugation in zinc sulfate or in sodium dichromate solution are good methods for detecting the ova. One negative fecal should not be considered as proof that the animal is free of the parasite. The female nematodes may not be shedding ova at this time. Subsequent rechecks must be employed, especially in the first six to eight weeks of confinement.

Treatment

For the definitive host, the raccoon, anthelmintics such as piperazine, levamisole, and fenbendazole have proven effective. The author has not found any documented use of the ivermectins in either the treatment of the definitive host or the paratenic host, thus its effectiveness cannot be evaluated at this time. The effectiveness of any anthelmintic in the paratenic host against the larval form is also not know. Prevention is definitely superior to the cure in the intermediate hosts, for no cure is known.

Diagnosis

In the raccoon, the finding of the ova in the feces is definitive. In the unfortunate paratenic hosts, diagnosis must be made by history of exposure, clinical symptoms, or the demonstration of the larvae on necropsy. An Enzyme Linked ImmunoSorbent Assay (ELISA), detecting antibodies to the parasite in the bloodstream of the infected animal, is being tested and may soon be available. The Center for Disease Control (CDC) uses this test for *Toxocara canis* infections.

On necropsy, the use of the Baermann extraction method can be employed to recover larvae from the brains and other tissues of infected animals. Even without larvae being isolated from the brain, the finding of visceral granulomas with encysted *Baylisascaris* larvae can lead to a probable cerebrospinal nematodiasis diagnosis because of the affinity of the larvae for the CNS.

Necropsies on these animals should be performed by experienced personnel in a diagnostic laboratory. Remember these animals should be considered rabies suspects as well.

1) Examine the thorax and abdomen for larval granulomatous lesions, pepsin-hydrochloric acid digestion techniques can be used to isolate larvae.
2) Take half of the brain for rabies testing.
3) Take two or three slices for histological examination.
4) Baermannize the rest of the brain, check for larvae under low power of a stereoscopic scope.
5) Refrigerate, but do not freeze samples.

Identification of *Baylisascaris*

The ascarid displays the characters of the ascarididae with cervical alae salient or reduced; cuticular bars reach the surface of the cuticle; dorsal and subventral labial papillae are double; U-shaped excretory cell; dorsal esophageal gland nucleus is U-shaped and does not extend into the subventral sector; stout spicules of uniform width and generally less than one millimeter; usually greater than 30 precloacal papillae; post-cloacal papillae are doubly paired on each side, with one closely associated single papilla and two subventral single papillae and a phasmid.

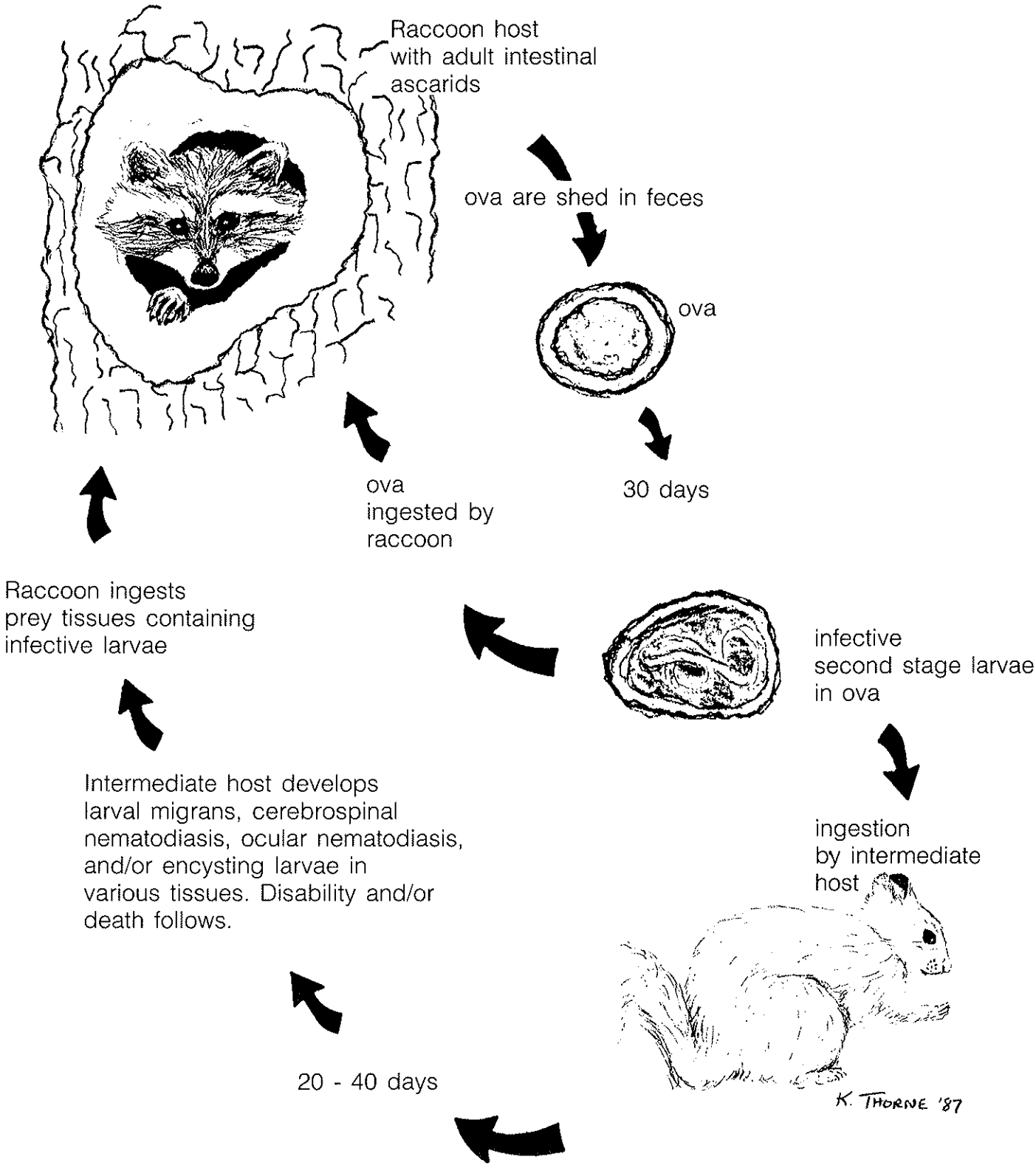
Conclusion

Baylisascaris procyonis is a potentially lethal organism to ourselves and most of our wildlife patients and needs to be handled with the utmost caution. Because of the similarity of this ascarid's ova to that of *Toxocara*, raccoons found positive for any ascarid should be treated and decontamination procedures followed. Metal cages that can be flamed are recommended for the more critical raccoon patients; dirt floor pens used by raccoons should not house other species. The opossum has been found to show resistance to the organism, but housing opossum after raccoons is not recommended. The ova and the life cycle of the organism is shown here for your understanding. Remember to run fecals on all raccoons admitted and, please, wear gloves when handling raccoons and their excrement!

Reviewed by Norman Baker D.V.M., Department of Microbiology and Immunology, University of California, Davis, School of Veterinary Medicine

Glossary

Astrocytosis:	a condition of an increased number of astrocytes: a small (5 μm), star-shaped, specialized, neuroglial cell. See also gliosis.
Ataxic:	a state of loss of coordination in locomotor movement; staggering, loss of balance.
Autoclaving:	a process of sterilizing materials in an autoclave: a steam and pressure sterilizer.
Baermann extraction:	a technique to remove larvae from feces or tissue: A glass funnel nine or ten inches wide at the top and closed at the bottom by clamped rubber tubing is set in a ring stand. Place a five inch piece of wire mesh in the funnel and cover with linen. Place feces or mashed tissue in the funnel, and cover with 40 degree centigrade water. Let this set overnight or several hours. The larvae will settle to the bottom (the neck of the funnel) and can be gathered in the first few cc's drawn off.
Catheterized:	the state of having an apparatus inserted for facilitating administration or removal of fluid substances from the body. As used here, for replacing fluid into a vein. Catheters are also useful for blood removal, when many serial samples must be taken, and for transfusion. There are also urinary catheters useful for both the removal of urine and for bladder lavage.
Cerebrospinal nematodiasis:	a condition of nematodes (roundworms) in the cerebrum (brain) and spine; ocular - in the eye; visceral - in the body cavity organs, such as the liver, heart.
Demyelination:	the removal of myelin (a fat and protein substance) from around the nerve.
Dyspnea:	difficult or labored breathing.



Gliosis:	a condition of increased number of neuroglial cells: supporting structures of the brain and spinal cord.
Granuloma:	granular growth that is generally lymphoid and epithelial in nature; visceral granulomatous legions - granular growths in the organs of the body cavities.
Hemorrhagic:	pertaining to or characterized by leaking of blood from an artery or vein.

Hypothermic:	having less than "normal" temperature. Remember that different animals have different normals!
Hypovolemic:	having less than "normal" volume. Used here, referring to less than normal blood volume caused by acute (sudden) loss of blood.
Immunocompromised:	a state of having an immune system that is not functioning "normally" because of predisposing factors. Such factors can be certain drugs, prolonged psycho and physiological stress, other disease conditions, etc. A state of increased susceptibility to disease.
Intraspecific:	within a single species. For example, you and I are (assumably) communicating intraspecifically. My dog and I, however, communicate interspecifically.
Intussusception:	the telescoping of one part of the intestine into an adjoining part. This is dangerous in that it causes blockage and can compromise the circulation to the folded tissue.
Macrophages:	large, mononuclear (having just one nucleus), cells of the reticuloendothelial system (cells that are able to phagocytose or eat invading, foreign, or malformed matter).
Malacia:	a condition of abnormal softening of tissue. In the brain, the tissue becomes softer and less structured than usual. Osteomalacia is softening of the bone, often seen in animals fed diets with improper calcium/phosphorus ratios.
Microcavitation foci:	small cavities (indentations) that are lesions (injuries) that are produced by the nematode larvae. These generally have rough, ragged, asymmetrical centers.
Necrosis:	a condition of death of tissue.
Opisthotonos:	a rigid dorsal arching of the body. This is seen in strychnine poisoning, epilepsy, rabies, severe meningitis, cerebrospinal nematodiasis, and occasionally in other pathological states.
Paratenic:	a host in which the parasite lives, but does not develop. This is opposed to the definitive host in which the parasite reaches maturity. See life cycle in text.
Perivascular cuffing:	deposition of tissue encircling veins or arteries.
Torticollis:	head tilt.

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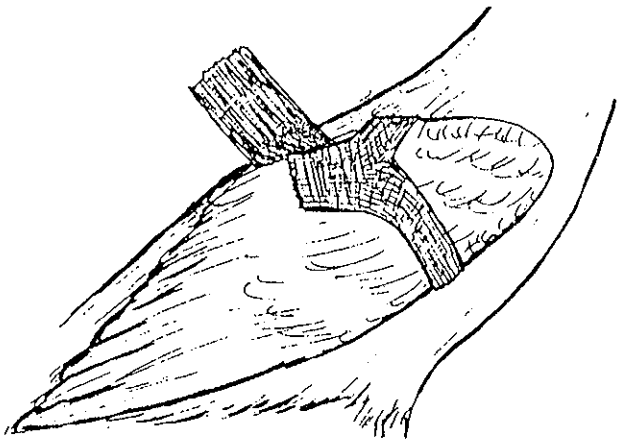
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we cut the Vetrap® shorter and wrap the inner piece back over the wing. Apply tape to the seam. (See Illustration.)

NOTE:

— Although this is an excellent wrap, it does not replace surgical fixation. Certain kinds of fractures should be seen and treated by a veterinarian: for example, humeral and displaced fractures.

— The Slit-Wrap may be used as an emergency pre-exam wrap, or as a post-surgery wrap if needed.

— Vetrap® is a self-adhering elastic wrap, which when wrapped too tightly, will remain so. Therefore, any wrap with Vetrap® bandaging tape should be checked frequently for swelling.

Illustrations by Kappy Sprenger

Book Review

Wildlife Rehabilitators of Eastern North America

1984 Symposium Proceedings

Lynne Frink, et al., Editors
Tri-State Bird Rescue & Research, Inc.
Wilmington, Delaware
206 pp., 1985 $15.00

Lynne Frink and her associates have compiled the papers at the October 1984 Wildlife Rehabilitators of Eastern North America (WREN) Symposium. The information presented in the soft-bound book ranges from Hippoboscid infestation and control in captive owls to the rational use and delivery of antibiotic and therapeutics in avians. Also included are thorough outlines on the care of snakes, turtles, and small mammals. Especially interesting was the preface written by Franklin M. Loew, D.V.M. Ph.D. Dean, School of Veterinary Medicine, Tufts University. He gave his perspective on the development of wildlife rehabilitation as a profession and acknowleged that our "potential patient constituency is by far the largest animal patient constituency in the country".

All 23 papers and six workshop transcripts have good solid information that is clear, concise and easily understood. In the interest of economics the text was prepared on a word processor. Varied margin alignments serve to highlight important tables. The graphics are instructive and appropriate.

The topics covered will appeal not only to the novice but also to the experienced rehabilitator. This is a book that should be included in the library of every serious rehabilitator. Interested persons should order soon as the majority of the copies have already been sold.

Kirstine Thorne
Wildlife Biologist