REHABILITATION AND CAPTIVE CARE OF MEXICAN FREE-TAIL BATS

INTRODUCTION

Bats are slowly gaining ground as a species worth understanding and saving. As the bats' popularity increases, animal care professionals have an increased need for manuals on the captive care of these fascinating creatures.

A popular organization called Bat Conservation International is succeeding in changing the image of bats worldwide. Founded by Merlin Tuttle ten years ago, the organization is dedicated to preserving endangered species, protecting healthy bat populations and educating the public about the vast, beneficial role bats play in the environment. More information can be obtained by writing B.C.I. at P. O. Box 162603, Austin, TX 78716; telephone (512) 327-9721.

There are almost one-thousand different kinds of bats, with each species being different from the others. The needs in housing, handling and maintenance can vary with each species. This manual concentrates solely on the Mexican free-tail bat (Tadarida Braziliensis), but may also prove useful for other insectivorous, crevice-dwelling bats.

Information in this manual is presented after several years of caring for hundreds of Mexican free-tail bats in captivity, and field research, including thousands of hours of observation. Some information is gathered from published works, including Susan Barnard's text, "The Maintenance of Bats in Captivity." Aspects of maintaining many other species of bats can be found in her book, available by contacting her at 6146 Fieldcrest Drive, Morrow, GA 30260; telephone (404) 961-4127.

This manual is made possible through the Beneficial Animal Teaching Society (B.A.T.S.) a non-profit organization dedicated to the rehabilitation and education of bats. Inquiries and donations are welcomed. This manual may be duplicated in part or in whole.

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For Sunshine

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ANATOMY

One of the most noticeable traits about the Mexican free-tail bat is its odor. Individually their smell is not at all unpleasant. On the contrary, large colonies in caves and buildings often create an odor that can be smelled from a distance. Small groups in captivity are not a problem with proper caging and hygiene.

The common name "Mexican free-tail," is descriptive in itself. About two-thirds of the tail extends beyond the tail membrane. These bats are also known for their yearly migrations to Mexico.

The wings of the free-tail are long and narrow, and built for speed. Unlike other bats, it is almost impossible for a free-tail to take flight from the ground. Because of their build, most need at least a six-foot drop off to take flight.

Male Mexican free-tail bats have a scent gland that resembles a human navel, located on their chest. This is known as the gular gland. It is used to mark territory and attract females. During periods of migration and breeding, males may become slightly aggressive towards each other, and rub this gland on surfaces they have proclaimed theirs. It is unlikely Mexican free-tail bats will mate in captivity, even when males and females are housed together.

When sleeping, free-tails may enter torpor, a form of semi-hibernation, in which their body temperature lowers to that of the air around them. In this state, the bat will be cool to the touch and slow in responding to stimulation. Bats in torpor should not be disturbed unless absolutely necessary.

Free-tails experience an annual molt, which may or may not happen in captivity. In the wild, males usually molt in July and females molt during August. Molting normally starts on the back and is near complete before beginning on the stomach. Bats in captivity know no seasons, and may molt at any time, especially if kept in temperatures over 80 degrees Fahrenheit.

BEHAVIOR

Mexican free-tail bats are highly social, intelligent animals that often form strong bonds to each other within a colony. Perhaps the single, most important aspect in the free-tail's health and mental well-being, is keeping them housed as a colony. With few exceptions, separation or isolating these bats from each other is detrimental.

The majority of free-tails are gentle and tame easily, however, each bat possesses its own distinct personality. The rate at which the bat adjusts to captivity and tames, will depend upon its individual personality. Each bat also has distinct facial features and body language, which in time, makes it easier to tell them apart.

Free-tails communicate to each other using a variety of noises. As they begin to feel safe, they will also communicate to their handler. Soft nuzzling with eyes half closed is an affectionate gesture. Harder nuzzles combined with a rattle/hiss noise means that the bat is becoming annoyed and may bite. Free-tails rarely become aggressive, even with each other, but will engage in "screaming matches," which sound like a series of very loud, constant peeps. During these matches, they may show each other their bared teeth or swat the opponent with a folded wing. These disputes are normally settled shortly and can be ignored. Occasionally, even the handler will get swatted if the bat feels short tempered.

The irritation "buzz" is another noise used to show displeasure. Bites rarely accompany the buzz. If the handler gets "buzzed," it may seem to the contrary, but progress has been made in taming the bat. This shows that the animal feels comfortable enough with its handler to display its feelings. Free-tails occasionally vent frustration by biting or chewing on various surfaces, as if throwing a tantrum. Although this behavior can signify rabies (see *ILLNESS; BAT DISEASES AND HEALTH PRECAUTIONS*), it has been observed in healthy, but angry bats, which had been in captivity three years. Free-tails will take their frustrations out on each other at times, but viciously biting another bat seldom occurs except during spring migration. At this time, males are more aggressive and may bite other bats occasionally.

Other noises include small squeaks and chirrups, which appear to be forms of greeting and displays of contentment. During spring migration, males will occasionally sing a faint bird-like song. Free-tails are often awake and become noisy throughout the day.

Most injured Mexican free-tails quickly adjust, and often thrive, in captivity. Uninjured or otherwise releasable free-tails may become unhappy in captivity, and should not be considered for part of a captive colony. However, releasable bats that have been nursed back to health over a period of time, and seem to prefer captivity, should be kept. Bats that are unable to accept captivity, with healed injuries and capable of flight, should be released regardless of the length of time in captivity. These bats will need flight exercise, 10 to 20 minutes daily for at least one week to build up flight muscles prior to release. The release site should be close to the area where the bat was found.

Free-tails kept in small cages will not attempt flight. Most seem content to stretch and flap their wings. Once adjusted and tame, few will try to escape from their housing. When lost outside their housing, most will attempt to find their way back to the cage and their cagemates. In large flight enclosures, permanently injured bats may eventually take flight, flying from wall to wall.

The male/female ratio is not important when keeping free-tails in captivity. In the wild, both sexes roost together, except when maternity colonies are formed. Unpregnant females will roost in bachelor colonies at that time. Personality clashes can happen between both male and female free-tails. When keeping large numbers of free-tails together, small groups of bats may separate and roost in different areas to resolve their disputes. Plenty of roosting space should be provided to give the bats this choice. Age may be the only important factor in the pecking order of free-tails, as both dominant males and females exist. Occasionally, an unruly juvenile will test the dominant bat repeatedly.

Mexican free-tails have been successfully housed in captivity with other species, including Pallid bats and Evening bats. In the wild, free-tails can be found roosting with the Ghost-faced bat (Mormoops megalophylla), Pallid bat (Antrozous pallidus), Cave myotis (Myotis velifer), Big brown bat (Eptesicus fuscus), Yuma myotis (Myotis ymanensis), Evening bat (Nyticeius humeralis, and the Southeastern myotis (Myotis austroriparius). Most of these species segregate and use different portions of the cave.

HANDLING AND CONDITIONING

Injured or otherwise grounded wild bats can be gently gathered up with a soft cloth, for treatment. When picking up any small bat from any surface, delicate wings must be considered. The wings and total front-half of the bat should be completely in the hand or cloth before gathering up the rest of the bat. Stubborn back toes can then be gently plucked from surfaces with your opposite fingers.

Captive free-tails should always be held cupped in the palm of the hand. Placing your fingers across the bats back will give both the bat and the handler a secure feeling. For added security, the bat can be placed so that its hind legs straddle the inside of the index finger. This will prevent the bat from backing out of your hand. This position allows the handler to become familiar with the bat by petting its head and shoulders, and is also a good position for giving oral medication.

A secure holding position for both handler and bat.

When petting the bat, use your fingertip to gently stroke the top of the head from front to back. Never stroke against the natural growth of the fur, as this will irritate the bat. Some free-tails enjoy having the back of their ears rubbed. The bat should be held at eye-level, especially if being conditioned for demonstrations. Hand feeding and petting should also be done at eye-level. Held in this manner, you will appear smaller and less threatening to the bat, allowing it to calm and tame faster. Holding the bat in a lower position before it has learned to trust you, will only increase it's level of stress. Talking softly to the bat will also help it to calm. Mexican free-tails are very perceptive, and pick up on emotions easily. Avoid handling these bats while emotionally distressed.

Short intervals of working with the bat, two to three times daily, will greatly increase taming. A good rule of thumb is to let the bat make the rules. Some bats will duck their heads down and push their nose into the palm of your hand, indicating their desire to be put up. Immediately upon its first attempt to get away, the bat should be returned to its cage. This will let the bat know that it does have some control, and in turn, it will begin to trust you. When returning the bat to its cage, hold it towards the cage ceiling to aid its toe grip. After the bat has a hold, open your hand and let the bat take its time in leaving. This will give the bat confidence in being out in the open with a human close by.

Each time the bat is handled for conditioning, small rewards should be offered. Mealworms are always a good choice. Small bits of cream cheese held on the fingertip, often proves a favorite, but messy treat. Due to their unusually fat lips, it will be necessary to form the cream cheese into a small lump, to enable the bat to eat it from the fingertip. This reward should only be given occasionally. Contrary to previous opinion, periodically supplementing the free-tail's diet with various foods is not harmful. Mixing a few drops of water with the cream cheese will prevent it from sticking to the teeth. Free-tails given cream cheese rewards during demonstrations often put on the best part of the show while grooming the cream cheese off their faces. Bats that readily accept or anxiously await rewards, will eventually become the best demonstration bats.

Within a few weeks of conditioning, some free-tails will readily enter your hand from within their cage, and may be unwilling to leave your hand when sessions are completed.

Tame free-tails used for educational programs will look like "neat little pets" to the public, especially children. It is important to stress health concerns, along with directions to leave bats, and their roosts, alone. Any bat found within reach is more likely to be sick or injured, thus more likely to bite.

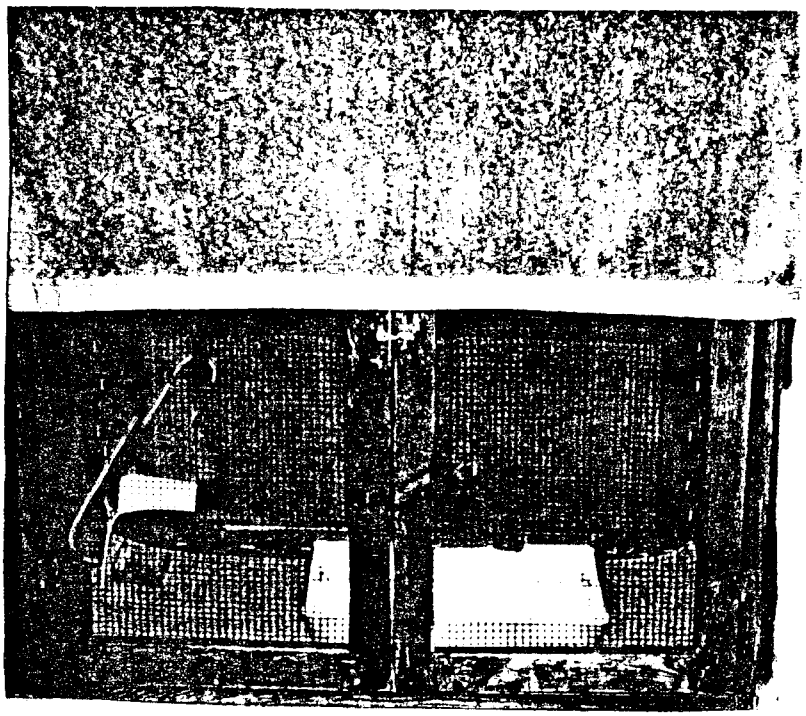
Emphasize that bats are very complicated, wild animals, that need specialized food and cages in order to survive in captivity, and possibly hours of daily care. They are at the very least not good "pets."

NOTE: Hands should always be clean and dry before handling bats. Some species (including free-tails) are highly sensitive to perfumes and odors. NEVER use scented hand cream or highly perfumed soap before handling bats.

HOUSING ADULT FREE-TAILS

A good style cage for Mexican free-tail bats can be found in Sue Barnard's text, "The Maintenance of Bats in Captivity." Cage sizes can vary, depending on available room. Two to four bats should have a cage of at least 2 1/2' wide x 1 1/2' deep x 2 1/2' high. A larger cage should be used if more than four bats are to be housed. Following instructions in Sue Barnard's text, walls are made of wood, which has been horizontally grooved in 1/4 to 1/2 inch spaces. This creates a "ladder" effect in which the bats can climb. Because free-tails prefer dark roosts, the interior walls should be painted or stained a dark color, then coated with at least three coats of polyurethane. This will prevent the free-tail's natural body oils and scent from absorbing into the wood. The cage will need to cure at least thirty days before using. After curing, fiberglass screen can be stapled to the ceiling and door frame. All surfaces should be free of splinters, un-secured staples or any sharp object that may harm the bat.

Frame-style cages with walls, floor and ceiling made of fiberglass screen may also be used. Cages of this style should be covered on the outside with dark material or towels, leaving the cage door uncovered.



A covered frame-style cage showing shielded water dish and large feeding pan inside. Nerf-cave hanging upside-down over the pan will provide a hiding place for shy eaters.

Walls and doors of both style cages should fit tightly. Mexican Free-tails are naturally curious and can squeeze through a 1/2" crack. Never house free-tails in aquariums or anything similar. These bats often panic when enclosed by clear walls. To prevent further injury to bats that are healing, the floor of either style cage should be padded with an appropriate sized pillow, with a similar sized dark towel placed over the pillow. The towel can be taken out daily to shake clean, then washed once or twice weekly as needed. A simple "water-proof" pillow can be made by cutting quilt batting to the size of the cage floor, then covering the batting with a strong plastic garbage bag. Cut the plastic bag to fit over the batting and seal the edges by melting with a lighter, then pressing the melted edges together after they have cooled somewhat. Before the final edge is sealed, excess air should be pushed out of the pillow. Some bats will roost under the pillow or towel, so care should be taken when removing either article for cleaning. Encourage the bats to roost at the top of their cage by placing them there.

Free-tails will need a crevice in which to roost inside their cage, along with some diversity for mental health. "Nerf caves," crevice providing pillows, can be made following the directions below. Large sized nerf caves will allow several bats to sleep comfortably together, while smaller caves of different shapes and sizes will create scenery changes needed for the bat. Smaller caves often come in handy when transporting, medicating, or isolating wings in need of medical attention.

Materials Needed for Nerf-Caves

Quilt batting - preferably high-loft.

Dark material - thick enough to prevent batting from being pulled through by the bats toenails. Slick materials are best. Thick, winter material often has a smooth wrong side, and is an ideal choice when used wrong side out. Sweat shirt material is also good.

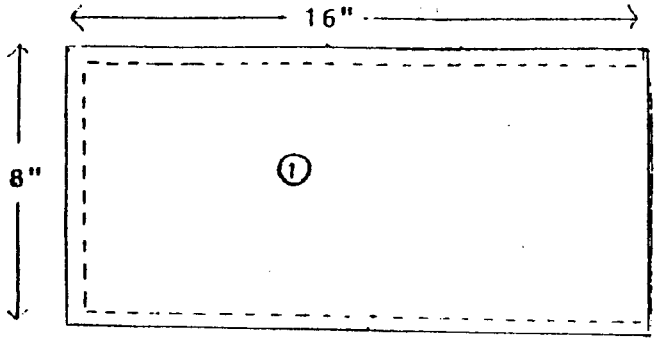
Thread

Velcro - for sewing, use non-adhesive. Sticky back velcro will clog the sewing machine needle.

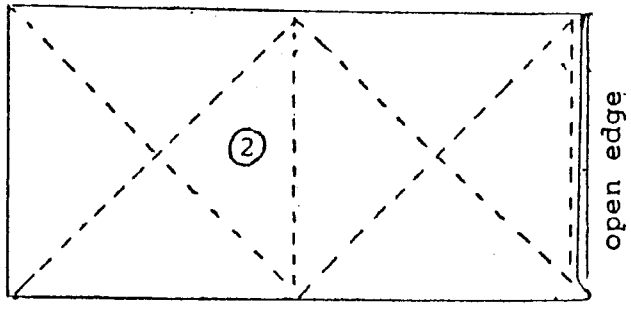
Instructions for a Medium-sized Roosting Cave

(Completed size approximately 7" x 7"). Large enough for 4 to 6 bats to sleep comfortably. For smaller caves, simply scale down measurements. Examples of diversity caves; fold the quilted rectangle from corner to corner and stitch, to create a "basket," or leave two ends open, to form a tunnel. Many shapes can be created with a little imagination.

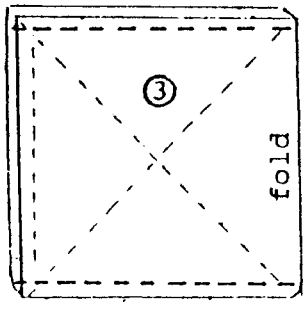
1. Cut two pieces of material to appropriate size. Place together, wrong side out, and stitch along three sides.



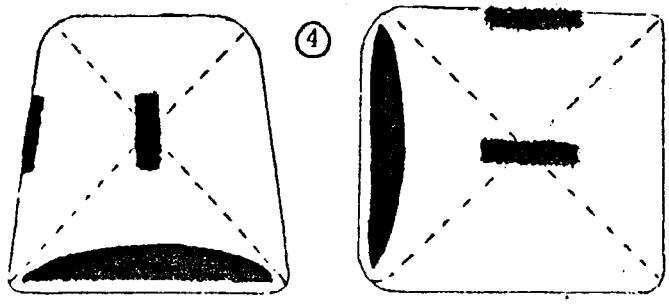
2. Turn inside-out, so that the seam is on the inside. Cut 2 to 3 layers of batting to fit, then slip inside, as if putting a pillow into a pillowcase. Batting will seem high. fold open edge of material to the inside and stitch across the top. Then, quilt through all layers as shown, to secure and compress batting.



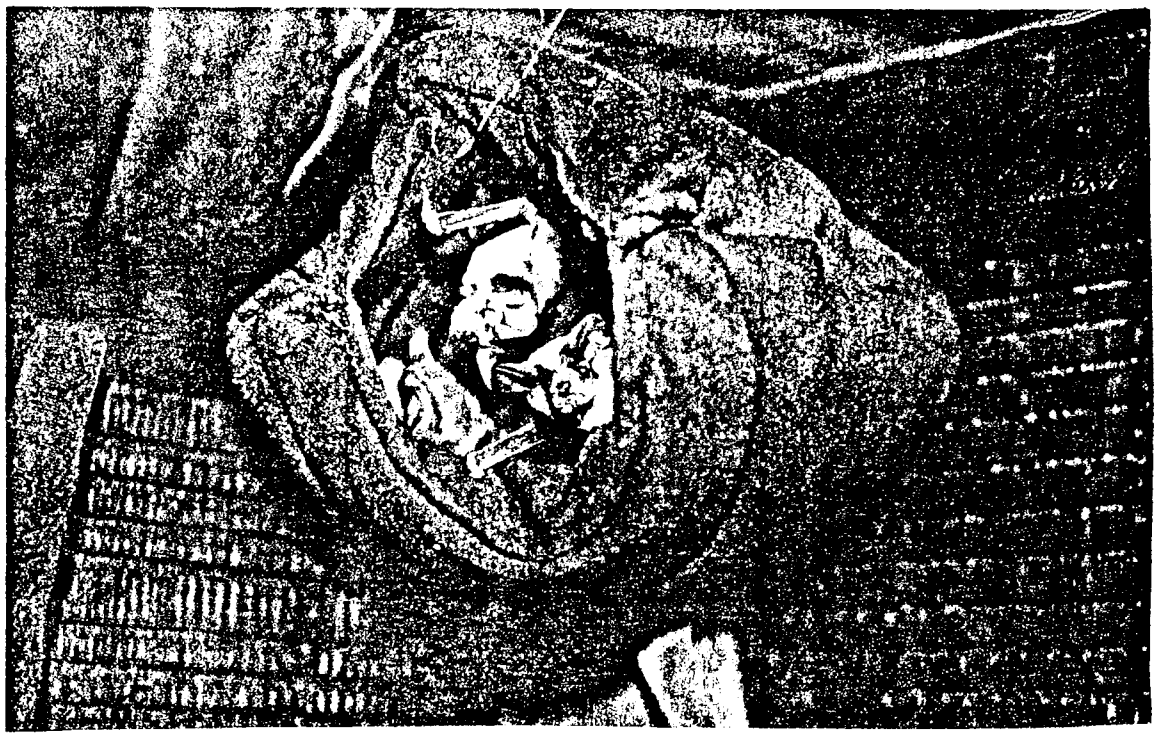
3. Fold rectangle in half. Stitch two sides closed, through all layers, leaving one opening.



4. Turn inside-out. Stitch velcro strips on cave to hang vertically or horizontally.



Velcro is the best choice for hanging the caves. It can be sewn onto the caves by machine and stapled onto wood surfaces of the cage. If using a fiberglass screen cage, hand-sewing the velcro to the screen ceiling and walls will probably be necessary. Never use safety pins or hooks & eyes within the cage to hang nerf-caves. Delicate wings might get caught in these items, resulting in injury. Free-tails prefer caves mounted on the ceiling and against the walls. For diversity, different sizes of caves should be rearranged occasionally, and change from hanging horizontally to vertically. However, the bats day roosting cave should always remain in the same place and the same position within the cage. The middle area of the cage should be left unobstructed so the bats will have an open area in which to stretch their wings.



Mexican free-tails in a nerf-cave, mounted in the corner of a grooved, wooden cabinet.

Nerf-caves will absorb odors from the bats and droppings will collect in the bottom. Caves should be turned inside out and brushed free of droppings daily. If housing a large colony of bats, it may be necessary to change the cave daily. Caves used by small colonies may last a day or two before any laundering is needed. Nerf-caves, towels or bedding of any kind should be washed in unscented detergent only. Nerf-caves should always be turned inside out before laundering, to be positive no bats have remained inside. After laundering, caves should be brushed free of lint if necessary.

Cages should be cleaned with water only. Lightweight frame cages can be taken outside and hosed down. Wooden grooved cages can be scrubbed clean with hot water and a stiff dish brush. Before cleaning, bats within a nerf cave can be placed into a holding container, such as a box. The cage should be dry before returning the bats to it.

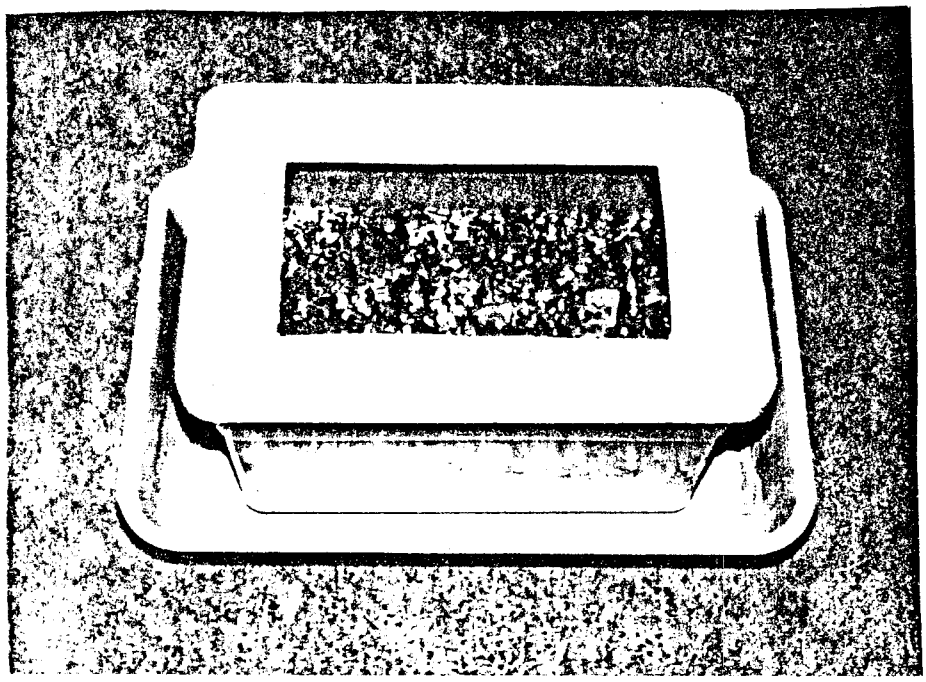
The bat cage should be kept in a room that is quiet, preferably a room that household pets do not have access to. For the handlers ease, along with the bats comfort, the cage should be placed at a high position, keeping the cage ceiling at about eye-level. Never place a bat cage on the floor. The room should be free of drafts, and kept at a temperature between 72 - 80 degrees Fahrenheit. In arid climates, it may be necessary to occasionally use a humidifier, especially if the bat's appetite seems low. The cage should not be placed directly in front of a window, but still, should have access to sunlight so the bats will be aware of the natural patterns of day and night. (If sunlight cannot be utilized, a U.V. light must be used. Failure to simulate day/night patterns will be fatal to the free-tail.) If bright lights will be on at night for long periods in the room, the dark towel or covering should be pulled completely over the front of the bats cage to keep it dark inside for them.

Air fresheners, potpourri and highly scented cleaners should not be used in the room. Some products will actually burn the bats' lungs. Also, avoid unnecessary loud noises. High-frequency noises, like rustling of papers, should also be avoided. The simple act of pulling a tissue from a box can be extremely loud to free-tail bats and may frighten them. After the bats become adjusted to the room and their environment, they will become accustomed to human noises and lose their fear.

FEEDING ADULT FREE-TAILS

In captivity, mealworms (flour beetle larva), are the best choice for the Mexican free-tail. While other bat species do well by supplementing the diet with wax moth larva, free-tails do not. Dentition in each species differs. The soft skin of the wax moth larva will get caught within the free-tails' teeth, eventually becoming embedded into the gums. This will cause gum infections and result in loss of teeth. Feeding wild caught insects is not advisable, as they may have been exposed to pesticides.

Several commercial companies offer varieties of insects and larva. One dealer, Rainbow Mealworms (800-777-9676), gives rehabilitators a 10% discount. To guard against dietary deficiencies in the bat, the mealworms should be placed into a nutritious mixture (example follows). The mixture should be placed into an appropriate sized container, such as a plastic, rectangular storage box with a lid. A section of the lid can be cut out and replaced with fiberglass screen, held in place with duct tape, or preferably, hot glue. It is important that all edges of the screen are sealed completely to guard against other insects finding their way in. As an extra precaution, the container should be placed into a pan such as a kitty-litter box, in which a small amount of water has been added. The container should sit steady within the pan, with the water creating a "moat" effect. This will keep the mixture from being contaminated with crawling insects and parasites.



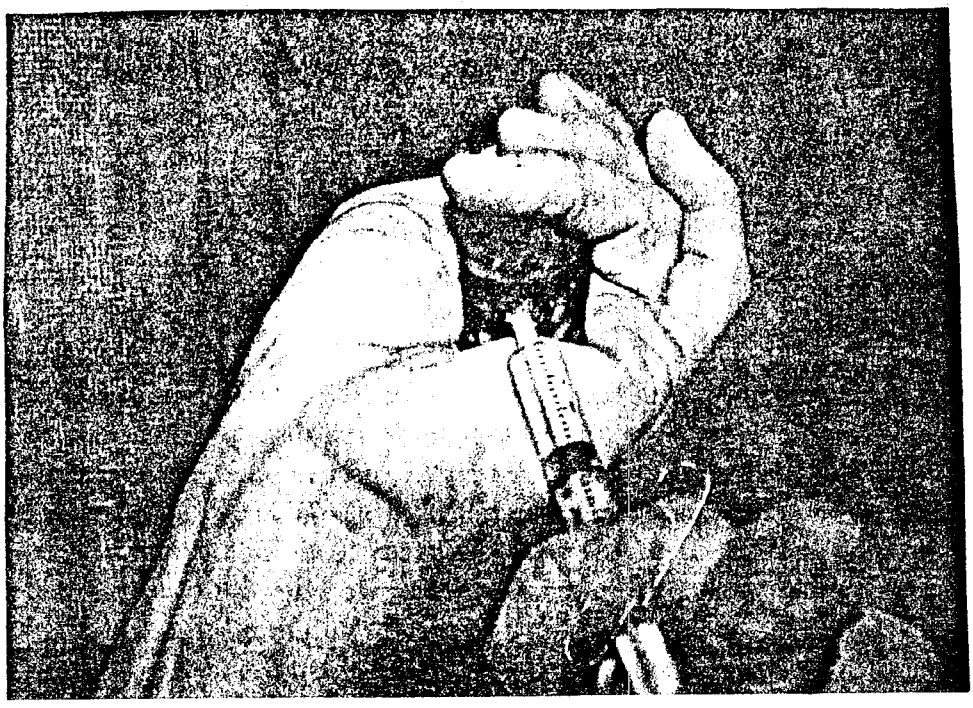
A good set up for maintaining the mealworm culture.

Medium for up to 5000 mealworms:
1 regular sized container slow cooking oats
1 box high protein baby cereal
2 cups wheat germ or Wheatrena
1 thinly sliced apple (for moisture and adding flavor)
1 small, thinly sliced sweet potato

Keeping the mealworms in a warm, humid environment, such as a laundry room, will increase the speed of the flour beetle cycle, thus producing more mealworms. As mealworms begin their transition into flour beetle larva, they will lay still in a half moon position, on top of the mixture. Flour beetles will lay their eggs on the dried pieces of sweet potato, so don't throw these away. Apple peels and the shedded skin of the mealworms can be gently raked and gathered up for disposal. When the mixture becomes old and needs replacing, pick out any remaining mealworms and place them in a fresh mixture. Do not throw the old mixture away. It may hold hundreds of tiny mealworms that aren't detectable yet. Save the old mixture in another container, keeping free from parasites. Within a month, they will have grown large enough to be picked out with tweezers and placed into the mixture.

Some free-tails readily eat mealworms upon entering captivity. For the most part however, the first few meals have to be gently forced. Rehabilitators that encounter large numbers of bats will find relief at feeding time by keeping frozen, ground mealworms on hand. Ground mealworms are good for weak or sick bats, older bats with worn teeth, putting weight on thin bats for fast release, and starting infant bats onto solid foods (see *INFANT CARE AND FEEDING*). Mealworms should be clean and frozen solid, before grinding, to prevent them from overheating in the blender. Measure before freezing by filling the blender with enough mealworms to adequately cover the blades. Blend on high until completely smooth. It may be necessary to add a few tablespoons of water while blending. Spread this mixture in a thin layer onto a non-stick plate or pan and freeze. After frozen, break the layer into small pieces and store in a freezer container. When needed, small pieces can be thawed to room temperature and be placed into a 3cc syringe for feeding. Ground worms quickly spoil. Do not store in the refrigerator, or re-use after warming to room temperature.

To force feed, hold the bat securely in the palm. Place the barrel of the syringe against the lower jaw, between the lips and directly in front of the mouth. Gently push down until the bat's mouth opens. Once open, gently squirt a little ground food into the mouth. Always start with a small amount as to not startle the bat. Then larger "bites" can be given. Most bats will eat readily and quickly learn to open their mouth to the syringe for more food. Feed at least 3cc's daily, preferably divided into A.M. and P.M. feedings. Occasionally, it may be necessary to add baby food veal, mashed avocado, or bananas to the mixture, to tempt extremely frightened bats. Still, it may take them several sessions to respond. After a week or two of ground food, when the bat has grown more trusting, mealworms can be attempted.



The ground food method assures the handler that the bat is maintaining its weight while learning to eat mealworms.

NOTE: The force feeding method should only be used on Mexican free-tails. Due to differences in facial structure, it may not work on or might even choke other bat species.

To start a bat on mealworms, first, fill the mouth with ground food. While the bat is chewing, squeeze the viscera from a large mealworm into the bat's mouth. Most bats will enjoy the taste and want more. After the bat has eaten the viscera from two or three more mealworms, gently try feeding a small mealworm, head removed, and held with tweezers. As with the viscera, feed the worm while the bat is eating ground food. Hold the worm in place until the bat has actually chewed the skin somewhat. After a few sessions, the bat will eat mealworms readily. Within a few days, most free-tails will eagerly grab out at the mealworms during feeding time. When the bat reaches this stage, the mealworms should be fed alive, and training to eat from a dish can begin.

NOTE: Mealworm viscera will stain the fingers. It is easily removed with a small brush and bleach.

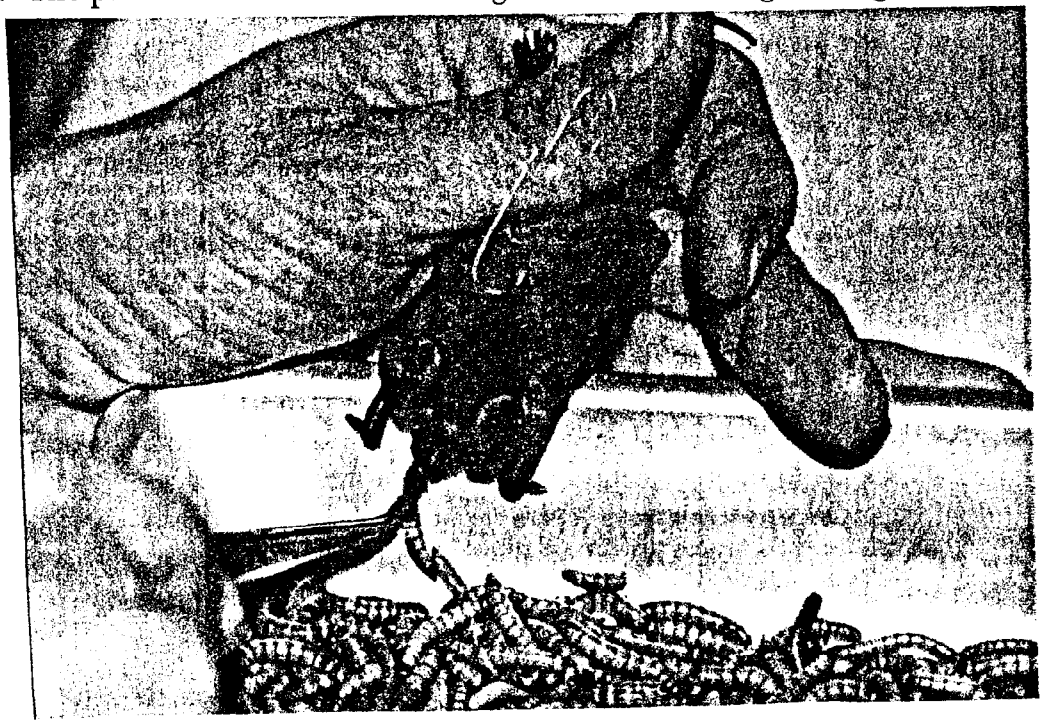
The mealworm dish should be large enough for the bat to fit into and climb in and out of easily, yet inescapable to mealworms. Children's small, aluminum baking pans and cooking sets, found in the toy section of most department stores, are excellent. For large groups of bats, old metal ice trays (cube separator removed), and baking pans (12" x 8" x 1 1/2"), work well. The dish should be filled with enough mealworms to completely cover the bottom. This will increase the free-tails success at catching mealworms. If too

few mealworms are used, the free-tail may become discouraged at unsuccessful attempts to catch them and give up, or the bat may become over aggressive and hard to handle.

Worms should be clean and dust free. Small pieces of oats or particles of medium should not be mixed in with the worms in the pan. Free-tails become excited when catching worms, and may inadvertently inhale small particles and choke. After the bat is eating on its own, it may gain extra weight at first, but eventually most free-tails will regulate their weight.

To start training, hold the bat over a dish filled with mealworms while feeding it with tweezers. As the bat relaxes, move it closer to the dish, so that its wrists or forearms are actually touching the inside edge of the dish. After the bat grows accustomed to this, start holding the worm towards the inside of the dish, making the bat reach for it. In a few days, most free-tails begin eating worms directly from the dish. some bats, however, will identify with the tweezers. It may be necessary to bury the tweezers half under the worms in the dish, making the bat reach completely into the dish to get the worm from the tweezers. With a few sessions, these bats finally grasp the idea. Starting the first night of training, the same dish of worms used for teaching should be placed in the cage with the bats, and left overnight. Occasionally, a bat will begin eating completely on its own, without training. Also, as trained free-tails eat from a dish, other bats will watch and be encouraged to try themselves. Bats will learn best from other bats. However, some bats never learn to eat from a dish. These bats will require hand feeding for their entire lives (possibly up to 25 years). Handlers unwilling to make this sacrifice may have luck placing the bat with a wildlife rehabilitator who will hand feed it.

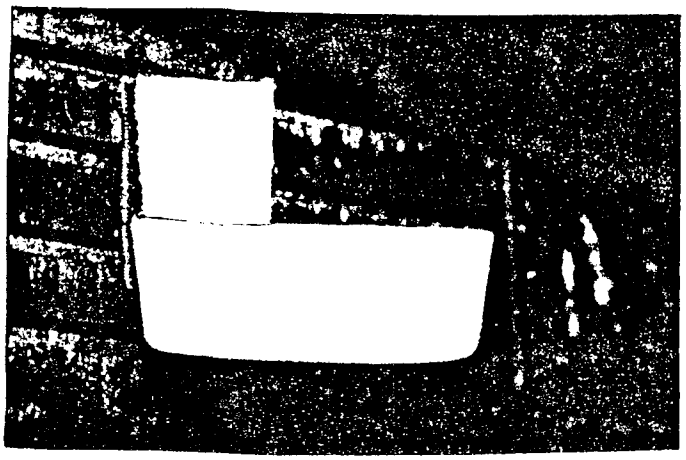
Each morning, the pan of worms should be removed, emptied and wiped clean. Guano and pieces of worms should be picked out before returning the uneaten worms to the pan. The pan can be stored in the refrigerator until evening feeding.



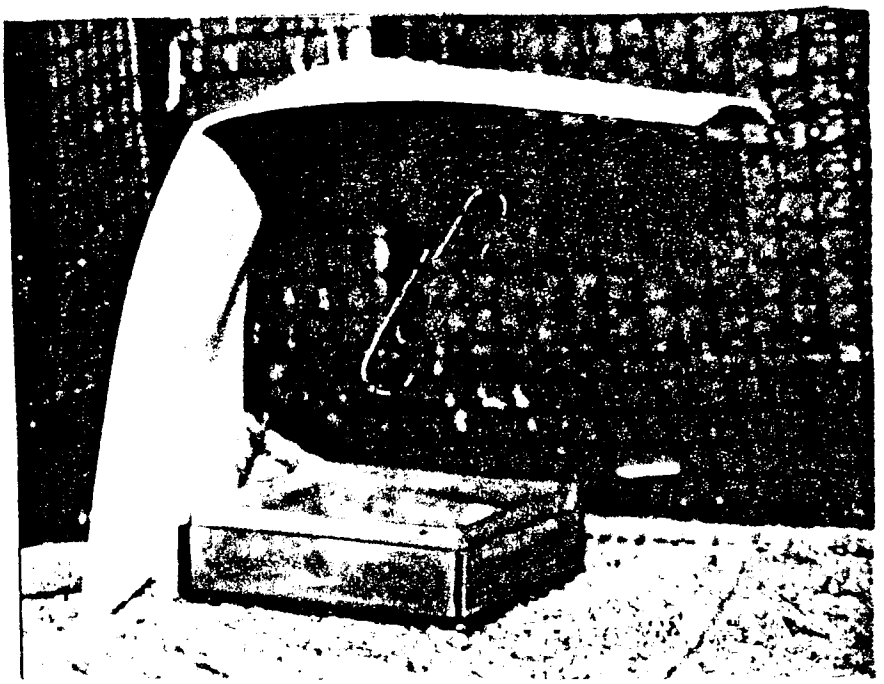
A free-tail being trained to eat mealworms from a dish.

WATER PROVISIONS

The free-tail's water dish should always be small. Never use a dish for water large enough for the bat to crawl into. They can and will drown, even in very shallow depths of water. Small, glass petri dishes work well, as do lids from vitamin or aspirin bottles. All lids should be thoroughly washed and rinsed before using. If water is to be placed on the floor of the cage, a shield can be made to cover the dish and keep it free of droppings (see diagram on page 22). Also, an excellent hanging water dish, mounted with velcro, can be made from Tupperware Midgets. When mounted within two inches of the cage ceiling, droppings in the water are not a problem. Free-tail bats will not drink from the standard hanging water bottles found in pet stores.

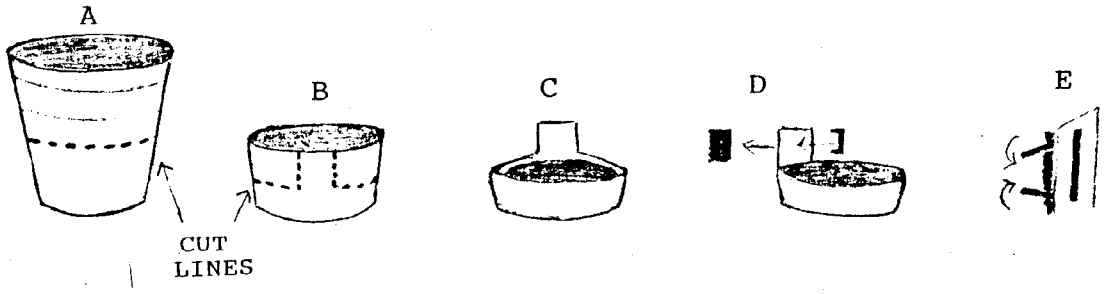


Water dish made from Tupperware Midget.



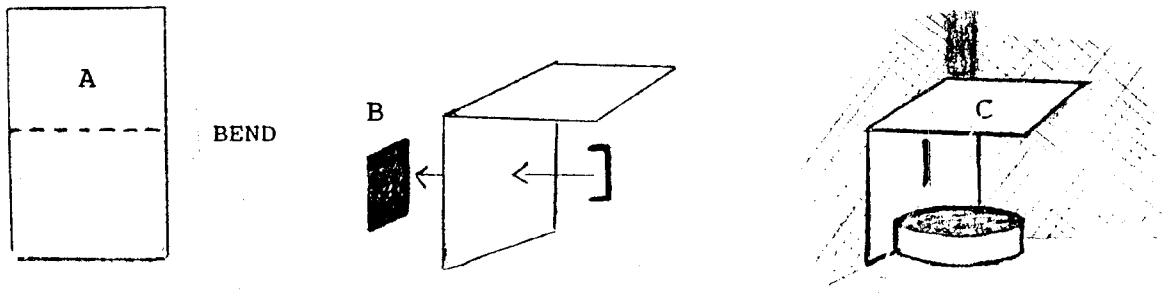
Water dish with shield cover.

Directions for Tupperware Midget water dish.



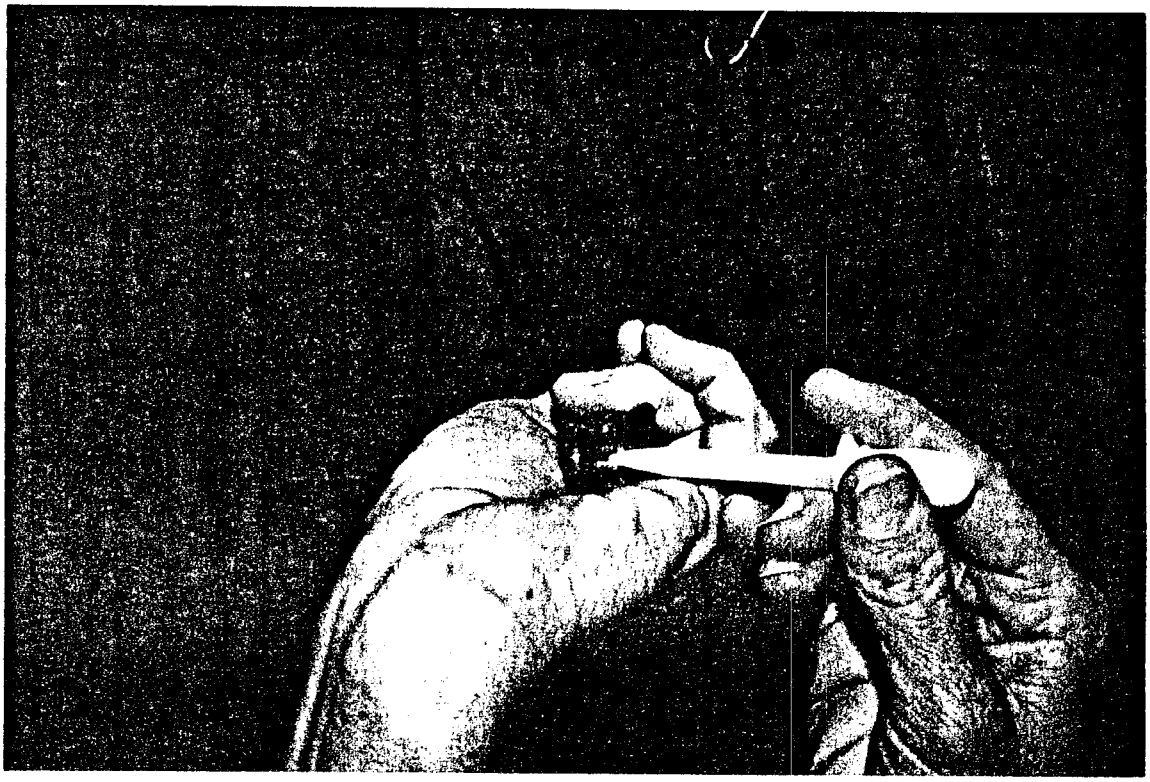
A. Cut Tupperware Midget in half, along the lowest molded line. B. Cut to form a small tab (about 3/4" across), then cut remainder of Midget in half again (C). D. Apply velcro to tab back, then staple through tab and velcro, from front to back. E. With plyers, bend the staple prongs inward to secure velcro.

Directions for water shield.



Water shields can be made from flexible pieces of thin plastic, such as the left-over piece cut from the Rubbermaid quarantine or worm container. A. Cut a rectangle large enough to cover the water dish, and bend in center. Attach velcro (B) as instructed for Midgets. C. Mount against the cage wall, in a corner, along the floor.

It may take several days for free-tails to find and drink from the dish of water; always keep the water dish in the same location. It will be necessary to give the bat water from a medicine dropper until it is drinking on its own. Water should be offered early A.M. and after P.M. feeding. Place dropper into the side of the bats mouth, just between the lips (see photo). To start, give one drop only. when the bat recognizes the water and swallows, more water can be slowly dropped in. Newly arriving bats may be too frightened to move, and swallow with their mouths closed, making it difficult to tell when they have swallowed. Watch the tragus portion of the ear - it will move slightly with each swallow. If the bat is extremely thirsty, dehydration may be setting in, and the bat will need to be injected SQ with lactated ringers solution (see page 36). When free-tails have learned to drink from the dish, they will start refusing water offered from the dropper.



Always give water and oral medications from the side, as to not startle and choke the free-tail.

Vitamins should be added to the bats drinking water. Liquid bird vitamins, along with the other supplements listed below, are a good choice. Each morning, water remaining in the dish should be discarded. Fresh water with vitamins added should be given each evening.

MIX FRESH DAILY

* 2 Tbsp. water
1 drop Avitron multivitamins (available at pet supply stores)
2 drops Avimin multiminerals (available at pet supply stores)
1 drop Liquid vitamin C (available in health food shops)

Twice weekly, 1 drop of Linatone (skin and coat supplement for dogs) should be added, along with the vitamins, to the drinking water. During winter months, free-tails in captivity may develop flaky skin. If this occurs, Linatone may need to be added every other day.

Water dishes will need to be washed and rinsed daily, as the liquid vitamins tend to leave a film that collects after time. If lids are used as dishes, a small brush should be used to thoroughly wash the inside threads clean.

* For safety, bottled water should be used.

PREGNANT FREE-TAILS

Pregnant Mexican free-tail bats congregate, to form large nursery colonies in which to have their young. In buildings and man-made structures, these numbers can reach the thousands. In caves, millions of mothers will come together to have their pups. After a gestation period of 77 to 84 days, a single infant is born. Pups cling tightly together for warmth and security.

Occasionally, an expectant mother is found grounded for no apparent reason. The additional weight burden towards late pregnancy is perhaps responsible. If the mother is healthy, she should be released, in the same area she was found, as soon as possible. If she appears dehydrated, an injection of Lactated Ringers Solution should be given before release (see page 36). When kept in captivity, pregnant free-tails often abort early or their infants are born dead. some mothers refuse to have their young, and the infant dies within the womb, causing the eventual death of the mother also. Because the natural conditions she requires for her baby cannot be duplicated, the stress of captivity is probably the cause of these problems.

When pregnant free-tails are found injured, her injuries should be treated accordingly, and the mother watched closely during her term. A heating pad should be placed on her cage to cover a portion of the ceiling and side, and set on low. If possible, another Mexican free-tail, preferably a female, should be placed in the cage with her.

Often, the first sign of complications is a noticeably strong odor in her urine. Upon the first sign of urine odor, start the mother on a Cephalexin/Baytril oral antibiotic mixture (see page 38).

Depending upon the region, most free-tails have their young in late-June to mid-July. Bats going past this term, and whose babies can no longer be seen or felt moving, may need a c-section performed by a veterinarian, to save the mother's life. Oral antibiotics will also be needed after the surgery.

INFANT CARE AND FEEDING

Mexican free-tail babies are born pink, naked and blind. Within two weeks, their eyes have opened and they begin to grow fur. Infants occasionally fall from their roosts and/or wander off. If the pup appears healthy, it can be quietly assisted back up into the nursery colony. Extreme care should be taken in disturbing the colony as little as possible while replacing the infant.

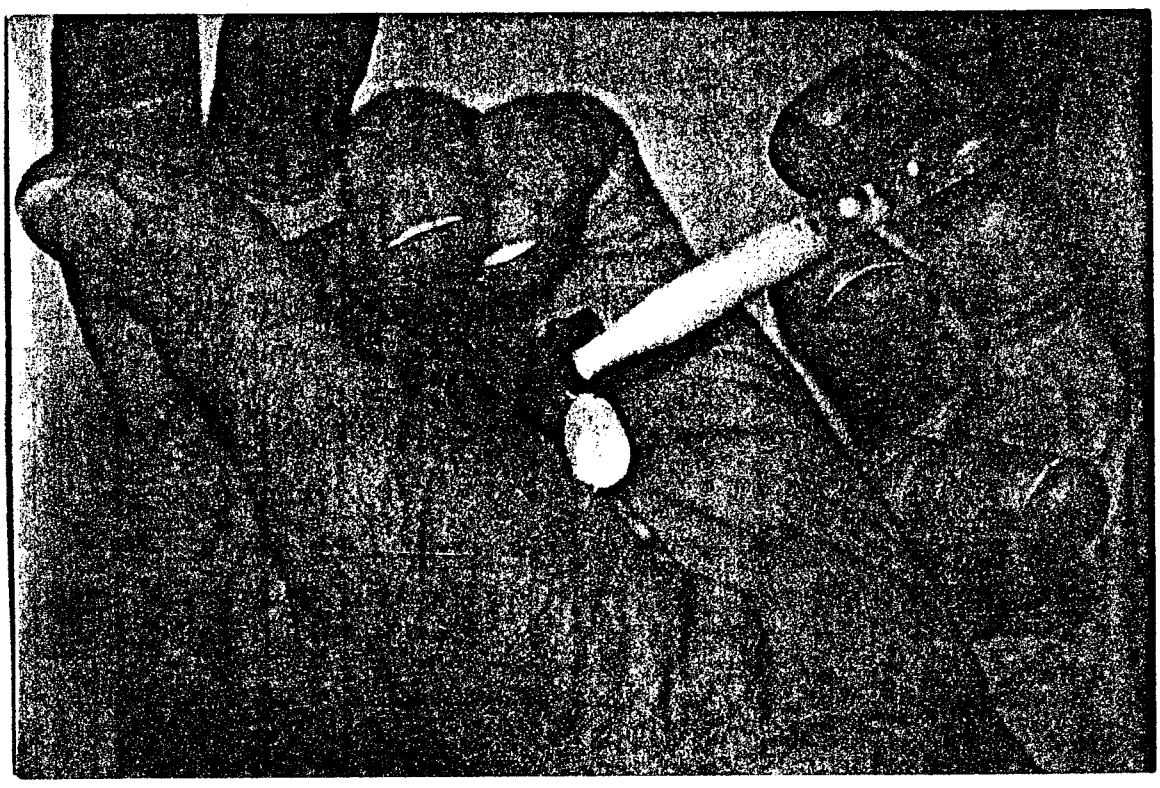
Infants that appear thin, weak or dehydrated may be orphaned, sick, or both. New born free-tails, as young as one day old, have been successfully raised by infant bat rehabilitator, Patricia Winters of Kentfield, CA (415-459-2126). Incorporating her knowledge into the following method, may prove successful for others as well.

Newly arriving infants should be injected with lactated Ringers solution, according to weight, for 1 to 2 days (see page 36). For feeding, mix one part *Esbilac Puppy Formula powder with two parts electrolyte supplement, such as **Pedialyte. The milk mixture should be smooth, free of lumps and mixed fresh daily. After a few days, the baby will be sufficiently hydrated. Water can then be used with the Esbilac instead of Pedialyte.

Various methods, such as feeding by catheter or syringe, have been used successfully on several infant bat species. An easy and stress free way to feed free-tail pups is by use of a ***non-dyed eye-shadow sponge applicator tip. Remove the sponge from the plastic wand and sterilize or sufficiently scald it under hot, running water. Have a medicine-dropper, full of the milk mixture, heating in a small bowl of warm water. Hold the pup upside down and on its side (see photo). In this position, the bat can regulate the amount of milk it receives, while any excess runs down the handler's palm, away from the baby. Coax the baby to eat by first dipping the sponge tip in the warm water, (squeeze out excess) then gently stroke the pup's lips with the sponge. Most infants will immediately grab the sponge and start sucking. Test the temperature of the milk mixture on the inside of the wrist before feeding, then slowly drop milk onto the sponge from the medicine-dropper.

With infant free-tails that are not fully furred, milk can be seen in the stomach. Some pups will indicate they are full by spitting out the sponge. Others simply stop sucking when full, but may refuse to let go of the sponge. Let the pup hang onto the sponge; it will probably be discarded after the infant falls asleep.

*Found at veterinary offices or pet supply stores.
**Found in baby food aisle of grocery stores.
***Found at cosmetic counters.



Method and hand position for feeding free-tail pups.

Depending upon the pup's age, it will need to be fed every two to four hours. Determine meal times by checking the infant's tummy. It should be empty before the next feeding. Extremely thin or dehydrated infants should be fed throughout the night. Hours between feedings can be increased when the pup does not appear hungry at its normally scheduled feeding time. After feedings, bowel movements can be encouraged by gently rubbing the pup's anus with a warm, damp cotton swab.

Free-tail infants crave companionship and stimulation. It will need to be held and stroked periodically throughout the day. Keeping the pup active will aid in its digestion and increase its will to live. In the wild, the mother calls out to her young, to locate it amongst the thousands of other babies in the cave. The infant calls back, enabling them to find each other. The free-tails directional calls sound like a series of short rapid-fire peeps. Imitating the mother by clicking softly (tongue against the roof of the mouth), will give the pup comfort while being held and fed. The pup will eventually respond and call back. Some infant free-tails grow so accustomed to their handlers that they will call out in response to the sound of their voice. One infant, in particular, learned that the sound of the alarm clock meant feeding time was near and would peep back a directional call each time the alarm went off.

Occasionally, free-tail infants will be covered with mites. The mites are easily disturbed, so the majority can be removed as they crawl, by dabbing them with warm, damp cotton swabs. Have a bowl of warm water handy and change to a fresh swab often. Mites will be destroyed when swabs are rinsed in the water. Make sure to check the folds of the wing membrane, as mites often collect there. Insecticides of any kind should not be used on infants. Bat mites do not live on humans or domestic pets. On the contrary, parasites from domestic animals can live on bats.

Free-tail pups will need to be kept very warm. The washable incubator described in *HOUSING AND TREATING SICK BATS*, works well for infants. Place a heating pad, set on low or medium, against one side, then lean that side against a wall. Pups will find a comfortable temperature range for themselves inside by moving close to, or away from, the heated side. The heating pad should never be placed inside the container with the bat. The infant will become overheated and die.

A nerf-cave, along with "bat sized" pieces of fake fur should be hung inside the container to give the infant comfort. Use velcro to hang, making sure to leave no loose strings or frayed edges the pup can get tangled in. A wash cloth placed in the container bottom can be taken out and brushed off, or washed daily.

In four to five weeks, the infant will be close to adult size, and weaning from the sponge applicator tip can begin. Small amounts of ground mealworms can be added to the milk mixture and fed directly from the medicine dropper. Start with a very liquid consistency, gradually adding more with each meal, until the mixture is pudding-like. After this stage, mealworm intestines can be offered, and eventually whole mealworms, following the procedure in *FEEDING ADULT FREE-TAILS*.

There is some controversy about returning hand-raised infant bats to the wild after they have reached adulthood. Tracking devices have proved that some captive-reared bat species will locate and join a colony of their kind, along with catching insects, on their own. Other species may have to be taught all survival skills by their mothers. Hand-raised orphaned free-tails may not be good candidates for release, as they might be lacking in some of the necessary survival skills. These bats can remain happy in captivity when housed with other free-tails, and are excellent for use in educational programs.

INJURIES

Although expert fliers, bats are sometimes found with broken bones resulting from accidents with (for the most part) man-made obstacles. Wind gusts can easily throw a small bat off course and into an object. Juveniles are especially prone to accidents while first learning to fly and forage on their own.

Most injuries to bats involve the wings. Minor injuries to wing fingers often heal nicely, and the bat can be released. All injuries to the large bones of the wing - even when appearing minor - are serious enough to prevent the bat from ever being released. Bruises to the upper arm, elbow, forearm or wrist will take months to heal. And small, undetected fractures may eventually cause the bat pain in flight. Injuries involving more than one limb will give the bat a poor quality of life. It is important to assess severe injuries before attempting to save the bat, and euthanize if necessary.

In urban areas, bats are occasionally found with burns resulting from contact with power lines or electronic bug-zappers. Once healed, minor burns and injuries to the wing membrane should not hamper the bat's flight, making release possible. Unfortunately, some bats are burned extensively and will need to be euthanized (see *EUTHANASIA*).

Being crevice dwellers, free-tails often roost in loose window frames of older two and three story buildings. Yellow jackets and wasps also use window frames to nest in, and will attack and sting bats. In summer months, grounded bats - particularly juveniles learning to fly - may be overcome with fire ants before getting air borne again. If found in time, insect stings can be treated and the bat will survive.

Bats taken in for treatment of any kind will need an injection of Lactated Ringer's solution. Consult the chart on page 36 for proper amount of fluids and injection procedure.

Simple and Compound Fractures to Wing Fingers; Membrane Tears

First, clean the wound by gently dabbing with a cotton swab dipped in peroxide. Dry in the same manner (with cotton swab), then apply *Betadine topical antiseptic and dab off the excess. Next, apply a small amount of *triple antibiotic cream. Oral antibiotics (Cephalexin/Baytril) can be administered following mixing and dose instructions on page 38.

After initial cleansing, the peroxide will not be needed for daily treatments. The Betadine and triple antibiotic cream should be applied twice daily until healed. Cephalexin only can be given for two weeks to thirty days, depending upon the condition of the wound. Ten to twenty minutes of flight exercise daily, for at least one week, will be needed for the bat prior to release.

Simple and Compound Fractures - Upper Wing and Forearm

Simple fractures can be stabilized following directions on page 31. It may be easier to work on the bat if its body is immobilized in a small nerf-cave or wash cloth, folded back to only expose the injured wing. It is perhaps best to not try "setting" the wing, as additional damage will probably occur. Rather, glue the wing into place in as close to a natural position as possible. Calcification will gradually form around the injury and further stabilize the break.

The best choice of skin adhesive is *Vetbond Tissue Adhesive, No. 1469, 3M Company. Be extremely careful when using this glue. It adheres with the strength of Super Glue, though not as long lasting. It is best to avoid accidents by not using the glue directly from the bottle onto the bat. Rather, make a small puddle of glue (4 to 5 drops) on a piece of non-porous paper, then apply where needed with the round end of a flat toothpick. The glue is not irritating to the thick folds of membrane closest to the bat's body, but is irritating to the thin, wing finger membrane. Some bats will mutilate themselves trying to clean glue from the thinner parts of the wing membrane.
If accidents occur, the adhesive can be removed with **Super Glue Remover. The bat should be shielded from the fumes in a wash cloth or nerf cave. After using the remover, the area should be thoroughly but gently washed and dried to remove all residue. It is extremely important that the wing be glued in as close to a natural position as possible. When the wing is in a comfortable position and the glue is properly applied, most free-tails will leave the injury alone after only a few attempts to "clean" the area. Because the glue is short-lived, the wing should be checked daily for any loose areas, and glue re-applied as needed. Before re-gluing, old pieces of hardened glue can be gently lifted off with small tweezers. In about three weeks, the break will be stable and no longer need adhesive. At that time, it may be necessary to help the bat clean the area by gently removing any large pieces of glue with tweezers.

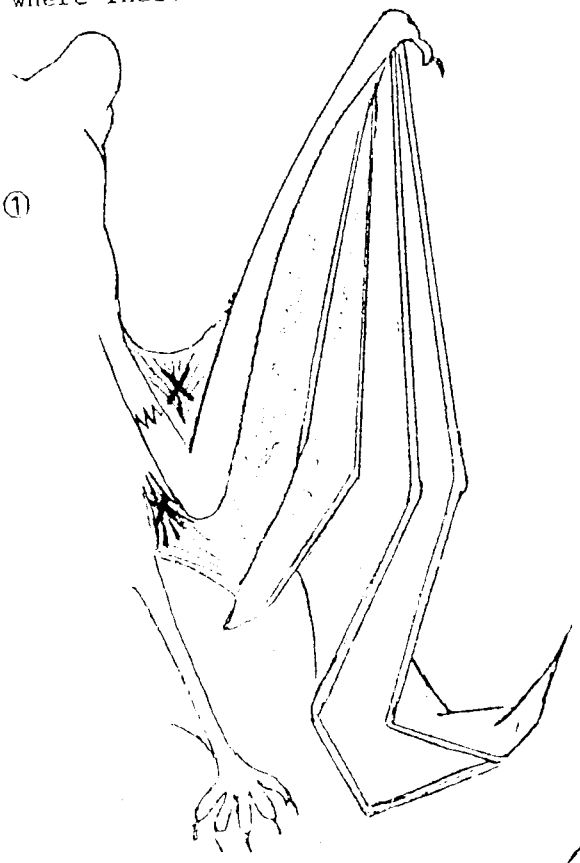
Compound Fractures

For compound fractures, the wound should first be cleaned in the same manner as with wing finger injuries. Do not apply triple antibiotic cream until the wing is stabilized with skin adhesive. When glued properly, open wounds will remain exposed enough to treat with Betadine and antibiotic cream, twice daily. Oral antibiotics will be needed for compound fractures (page 38) for 21 to 30 days. In three weeks, most compound fractures will have healed enough to discontinue the adhesive.

* Available at veterinary offices.
** Found at hardware and department stores

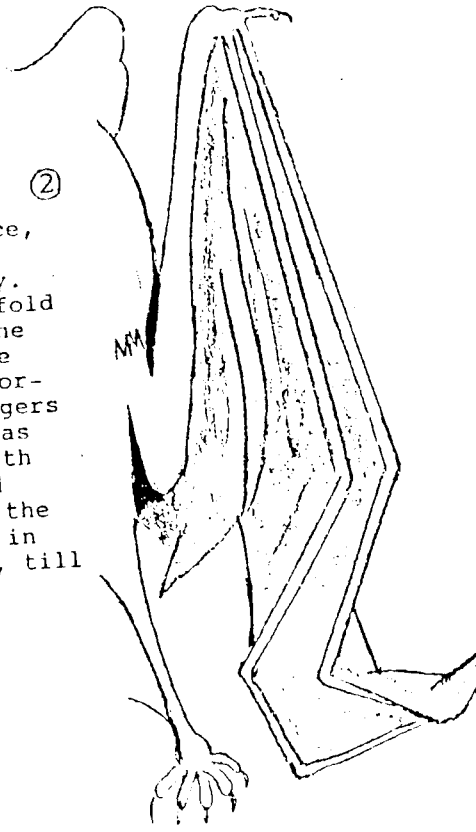
NOTE: Thumbnail of the injured wing should be clipped just short of the cuticle, to prevent further injury.

. Breaks to the upper wing can be secured by placing small amounts of skin adhesive into the folds of the membrane, where indicated.



①

2. After glue is in place, gently move the wing back towards the body. The membrane should fold up naturally, with the glue being inside the fold. Make sure no portion of the wing fingers or finger membrane has come into contact with the glue and adhered unnaturally beneath the body. Hold the wing in place a few seconds, till glue is set.



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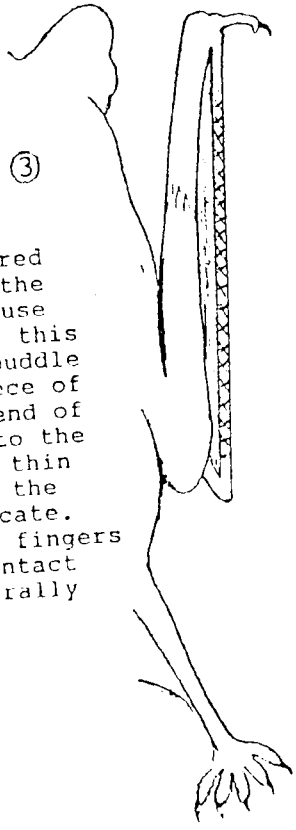

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3. Breaks to the forearm can be secured with a thin line of glue between the forearm and first finger. Do not use glue directly from the bottle for this procedure. Rather, drop a small puddle of glue (4 to 5 drops) onto a piece of non-porous paper. Use the round end of a flat toothpick, for dipping into the glue and applying. Gently form a thin line of glue along the length of the wing finger bone, where x's indicate. Make sure no portion of the wing fingers or finger membrane comes into contact with the glue and adheres unnaturally beneath the body.

4. Gently press the first finger against the forearm until set.

④

LARGE MEMBRANE TEARS

Large membrane tears can be treated in the same manner as minor tears. Never attempt to sew up the membrane, it will eventually heal. Because the membrane will not grow back together, release may not be possible. However, free-tails have been found with rather large, healed membrane tears from old injuries. The bat should be checked for flight capabilities before release. Ten to twenty minutes of daily flight exercise, for at least one week, will be needed prior to release.

BACK AND LEG INJURIES

Little can be done for bats with injuries to the back or legs. However, providing adequate rest and nourishment is often enough to allow the bat to heal. After recovery, the bat should not be released, as these areas will re-injure easily.

With either injury, the bat may be unable to hang in its normal upside down position. A nerf-cave, hung horizontally, should be provided to allow the bat to lay on its stomach while roosting along the cage ceiling, as it would do naturally. If the injury appears severe, a fiberglass screen can be sewn across the opening of the nerf cave. Cut a rectangle of screen to fit over the nerf-cave opening. Sew one edge of the screen to the cave bottom, and use velcro to secure the top edge. This will allow for easy access to the bat. Also, this method keeps the bat safely confined while allowing the company of other free-tails through the screen "window." A soft paper towel or pad can be placed on the bottom of the cave, under the bat, to help draw urine away from the body. The towel should be checked every few hours and changed when necessary.

Most bats with back injuries seem grateful for this type of semi-confinement, and will lay still and content while healing. Occasionally, back injuries also involve trauma to the kidneys, resulting with blood in the urine. Oral antibiotics may provide help (page 38).

Bats with back or leg injuries will be unable to adequately groom their bodies. Free-tails are highly meticulous about their fur, and become depressed when soiled and unable to clean themselves. Once depressed, they soon start losing their will to live. It is imperative to help the free-tail keep itself clean by brushing it daily.

The best choice of brush is a small *interdental tooth brush. Before attempting to use, let the bat see and smell the brush. Then gently stroke the bristles along the vertical folds of the cheeks, so the animal can both see and feel what is happening. Next, attempt to brush the fur behind the ears. Try to duplicate the natural movements of a bat when it is grooming. Use very quick, short, soft strokes. Always brush the bat in the same

* Found with toothbrushes in dental sections of most stores

direction of the natural hair growth. Brushing the fur opposite of its natural growth will irritate the bat. If the bat becomes distressed at any time, leave it alone to calm and try again later. Once the free-tail learns that you are helping to groom its body, it will enjoy the process and respond by moving parts of its body against the brush as it is being used.

Bats with broken legs will recover, but may always need help to groom certain areas of the body. It will be difficult for the bat to hang up-side down with its weak leg to groom with the opposite foot. If bats with back injuries are going to recover, some improvement should be seen within a week to ten days. If no improvement is seen, or the condition worsens during that time, euthanasia should be considered (page 47).

NOTE: **Toenails of the injured leg should be clipped to prevent further injury.**

POWER LINE BURNS AND INSECT STINGS

Next to fractures of the wing, power line burns are perhaps the second most common injury to Mexican free-tail bats. When flying around street lights, the free-tail's wing span (about 14") is unfortunately large enough for the bat to arc itself between the power lines.

Burns will range from minor to extreme. In minor cases, the wing tip and surrounding membrane will appear blackened and brittle. These bats will need LRS injections (page 36) for two to three days. Oral antibiotics should be started immediately and the burned areas treated in the same manner as membrane tears. *Neosporin Plus cream, with Lidocaine, may be a good choice of triple antibiotic as it will help to relieve pain. Do not attempt to cut away dried, burned areas. Dead skin will eventually fall off and reveal the pink edges of healing membrane. If large areas of membrane have been burned away from the wing fingers, the bat will not be releasable.

In extreme cases, the wings may not appear burned at all, but will swell up four to five times their normal size within a few days. These bats may also have blisters on the torso, or the skin beneath the fur might appear beet-red. When the bat is burned this badly, it's very probable that the internal organs are also involved. The animal may live up to two weeks, in extreme pain, before its ultimate death. The most humane thing to do is euthanize the bat immediately (page 47).

To identify stings from flying insects, look for a large area of localized swelling, particularly about the face and head. The fur on top of the head and around the neck will often stand erect, creating a "lion's-mane" appearance, and indicating toxins within the system. The bat will be lethargic and without appetite. LRS (page 36) should be injected for two to three days to help flush toxins from the system. Oral antibiotics will be needed (page 38) and a triple antibiotic cream with lidocaine should be applied two or more times daily to the swollen area. Force feeding the ground food will probably be necessary for a few days. Within four days, the bat should begin to show signs of improvement, and can be released after ten days, when oral atibiotics are stopped.

Fire ants can completely cover a grounded bat within seconds. All ants should be brushed from the bat's body as quickly as possible. Treatment should be the same as with flying insects. If the bat is found in time, it may recover. However, fire ant bites will cause intense agony, especially to an animal so small, and euthanasia may be the only solution.

* Available in pharmacies and grocery stores

AMPUTATION

Mexican free-tail bats can survive wing amputations and adapt to the loss quite well. Surgery, under general anesthesia, should only be performed by a veterinarian. Afterwards, special adaptations will be necessary within the cage, to assure both safety and a good quality of life for the bat. Call the author for complete information (page 2).

Dosages for Lactated Ringer's Solution (LRS)

From "The Maintenance of Bats in Captivity," by Susan Barnard © 1991

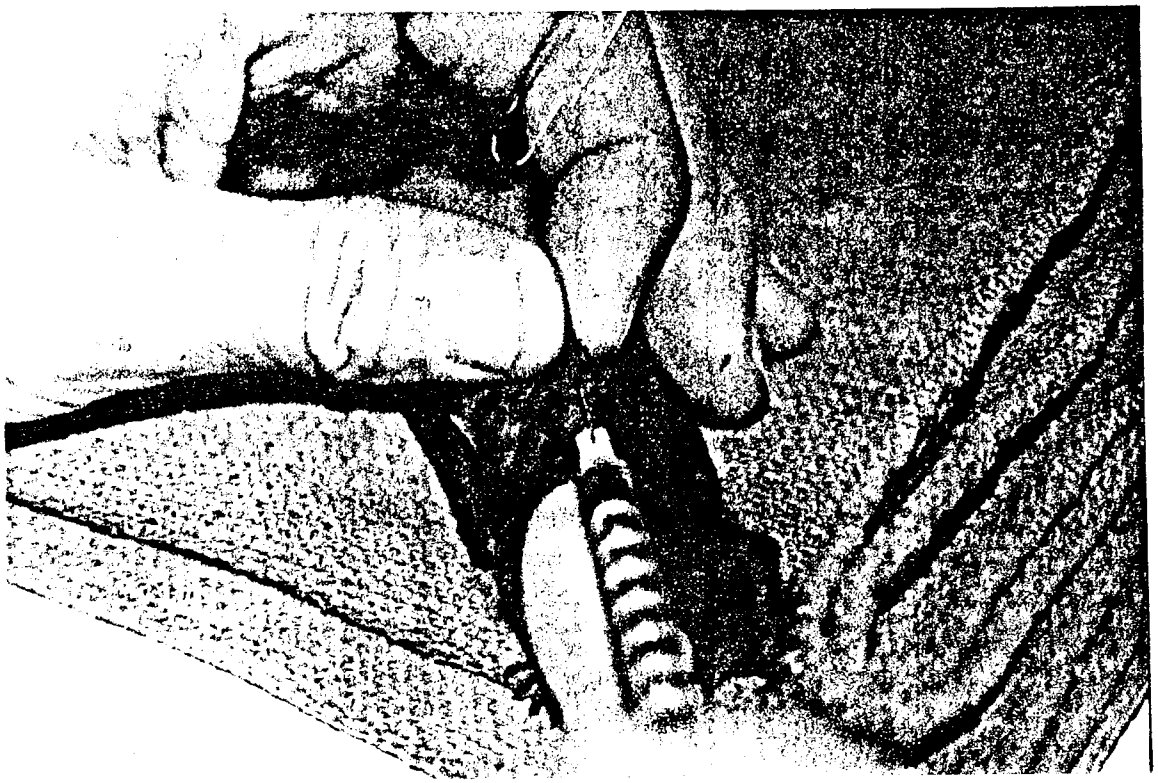
Weight of Bat in grams	Dosages LRS in ml (cc) *	Number of Injections in a 24-hr. Period, or as needed
1.0 - 1.1	0.03 - 0.04	3 - 5
1.2 - 1.5	0.04 - 0.05	3 - 5
1.6 - 1.9	0.05 - 0.06	3 - 5
2.0 - 2.4	0.06 - 0.07	3 - 4
2.5 - 2.9	0.07 - 0.08	3 - 4
3.0 - 3.4	0.08 - 0.09	3 - 4
3.5 - 3.6	0.09 - 0.10	3 - 4
4.0 - 4.4	0.10 - 0.15	3 - 4
4.5 - 4.9	0.15 - 0.20	2 - 3
5.0 - 5.4	0.20 - 0.25	2 - 3
5.5 - 5.9	0.25 - 0.30	1 - 2
6.0 - 6.4	0.25 - 0.30	1 - 2
6.5 - 6.9	0.30 - 0.35	1 - 2
7.0 - 7.4	0.35 - 0.40	1 - 2
7.5 - 7.9	0.40 - 0.45	1 - 2
8.0 - 8.4	0.45 - 0.50	1 - 2
8.5 +	0.50	1 - 2

* The higher dosage is also the maximum safe amount of fluids that can be delivered in one injection. It is not necessary to inject bats throughout the night. Injections can begin at 6 a.m. and end at midnight.

NOTE: Consult page 37 for correct procedure for subcutaneous injections.

PROCEDURE FOR SUBCUTANEOUS INJECTIONS

Most injections are given subcutaneously, in the upper back. An allergy syringe, 1cc - 28 1/2 gauge needle or smaller, is a good choice. For easier injections, place the bat on a surface that is chest to shoulder level. Lift skin in the upper back area and insert the tip of the needle parallel with the bat. Be particularly careful so that the needle only goes under the skin, and not into the body beneath. A poorly given injection will damage organs, causing seizures and subsequent death. After the insertion, let go of the skin and begin the injection. Fluids may cause the skin to bubble until absorbed.



MIXTURES AND DOSAGES FOR ORAL ANTIBIOTICS

To cover a broad spectrum of gram-negative, gram-positive bacteria, a Cephalexin/Baytril oral antibiotic mixture is perhaps the best choice. Both antibiotics are available at veterinary clinics. Mix as follows:

Cephalexin oral suspension - 250 mg per 5 ml

Cephalexin comes in a flavored powder to be mixed with water. Do not mix the entire bottle as directed by the insert. Instead, to avoid waste, mix equal measures (i.e., 1 tsp. water to 1 tsp. Cephalexin). Shake well to dissolve. Mexican free-tails enjoy the taste of this antibiotic.

Baytril (enrofloxacin) antibacterial injectable solution 2.27%

Baytril is an injectable antibiotic that also works well when given orally. Mixing with Cephalexin helps to mask the taste. Withdraw .10cc Baytril and mix with 1cc fruit flavored electrolyte solution (*Pedialyte) or water. Mix well.

To the Baytril mixture, add an equal measure (i.e., 1.1cc) of the mixed Cephalexin. Give the bat two drops orally, with a regular standard sized medicine dropper, twice daily. Doses should be scheduled about twelve hours apart. Keep the mixture refrigerated and shake well before each use. Baytril should be stopped after 10 to 14 days. Cephalexin by itself can be continued for up to six weeks for infections requiring long term antibiotic coverage, such as certain skin and urinary tract infections. If symptoms worsen while on straight Cephalexin, the Baytril/Cephalexin mixture may need to be re-started, at the handler's discretion. See package inserts on both medications for clinical pharmacology.

* Found in baby food aisle of grocery stores

ILLNESS; BAT DISEASES AND HEALTH PRECAUTIONS

Bats carry two diseases that are transmittable to humans; Histoplasmosis and Rabies. Primarily found in humid areas, Histoplasma can be found in the droppings of birds and bats. Animal to human transmission is rare, but may occur by inhalation of air-borne spores. Survival of the fungus in hot, dry attics is uncommon. Regularly cleaning the bats cage should eliminate any chances of humans contracting Histoplasmosis. Symptoms mostly appear as a mild respiratory illness.

Statistics show that only about one in every one-thousand bats contracts rabies. However, the infection rate for Mexican free-tails is slightly higher; about five in every one-thousand.

Free-tails normally develop paralytic rabies, and go off and die quietly. Symptoms range from respiratory distress to drowsiness. Although unlikely, the aggressive form of rabies may be encountered in Mexican free-tails. These animals will snap at objects and other bats. Some will roost alone, in open areas, and appear extremely alert and sensitive to noise. Once they bite an object, they hold on and chew furiously for lengthy periods of time. It is important to note that pesticide poisoning can cause similar symptoms to both forms of rabies.

Rabies outbreaks are common in skunks, raccoons and other wildlife. Bats form large colonies, sometimes consisting of millions of individuals, yet a rabies outbreak among bats has never been recorded. Evidence exists that most bats carry a natural rabies antibody, and will survive the disease. However, bats are not asymptomatic carriers of the rabies virus.

The Center of Disease Control will soon have an injection that can be administered to bats. If the bat is incubating the rabies virus within its system, it will die. It is recommended that all animal care professionals handling wildlife receive pre-exposure rabies vaccinations and yearly boosters, if needed. When bitten, the wound should be thoroughly washed with soap and water. This will help destroy the rabies virus and considerably reduce the chances of contracting the disease. If the bat is supected of rabies, booster vaccinations will also be needed. Rabies is fatal. The importance of pre-exposure vaccinations cannot be over-stressed.

TREATING AND HOUSING SICK BATS

When sick, Mexican free-tails will isolate themselves from other bats. In captivity, this is often the first noticeable sign of illness. Healthy free-tails have clear, shiny eyes, a soft clean coat and the wings will have a glossy sheen. Dull, drowsy eyes and unkempt fur are symptoms that usually follow isolation.

Beside histoplasmosis, rabies and pesticide poisoning, bats are also susceptible to bacterial and viral infections specific to their species, including some strains of pneumonia and encephalitis. Because these different illnesses cannot be positively identified, oral antibiotics (page 38) and LRS injections (page 36) are probably the only recourse. If the bat has not improved from an illness within five days, or symptoms worsen beforehand, euthanasia (page 47) should be considered.

Sick free-tails will need to be force fed. *Nutri-Cal, a high calorie, nutritional dietary supplement, works very well for these bats. Squirt the supplement into a 3cc syringe and feed as in *FEEDING ADULT FREE-TAILS.* Most bats will readily eat Nutri-Cal. Even those too weak to chew will slowly swallow small amounts when placed within the mouth. Nutri-Cal is very thick and sticky. To increase palatability and protein content, it can be mixed half and half with cream cheese or baby food veal. When recovery starts and the bat's appetite increases, Nutri-Cal should be replaced with ground worms and finally, whole mealworms, as in *FEEDING ADULT FREE-TAILS.*

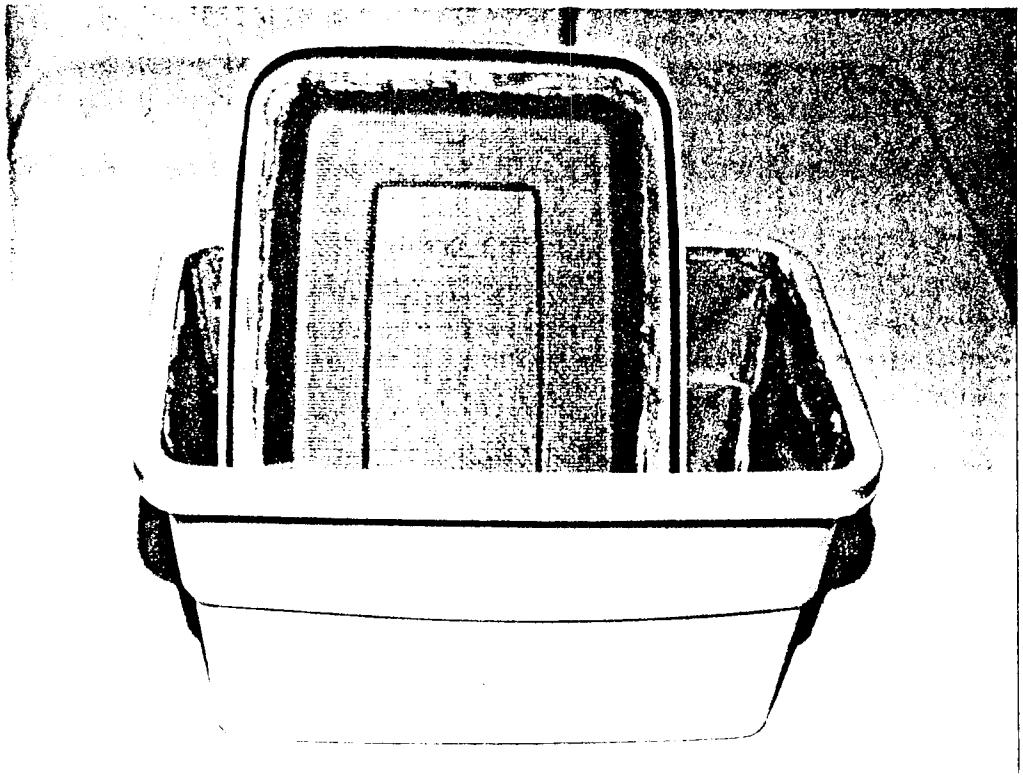
Free-tails are meticulous groomers, spending up to 25% of their day cleaning their bodies. When these animals ignore their coats, they have usually given up, and are ready to die. To help the sick free-tail survive, brushing and cleaning its coat is essential. Use an interdental brush, in the same manner as described in *BACK AND LEG INJURIES.* If the bat becomes soiled with food during feedings, a cotton swab, dipped in warm water will clean the area. Afterwards, use a blow-dryer to avoid chills and help dry the bat. Set the dryer on low heat and hold the bat several feet away to create a very gentle air-stream. If the bat shows any discomfort, you are too close. When comfortable, the bat will enjoy the warmth. Brush the damp fur as it dries.

Because sick free-tails isolate themselves from other bats, quarantine is made easier. A good quarantine enclosure can be made from a small Rubbermaid storage container with a tight fitting lid (see photo). Cut a window in one end to allow ventilation for the bat and viewing. Line the four inside walls with fiberglass screen, held in place with hot-glue. The screen should be glued securely against the walls, leaving no openings that will allow the bat to squeeze between the screen and the inside walls.

* Available at veterinary offices

Also, completely line the lid with screen. Use only hot-glue, as it is non-toxic. Velcro tabs can also be glued into place to hold nerf-caves. Place a paper towel or wash cloth on the floor of the container. The sick bat will need to be kept warm to help it conserve energy. A heating pad, set on low, can be placed on the container to cover the bottom and one side. To keep the heating pad against the side of the container, push that side against a wall, or tape it into place with duct tape on the outside of the container, DO NOT COVER THE SCREEN WINDOW. The bat will be able to select the temperature it needs by moving towards, or away from, the heating pad. Always view the bat through the screen window before lifting the lid. The bat may be hanging onto both the lid and inside wall, and can be easily injured if the lid is lifted too quickly. A small pen-light will allow easy periodic checks on the bat through the screen window. The container should be kept a good distance away from other bats, or in another room.

After each use, the quarantine container should be sterilized with bleach and hot water. Be sure the container is dry and free of bleach fumes before re-using.



An easily sterilized quarantine container and incubator.

PESTICIDE POISONING AND CONTAMINANTS

In the United States, two types of pesticides pose a threat to bats when used according to label instructions; organic phosphates and carbamates - often used for insect control. These compounds inhibit cholinesterase activity within the brain. The cholinesterase enzyme is essential for proper nerve function.

The following symptoms, possibly from organic phosphate or carbamate poisoning, have been observed in Mexican free-tail bats: hunched back; tail tucked inward; legs drawn up or clamped towards the stomach; excessive salivation; increased, irregular or slow respiration; tremors; severe uncoordination; hindquarter weakness and stiffness; calmness; laying to one side; tightness of jaw muscle; wing shivers with wings drawing forward towards the chest, sometimes crossing in front; wing extensions and flapping; penile extrusion; prostration; pin-point hemmorrhage spots on wing and tail membrane,and bleeding from mouth, nose and ears. Pesticides may also cause fetal deformities and premature births in pregnant females, or be passed inutero to the infant. Dwarfism has been noted in juvenile free-tails, along with malformation of the teeth and abnormal hair loss.

Because little is known on how to treat bats with pesticide poisoning, a precise remedy has yet to be determined. However, treatment with Atropine Sulfate may be of some help. Atropine relieves many distressing symptoms associated with pesticide poisoning. It reduces heart blockage and dries secretions of the respiratory tract. Dose as follows:

* Atropine Sulfate Injection 1/120 grain - 0.54 mg per ml.

Inject .06 cc (high-end dose) SQ at ten to thirty minute intervals, as needed by excessive salivation and secretions. Effects begin in one to four minutes and are maximal within eight hours. After two hours, dose at less frequent intervals. Continue treatment twenty-four hours, or in severe cases as long as necessary, according to symptoms. Recovery can occur within two to twenty-four hours. Death can result from delayed treatment or insufficient Atropine administered,. Surviving bats may continue to show neurological symptoms and should not be released.

Although chlorinated hydrocarbons are no longer used in the United States, DDT is still used in Mexico. Free-tails that have migrated may ingest small amounts of DDT from insects and streams. These small amounts are stored and slowly build up in the bat's fat reserve. This fat reserve is then used during the migration back to the United States, thus releasing the total build up of poison into the bat's system.

Possible symptoms of poisoning from chlorinated hydrocarbons are hindquarter weakness, fast respiration, uncoordination, salivation, teeth grinding, gasping, and backward movement with loss of balance resulting in somersaults. Flushing the system with LRS injections (page 36) is perhaps the only recourse. Death should occur within twenty-four to seventy-two hours. Animals that survive will recover completely.

Occasionally, bats become stuck in "No Roost," a petroleum product used to prevent birds from nesting in chimneys and buildings. Bats may also be found stuck in or contaminated with roofing tar or oil.

Some of these contaminants can be removed with dishwashing liquid. This is very stressful for the bat. A prognosis should be assessed beforehand and euthanasia considered, depending upon the bat's condition. To rid the bat's fur of the contaminant may be of little value if the bat attempted to clean itself. Because bats lick their toes while grooming, the chemical may be inadvertently ingested. However, unlike other bats, free-tails will immediately and forcefully spit from their mouths any unwanted or bad tasting substance.

To clean the bat, wet it down gently with a very small stream of warm, running water. Hold the bat face up and avoid wetting the head area, rather, start at the neck and work down. Apply dishwashing liquid to the fingertips and gently massage the bat's fur. Clean the wings in the same manner. This is a slow process that may take several applications and rinses. To clean the head and face, use *cotton swabs with dishwashing liquid, taking extreme care to avoid getting soap into the bat's eyes, ears or mouth. Rinse thoroughly with cotton swabs and warm water. Afterwards, gently blot the bat of excess water with a wash rag or soft cloth. Dry with a blow-dryer following the method in *TREATING AND HOUSING SICK BATS.*

Roofing tar and oil may require the use of **WD-40 lubricant to aid in removal. Before wetting the bat, spray WD-40 onto the fingertips and massage into the bat's fur. Wipe off the excess with a facial tissue. If the bat is heavily coated with a contaminant, several applications may be necessary before starting the washing process. It is important to note that WD-40 is also a petroleum based product, and poisonous if ingested. Careful and complete removal of the WD-40 from the bat's body is critical.

* Foam eyeshadow applicator wands also work well for cleaning delicate areas, and are more gentle than cotton swabs.

** Found in hardware stores.

EYE AND TOOTH INFECTIONS

Cloudy eyes are often the first sign of an eye infection. If left untreated, symptoms will progress to running or matted eyes, possibly resulting in blindness. Eye infections can be difficult to treat and are often recurrent. It is equally as important to locate and eliminate the cause of infection. Possible sources are dust, chemical irritants from household cleaners, and stress.

The most effective cure is applying triple antibiotic opthalmic ointment to the eyes, three to four times daily. Do not apply the ointment directly from the tube, as the contents will become contaminated with bacteria from the eyes, resulting in re-infection. Use a small narrow artist's paintbrush for applications. Squeeze a dab of ointment onto a surface, and dip the brush into it to apply. Hold the bat on its side as in *INFANT CARE AND FEEDING,* and gently "paint" each eye with the ointment.

After each treatment, the brush will be contaminated. Thoroughly wash it with soap and hot water before the next use. It is important to consistently treat the eyes three to four times daily, for one week to ten days, even if the eyes appear cleared up beforehand.

Tooth and gum problems first become noticeable when the free-tail exhibits a slower chewing pattern than normal. Other signs are mealworms being discarded after a few attempts to chew, or completely refusing to eat them.

As with humans and other animals, abcessed teeth become apparent with a swollen area on the face or cheek. A cotton swab can be used to gently lift the lips and inspect the teeth and gums. With abcessed teeth, the gum will appear bright-red and swollen directly around the tooth. Oral antibiotics will be needed (page 38), preferably started before extracting the tooth.

Infected teeth are often loose and can be easily removed. However, the procedure will require two people. After the tooth is located, one person can restrain the bat in the hand, in a position that allows easy access to the tooth. A cotton swab, gently inserted into the mouth, will keep it open temporarily. The second person can then test the tooth for looseness with small forceps or a pair of tweezers. IF THE TOOTH IS NOT LOOSE, DO NOT ATTEMPT TO PULL IT. Oral antibiotics may clear up the infection and eliminate the need for an extraction. If the tooth is loose, wiggle it slightly to further loosen, then gently flick it sideways towards the outside of the mouth. Do not push the tooth towards the inside of the mouth. The startled bat may accidently swallow it and choke. After extraction, the gum will bleed a few minutes before clotting.

* Available at veterinary clinics.
** Available in craft or department stores.

Healthy gums are pale pink and smooth. Infected gums will appear dark pink to red with swollen or lumpy areas, and may produce a foul smell, especially if infected from eating wax moth larva.

Oral antibiotics (page 38) will be needed, along with brushing once daily with *CHX (.12% Chlorhexidine gel for animals). Use a small, flat edged artist's paintbrush and brush the area thoroughly but gently. The gums may be extremely sore and bleed easily, however, the condition should show improvement within a few days and gone within two weeks. With severe gum infections, some tooth loss may also occur. It may be necessary to temporarily feed the bat ground food (page 18) until the gums have healed enough to eat mealworms. If excessive tooth loss occurs, a permanent diet of ground food will be needed (see *CARE FOR THE GERIATRIC FREE-TAIL).*

* Available at veterinary clinics.

PARASITES

Wild free-tails often carry Ectoparasites such as mites and fleas. Red and white mites are mostly found on the membrane areas, particularly within the folds of the wings. Large fleas, normally only one or two, are sometimes found on the body, these parasites will quickly spread to other bats upon entering captivity but will not live on humans or domestic pets. On the contrary, parasites from domestic pets will live on bats. Measures should be taken to prevent this from occuring.

One method for quick removal of parasites is *Vet-Kem flea and tick powder for dogs and cats. Although Vet-Kem is a carbamate pesticide, when used with caution it is safe to use on free-tails that appear healthy.

Apply the dust to the bat with a cotton swab. Start with the wing area, as mites are often stubborn to remove. The bat's body can be covered in a soft cloth or within a nerf-cave, enabling each wing to be unfolded and thoroughly powdered on both sides. coat each wing and leave the dust to set while powdering the body. Mites are rarely on the face, and the facial area should be avoided with Vet-Kem. To dust the body, start at the head, using a cotton swab. Coat the entire neck, back, stomach and sides. When complete, softly and thoroughly blow all excess powder from the bat's body. Do not leave even the smallest speck, as accidental ingestion by the bat could be fatal. Next, unfold each wing and wash all powder and dead mites off with a clean, wet cotton swab dipped in warm water. Dry the wings with clean, dry swabs and thoroughly inspect to make sure no powder remains.

Vet-Kem should only be used on bats that appear otherwise healthy. Do not use on sick or unhealthy bats, as the powder will be fatal to any weakened immune system. Because sick free-tails will be isolated in the Rubbermaid quarantine enclosure away from other bats, parasites will stay contained. If the bat is heavily infested with mites, they can be removed in the manner described in *INFANT CARE AND FEEDING*. Along with the quarantine container, all bedding (i.e. nerf-caves and cloths) should be thoroughly washed before reuse to prevent the spread of parasites and disease.

All injuries should be dressed and stabilized before using Vet-Kem. Positively avoid all contact with open wounds.

* *Available at veterinary clinics.*

EUTHANASIA

Animals that are suffering or are beyond help should be provided with a pain-free ending to life as quickly as possible. Unfortunately at this time, most wildlife rehabilitators do not have legal access to a euthanisia drug. Therefore, euthanisia, performed by a veterinarian is the first and best choice. A very small amount of the drug (.02 cc to .04 cc) should be injected in the shoulder area SQ. After the bat appears comatose, another .20 to .30 cc given SQ in the shoulder, or directly into the chest wall, will finalize euthanasia.

Chloroform may not be a controlled substance in all states and possibly available to some rehabilitators. A small amount on a cotton ball can be placed near the bat, within a large nerf-cave. Death will occur shortly, and be relatively pain-free.

Although not as humane, another alternative exists when both above mentioned methods are not available. Most bats will enter torpor, a natural deep sleep, when placed into the refrigerator. Make the bat comfortable within a nerf-cave or soft cloth, then place it into a small box. Leave in the refrigerator, quietly for several hours. Try to avoid disturbing the bat; use the refrigerator door as little as possible during this time. After several hours, the bat should be in a deep sleep, and can be placed into the freezer. Make the move from the refrigerator to the freezer as quietly and smoothly as possible. Afterward, avoid opening the freezer door for several hours (a good time to place the bat within the freezer is before bedtime).

Because many bats can survive freezing temperatures, it will need to remain in the freezer for at least a week before disposal. If taken out before then, it should be decapitated while frozen, before disposal. All humane intentions will be defeated if the bat awakens, still suffereing, after it has been disposed of.

CO2 chambers are sometimes used to euthanize small animals, but will not work on bats. One of the above methods should be used to euthanize bats.

CARE FOR THE GERIATRIC FREE-TAIL

Sadly, most colonial bats do not live to an old age. Large colonies found in caves and buildings are easily and often destroyed. Out of every four Mexican free-tails born, three will die within their first year. The main cause is still human vandalism, mostly due to fear and ignorance.

In Mexican free-tail bats, tooth wear starts at approximately fifteen years old. Although uncommon, an occasional "old bat" is found.

As with domestic animals, older bats will need special care. Free-tails with extremely worn teeth may be unable to chew mealworms. The bat will need to be hand fed, preferably twice daily. Ground food, with a small amount of baby food veal mixed in, can be fed from a 3 cc syringe (see *FEEDING ADULT FREE-TAILS).* The bat will need 1 to 1 1/2 cc's at each meal. If the bat tires of this mixture, a small amount of baby food squash, bananas or pears will give added flavor and incentive for the bat. The diet will need to be supplemented with mealworm viscera, to ensure proper nutrition. Feed the intestines of several mealworms directly from the worm, three to four times weekly.

A permanent diet of soft food may result in a build-up between the teeth. A twice weekly brushing with CHX gel (see *EYE AND TOOTH INFECTIONS*) will discourage bacteria.

Arthritis may develop in the older bats joints, resulting in swollen knees and inability to properly grrom itself. These bats may need help with grooming (see *BACK AND LEG INJURIES).* If dry skin becomes a problem, a small amount of vitamin E oil can be applied to the area with a cotton swab.

With care, older free-tails can be maintained with a good quality of life for several years. As with any animal, euthanasia should be considered when its quality of life diminishes.

RELEASE TIPS

Free-tails in captivity two weeks or less will probably not need flight exercise before release. Those remaining longer will need an exercise period of 10 to 20 minutes daily up to one week, depending upon length of time in captivity and the injury. Bats able to stay airborne 20 minutes or longer are probably ready for release.

Before release, the bat's weight should be checked. Free-tails in the wild weigh between 13 and 15 grams. Bats preparing for migration are sometimes heavier. Do not release underweight bats as they probably will not survive. Overweight bats can reach their desired weight with flight exercise.

Before releasing, check weather forecast, especially during spring and fall, for upcoming cold fronts or rain. To help ensure survival, bats should be released during weather that permits insects to fly.

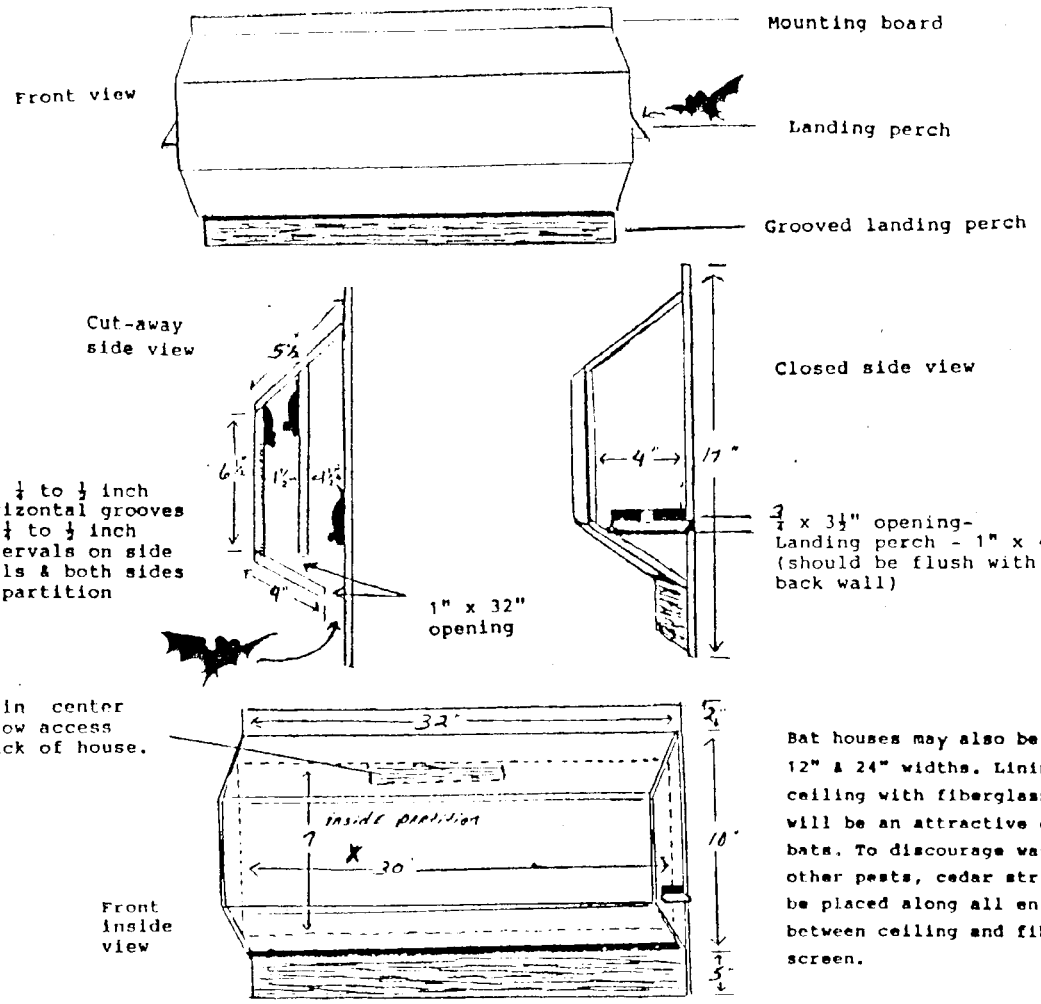
Never release bats during daylight hours, when they are easy prey for hawks and falcons. Also, during summer months, the wing membranes will absorb heat quickly and lead to heat stroke as the bat attempts to locate its colony.

Preferable release times are when other bats can be seen emerging or just after dark. Taking a flashlight along during the release will help in locating the bat if it is unable to stay airborne.

Whenever possible, free-tails should be released in the same area where found, to enable them to find and return to their colony. If the bat cannot be released near its original site, release should be near another known bat colony.

Free-tails will need a drop-off to take flight. When releasing, extend the arm overhead and release from an open hand or nerf-cave. The bat may need a few seconds to orient itself before taking flight. Let the bat take its time - do not attempt to throw or toss it into the air. If the free-tail refuses to take flight, or turns back down to its handler, it is not ready to be released. Free-tails exhibiting this behavior may still have pain from a healed injury and need more time, or may simple be unreleasable.

- for Mexican free-tail bats -



Bat houses may also be built in 12" & 24" widths. Lining inside ceiling with fiberglass screen will be an attractive option for bats. To discourage wasps and other pests, cedar strips should be placed along all entrances and between ceiling and fiberglass screen.

Approximately 17 board feet of material will be required. Dimensions may be varied to allow for slight differences in board widths. Use rough lumber, turning the rough side inward for walls and ceiling. Wood and boards used should be 3/4 to 1" thick to allow for grooves. Outside of bat house can be painted or coated with polyurethane to weather-proof, but should be cured at least 30 days before mounting.

Sunshine's bat house should be fastened securely to the side of a building at any desired height over 10 feet, preferably open to the morning sun yet shaded in the afternoon. Male bats do not live with females while young are being reared. The male bats may be attracted to a second house placed in a sheltered, similar location. Most bats seem to be attracted to sites somewhat protected from the wind.

Mexican free-tail bats are cave and crevice dwellers known and valued for their insect control. During Spring and Summer, they inhabit buildings and homes, roosting under roof-tiles, and in loose window and door frames,etc. If bats in structures become a nuisance, entrances can be sealed during the Winter, after the bats have migrated to Mexico. Care should be taken before sealing to make sure no over-wintering colonies have stayed. Mounting bat houses in early Spring - before bats migrate back - will increase chances of occupancy, especially if mounted in the area of a known bat site. Young bats learning to fly and explore will be in search of a roost in late July and early August, possibly choosing a bat house at that time. Often however, bats require a year or more to find a new house.

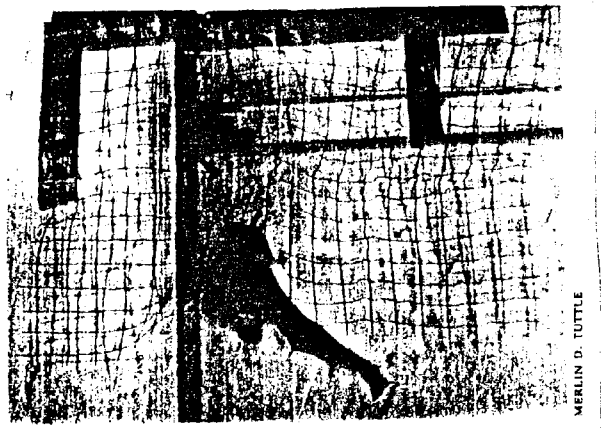
Bat houses of various designs have been used successfully in Europe for some time. Since the use of bat houses is new in the U.S.A., there is much to learn about local bat preferences. Reporting your successes and failures in attracting bats to your houses could greatly add to bat knowledge. Write either to Bat Conservation International, P.O. Box 162603, Austin, TX., 78761-2603 or to Amanda Lollar, 217 N. Oak, Mineral Wells, TX. 76067

Dealing with unwanted guests

MOST PROBLEMS WITH BATS arise only when large colonies attempt to live in buildings. It helps to keep things in perspective: by some estimates, over 80% of bats roosting in buildings are never detected by the human occupants. When too many bats take up residence in your attic, they can become a nuisance, even to people who like them. Fortunately, most problems are small enough to solve on your own.

The first step is to make careful observations to see where bats exit. The next day hang polypropylene bird netting (available at garden centers and some hardware stores) over the holes. Use duct tape or staples to secure the netting several inches above the bats' exit hole, extending at least a foot to each side and below, allowing it to hang loosely. In the evening when the bats leave to feed, they will be able to drop below the netting to gain flight. When they attempt to return, however, they will no longer be able to fly into the hole, the netting acting as a one-way excluder.

You can make permanent repairs later. Wait at least two or three nights to ensure that no bats have been trapped inside. Excluding bats should not be attempted in June or July when flightless young may be present. The best time is in fall or winter after bats have left to hibernate. Check and repair other possible entries, such as chimneys, vents, and loose screens. Bats potentially can enter through holes as small as 3/4" in diameter or crevices 3/8" X 7/8". They do not chew insulation or make new holes.



MERLIN D. TUTTLE

Using bird-netting, you can create your own one-way bat excluder. The bats have no trouble leaving for their evening meal, but since they fly straight back to the hole, the netting prevents them from entering.

The occasional bat visitor in your living quarters is most frequently a lost youngster. It will often leave on its own if you leave a window or door open, isolating it to only one room by closing it off from the rest of the house. If the bat lands, and you approach it carefully, you can try to cover it with a coffee can or tube. It usually will crawl into the dark space, and you can then slip cardboard over the opening and release the bat outside. You can also try to catch it with a butterfly net, in a towel, or with leather-gloved hands. Bats are not aggressive, but remember that when captured, they may become frightened and bite in self-defense.

Ultrasonic repellent devices, despite their claims, have never been proven effective and may actually attract bats. Leaving bright lights on in an attic may discourage use of a particular part, but many bats will merely retreat to darker crevices.

In the end, excluding bats from a structure is the only permanent solution. A detailed discussion of bat nuisance problems and solutions can be found in Merlin Tuttle's book, *America's Neighborhood Bats*, available through the BCI catalogue or at your local bookstore.

From **BATS**, a quarterly magazine published By Bat Conservation International (summer 1991, volume 9 #2). Reprinted with permission. For additional information about B.C.I., see page 2.

ANIMAL KEEPER'S SUPPLEMENT; A DAILY CHECKLIST FOR MAINTENANCE OF THE MEXICAN FREE-TAIL

Small groups of non-releasable Mexican free-tails are sometimes sent to zoos or educational facilities to better educate the public. When shipped over long distances, these bats will need to be rehydrated upon arrival, with LRS, according to weight (page 36).

The nerf-cave/frame cage system described in *HOUSING ADULT FREE-TAILS* will provide the bats with a relatively stress-free environment, during the normally required quarantine period for newly arriving animals. Bats not capable of flight may be permanently kept in this manner. Free-tails capable of limited flight can be introduced to small flight enclosures and housed with other bat species (listed in *BEHAVIOR*). When first placing free-tails in new quarters, hold each bat within the hand and show it the water location within the cage.

Mexican free-tails are delicate animals that require consistent, daily maintenance to ensure their health. The following checklist is helpful when the bats are maintained by more than one handler. Weekly copies can be made and posted near the cage, to be checked off daily as completed.

MAINTENANCE OF THE MEXICAN FREE-TAIL COLONY

INITIAL UPON COMPLETION OF CHORE

	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
A.M.							
1. Remove & clean nerf-caves of droppings.							
2. Replace one large nerf-cave for roosting. Locate bats and check the following before placing into the roosting cave:							
A) EYES (eyes should be clear & shiny).							
B) POSTURE (bat should feel lively and somewhat rigid within the hand).							
C) GROOMING (fur should appear soft and clean).							
3. Remove worm pan. Remove uneaten worms from pan. Wash pan, replace uneaten worms. Refrigerate until P.M. feeding.							
4. Empty & wash out water dish.							
5. Clean or change cage flooring, launder dirty nerf-caves.							
P.M.							
6. Replace laundered nerf-caves.							
7. Replace worm pan to cage.							
8. Fill water dish, add vitamins and replace to cage.							
9. Remove roosting cave with bats inside. Attach clean roosting cave. Remove each bat and check the following before replacing into clean roosting cave:							
A) EYES (See A.M. EYES)							
B) POSTURE (See A.M. POSTURE)							
C) GROOMING (See A.M. GROOMING)							

TWICE WEEKLY: *Mealworms in pan should be replaced with fresh mealworms from mixture, or pan should be left out at room temperature with sliced apples or sweet potatoes added until P.M. feeding.*

_____ _____

Day/Initials *Day/Initials*

ONCE WEEKLY: *Weigh and record each bat's weight with a gram scale. For security, place the bat in a dark sock to weigh. Deduct sock weight to determine the bat's weight.*

WEIGHT OF BAT

NO. 1 _____	*NO. 6* _____	*NO. 11* _____
NO. 2 _____	*NO. 7* _____	*NO. 12* _____
NO. 3 _____	*NO. 8* _____	*NO. 13* _____
NO. 4 _____	*NO. 9* _____	*NO. 14* _____
NO. 5 _____	*NO. 10* _____	*NO. 15* _____

CLEAN WEEKLY: *Clean cage* _____

Day cleaned & Initials

SUGGESTED READING

The Maintenance of Bats in Captivity
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Bats of America
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Fenton, M. B., 1987; Cambridge University Press, Cambridge, MS.

Communication in the Chiroptera
Fenton, M. B., 1985; University of Indiana Press, Bloomington, IL.

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The Bats of Texas
Schmidly, D. J., 1991; Texas A&M University Press, College Station, TX.

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Tuttle, M. D., 1988; University of Texas Press, Austin, TX.