Beautiful Beneficial Bats

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“It is simply amazing how quickly attitudes improve when people finally understand bats as they really are - sophisticated, beautiful, even cute, quite aside from their crucial roles as primary predators of insects, pollinators of flowers and dispersers of seeds.”

Merlin Tuttle “THE bat man”

Why is bat rehab important? Small wings....big impact!

Rehabilitating bats is conservation with ripple effects 🦇🌱

- **300+ species of fruit depends on bats for pollination**
  - These are some of our favorite foods and healthy foods we rely on for meeting our nutritional requirements
- **80 medicines come from plants pollinated by bats**
  - No plants no medications, more sickness. Anti-inflammatory, insulin, vitamins, digestive issues
- **Vampire bats are helping save stroke victims**
- **Bats help spread seeds of nuts, figs, cacao**
- **They are slow to rebound.**
  - Most bats have only one pup per year. Saving even one adult or reproductive female can have an outsized impact on future population stability.
- **Rehab protects people too.**
  - Proper rehabilitation ensures bats are handled by trained, vaccinated professionals, reducing unsafe public contact and improving disease monitoring and reporting.
- **They change minds.**
  - Rehabilitated bats become ambassadors. Education tied to rehab work replaces fear with understanding and builds public support for bat conservation.

Exterminators

Estimated 300 bats can eat 6.3 million insects a year

MENU

- CUTWORMS
- CUCUMBER BEETLE
- LEAFHOPPERS
- MOTHS
- HOPPERS
- FLIES
- ANTS
- TERMITES
- CADDISFLIES

Save U.S between $3.7 and 54 billion in pest control services.

Caution.....Danger Danger!!!

Threats to Bats

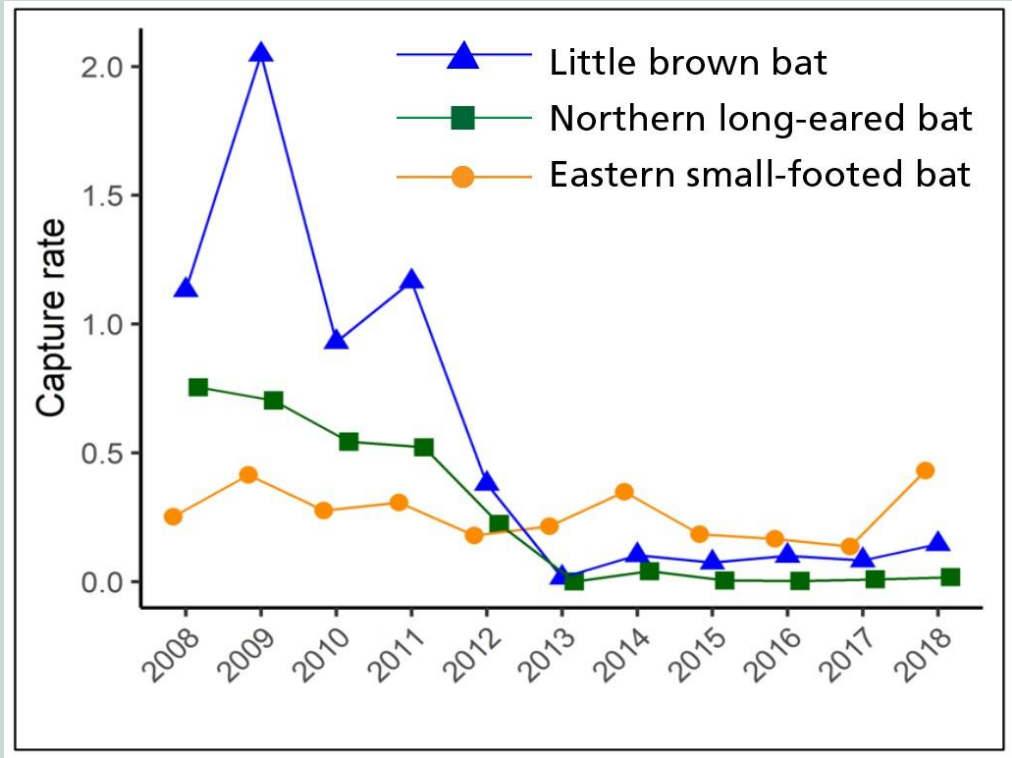
Habitat loss
Pesticides
Window collisions
Cave vandalism

Overhunting in SE Asia and Pacific Islands

Inappropriate guano mining
Wind turbines
Unusual weather patterns
White nose syndrome in North America

Bats are in decline!!

- As early as 2010, only one bat, the Indiana bat, was a listed species
- Now, every bat in Ohio is listed and several in N.C.
- Example: Little brown was most common bat-population around 6.3 million. Since WNS hit in 2011, 99% of their population is gone.
- 2006 first discovered in a cave in Albany, NY
- This species population will never recover in our lifetime.



Are you ready to take bats? Safety First.....

- Do you have….

- Your pre-exposure rabies shots?
- Have a plan to check your rabies titers regularly?
- Familiar with the CDC guidelines on rabies exposure in bats?
- Have a bite protocol in case of a bite?
- Intake forms for animal donors to cover bat intake and bites?
- Medical forms that are customized for bat rehab?
- Do you have safety protocols established?
- Do you have biosecurity measures in place to accept bats with WNS? Follow national and state protocols.
- You are willing to educate anyone who will listen about how cool bats are?

Intake Forms

1 of 2

BAT INTAKE

DATE_____

SPECIES_____

ANIMAL INFORMATION

☐ ANIMAL ATTACK ☐ FELL FROM NEST ☐ HIT BY VEHICLE

☐ HIT WINDOW ☐ ORPHANED ☐ DON'T KNOW

☐ OTHER _____

CONTACT INFORMATION

Name_____

Address_____

City_____State_____Zip_____

Phone _____County_____

Where did you find it?

_____

How long have you had the animal?

_____

If you fed the animal, please list the food _____

Have you brought us an animal before? Yes No

EMAIL (OPTIONAL)_____

_____

SIGNATURE

This animal is unconditionally given to Lake Metroparks' Rehabilitation Center. Successfully rehabilitated wildlife will be released in the appropriate park or location it was found. Thank you!

BAT ACCEPTANCE SHEET

Species:

DATE: TEMP: BAR QAR NAR Cage:

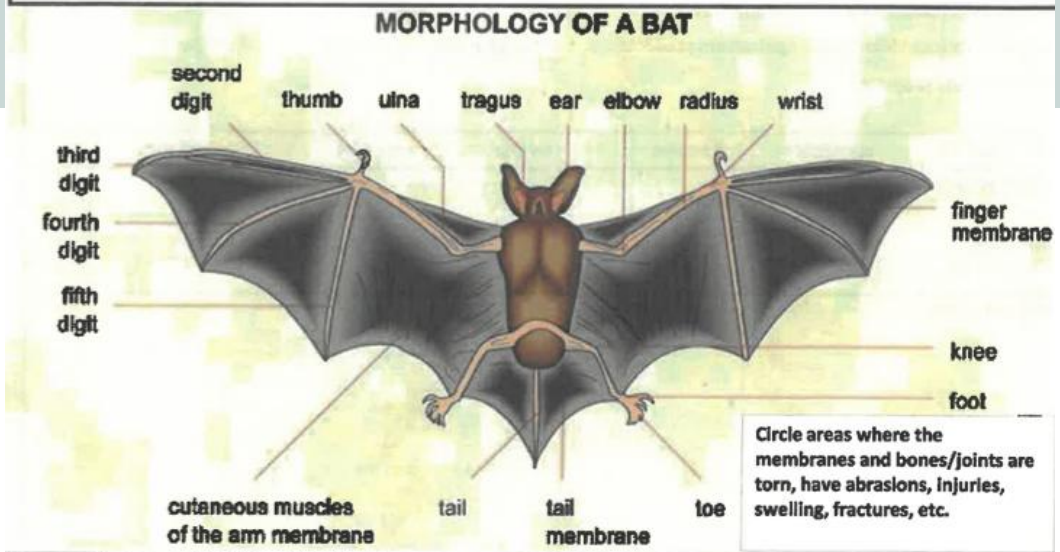
Reason for Admittance: LOC Found in home Found outside

Weight: Good Thin Emaciated Norm Weight Range:

Sex: M F UNK Age: neonate juvy adult pregnant female

Initial Observation:

MORPHOLOGY OF A BAT



Circle areas where the membranes and bones/joints are torn, have abrasions, injuries, swelling, fractures, etc.

Parameter	In mm
FL	
TL	
EL	

Additional Identification Notes:

Fungus: absent on snout on limbs/wing membranes ears body

Eyes: bright swelling redness cloudy discharge visual response

Hydration: mild hydration < 5% tacky mucous membrane moderate 5-8% ropey saliva, decreased skin turgor Severe > 8% Poor venous refill

Gums/Mouth: occlusion swelling wounds discharge plaques fractures blood

Normal

Respiration: crackles wheezes gurgles rapid shallow/labored

Normal

RABIES

- Less than ½ of 1% of all bats carry rabies
- A 2010 report stated that in last 50 years, 40 people died after a bat bite.
- Worldwide-rabies kills up to 59,000 people annually, this is reported deaths. 98% is transmitted by dogs.
- Less than 0.5% test positive that are wild caught.
- 1 rabid bat does not equal the whole colony having it.
- Can infect other bats for 5 days.
- Once a bat shows signs, usually dies within 7-10 days.
- Symptoms of rabies in bats can be similar to stress symptoms.

In 2025 North Carolina
1,200 bats tested for rabies
Total of 118 bats tested positive in 5 counties.
This is < 3% of the bats tested.

Source: North Carolina Health Dept

Source: Center for Disease Control

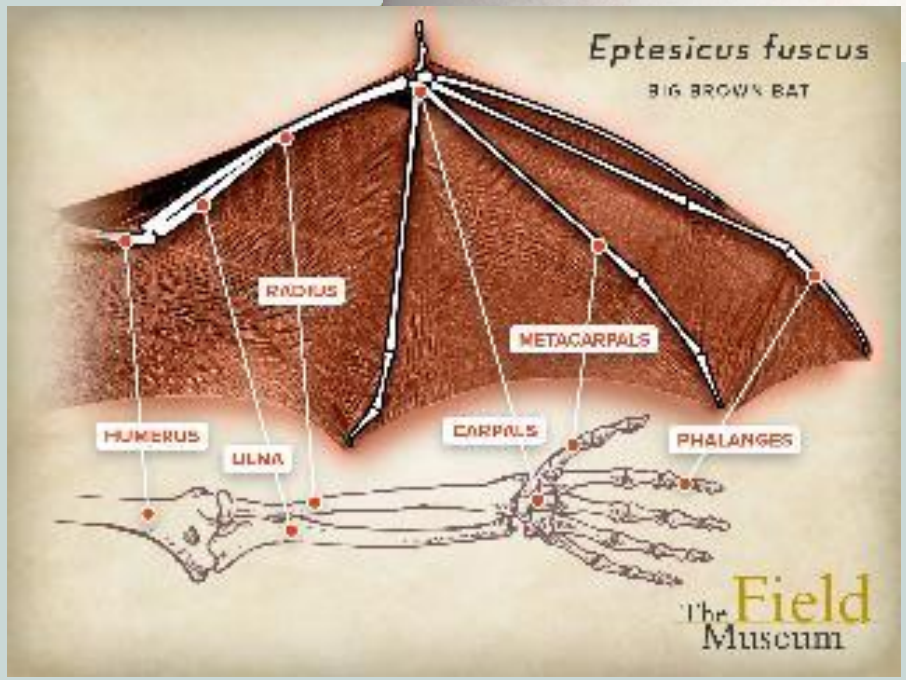
Safety and PPEs

- Rabies Risk: Always assume a bat might have rabies; wear gloves to prevent any skin exposure.
- Dexterity vs. Protection: Goat or deer skin for protection and dexterity. Cut and bite resistant material (golf, driving gloves)
- Avoid Contamination: Layer with nitrile gloves over leather gloves to prevent contamination between each bat and adds another protective layer to prevent bites.
- Alternative: A thick towel or blanket can also be used to scoop bats, reducing stress and risk.

Handling

Bat Facts!

Bats are so freaking cool!



What is a bat?

Kingdom: Animalia

Phylum: Chordata-all animals with a backbone

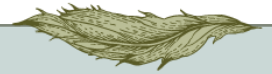
Class: Mammalia-all mammals that are warm blooded, have hair, breathe air, produce milk, give birth to young

Order: Chiroptera “hand wing” only mammal capable of flight

Family: 18 families of bats in the world. All bats in N.C. under Vespertilionidea=evening

Species: 1,000 species of bats. ¼ of all mammal species. There are 17 in North Carolina

Insectivorous Bats!



Crevice/cave Bats

- Hibernate
- Social, may roost in groups. This can reduce stress in rehab setting.
  - Note: males can fight sometimes. Listen for squabbling.
- Roost in crevices, buildings, attics, barns, tree cavities.
- Bats housed together can learn to eat from a dish more quickly.

The Tree Bats

- Migratory but do not hibernate. May utilize torpor
- Mostly solitary
- Roost in trees of leaf litter
- Do not put unrelated tree bats together.

Bats of N.C.

Eastern small-footed bat
Concern/hibernator
One of the smallest: 7" wing span; 4-6 grams = a nickel

Mexican free-tailed
Uses buildings, bridges

N. Yellow bat
Coastal areas; concern

Virginia big-eared bat
Federally end. ; W NC

Big brown bat
Concern/hibernator

Hoary Bat
Concern/migrates
Largest bat in Ohio: 18" wing span; 28 grams

Gray Bat
Endangered; caves

Rafinesque big-eared bat
Swamps, hollow trees

Eastern red bat
Concern/migrates

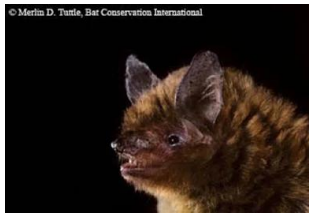
Evening Bat
Special interest/migrates

Silver-haired bat
Concern/migrates

Little brown bat
Endangered/hibernator

N. long-eared bat
Endangered
Hibernates

Indiana Bat
Endangered since 1967

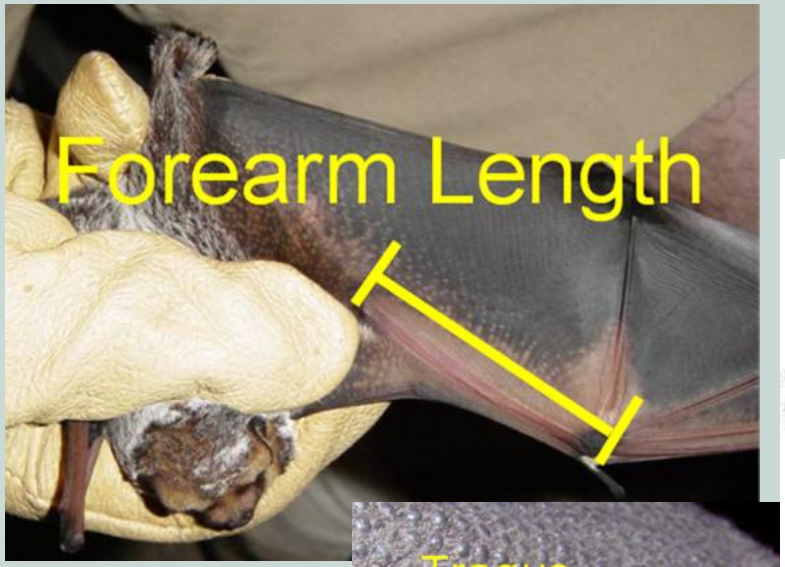


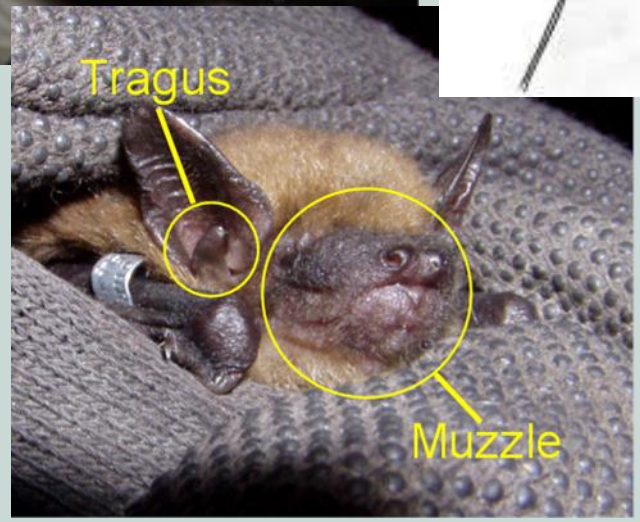
Southeastern bat
Concern: Hollow trees in wet areas

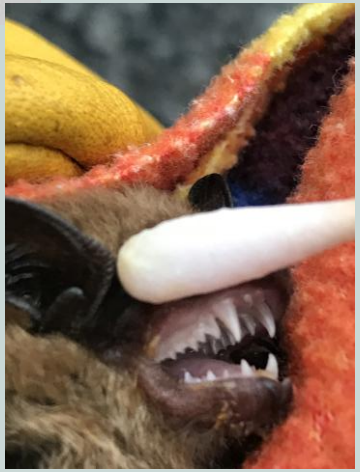
Seminole
Common

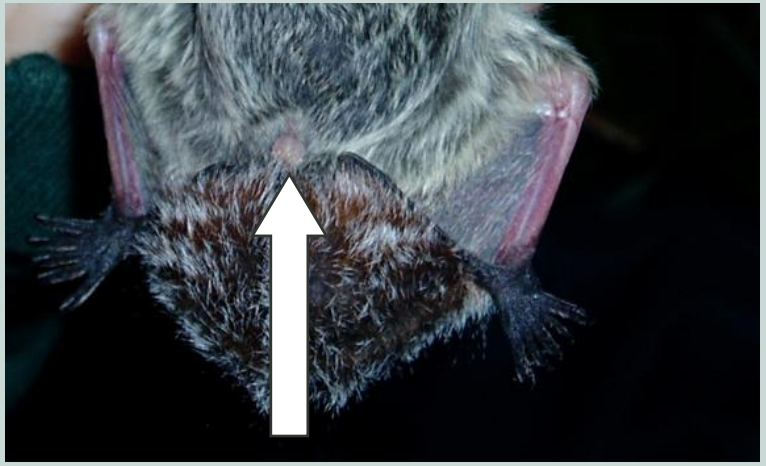
Tri-color Bat
Formerly known as Eastern Pipistrelle
Concern/hibernates/ smallest bat in the Midwest

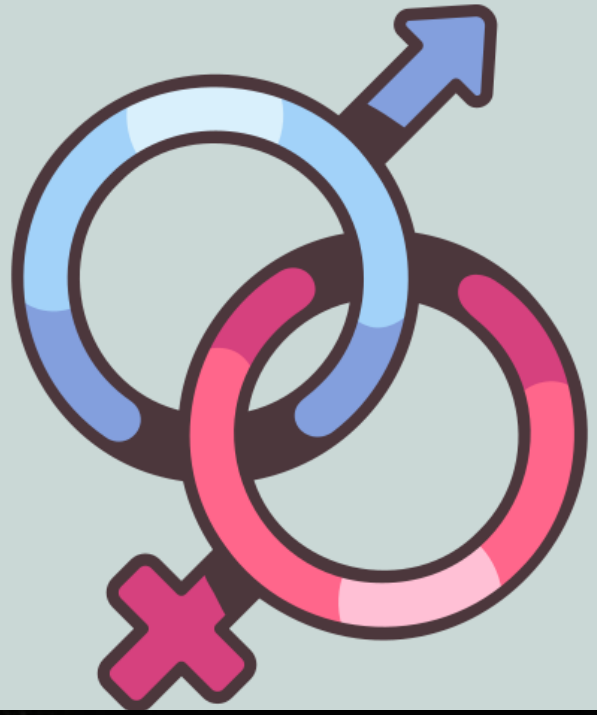
How to identify bats...



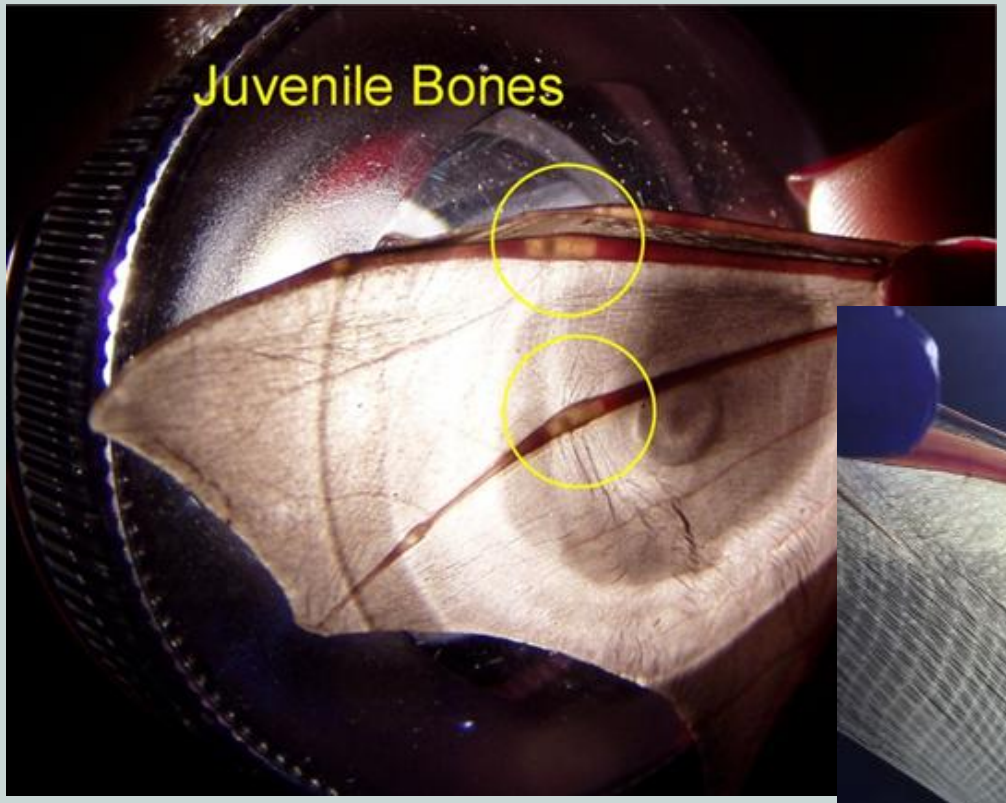




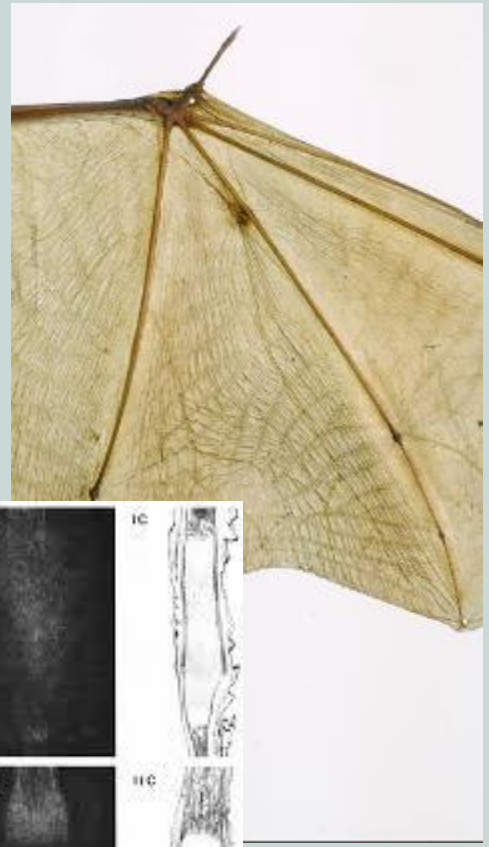




How old are you?



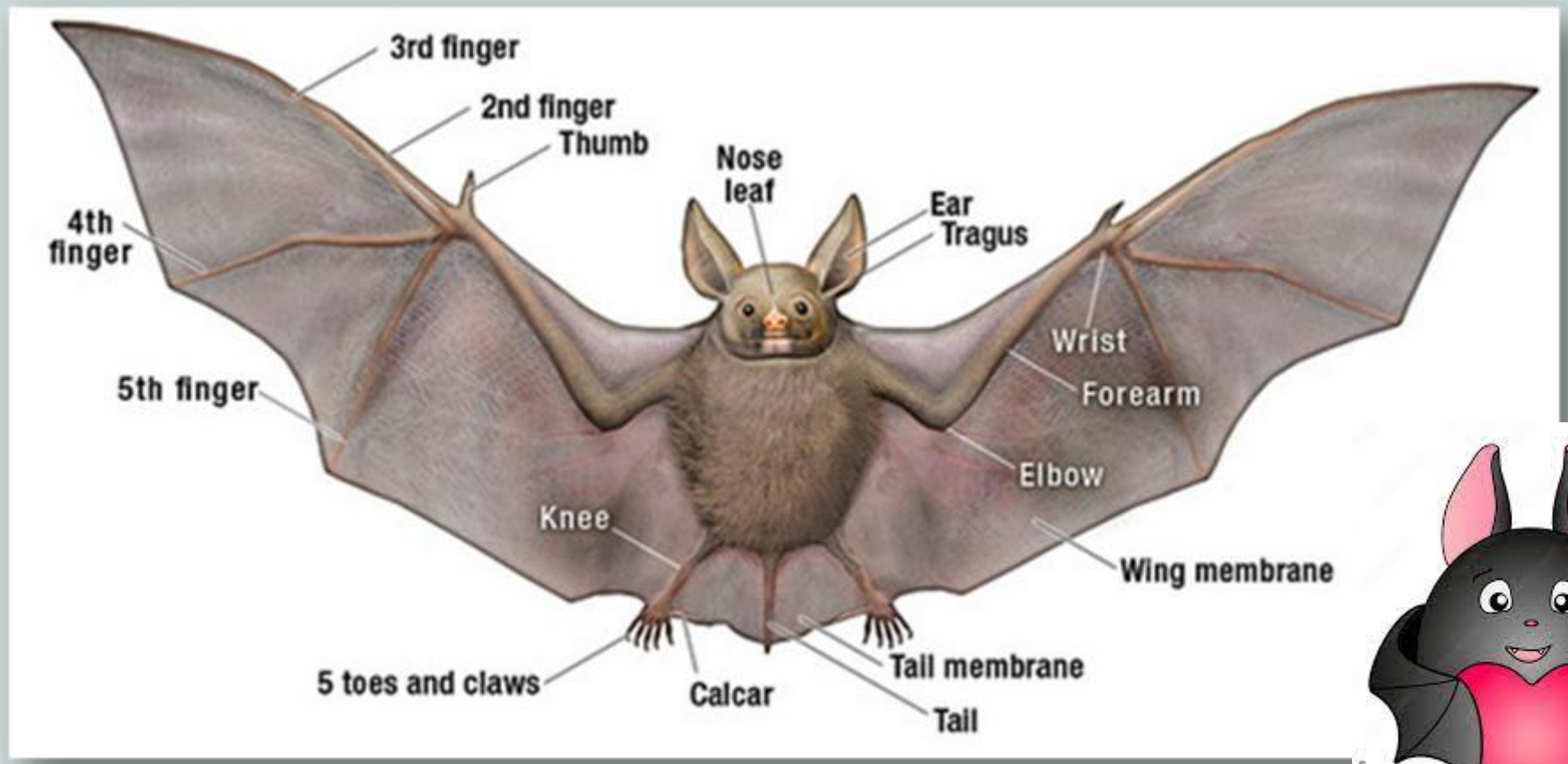
- By autumn, cartilage in wing bones turns to bone.



Bats can live over 10 years and up to 30 years

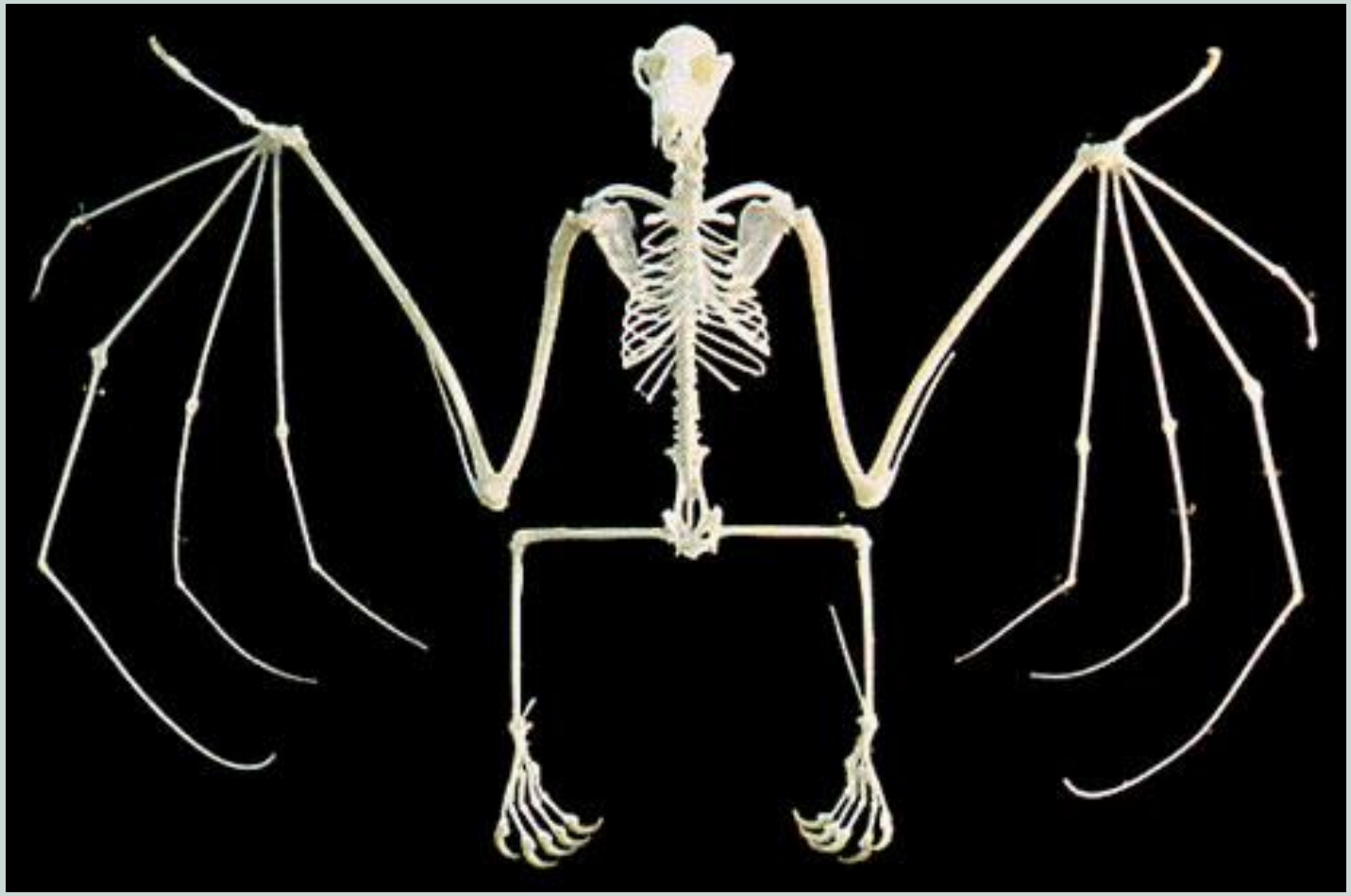
How can bats fly?
Only mammal capable of sustained flight!

- 2 layer wing membrane – allows for powerful flight when flapping
- Bats never stop flapping
- Can fly 6-40 mph
- Wings made for maneuverability, not speed or distance.
- Why they only migrate around 600 miles, not thousands like birds.
- Body temp ~104. Large surface area of wings allows for cooling during flight



Hearts are 3xs bigger than other mammals of comparable size = pumps more blood to get more oxygen.
1000 beats/min in flight.
Increased circulation to flight muscles.

Just hanging around....

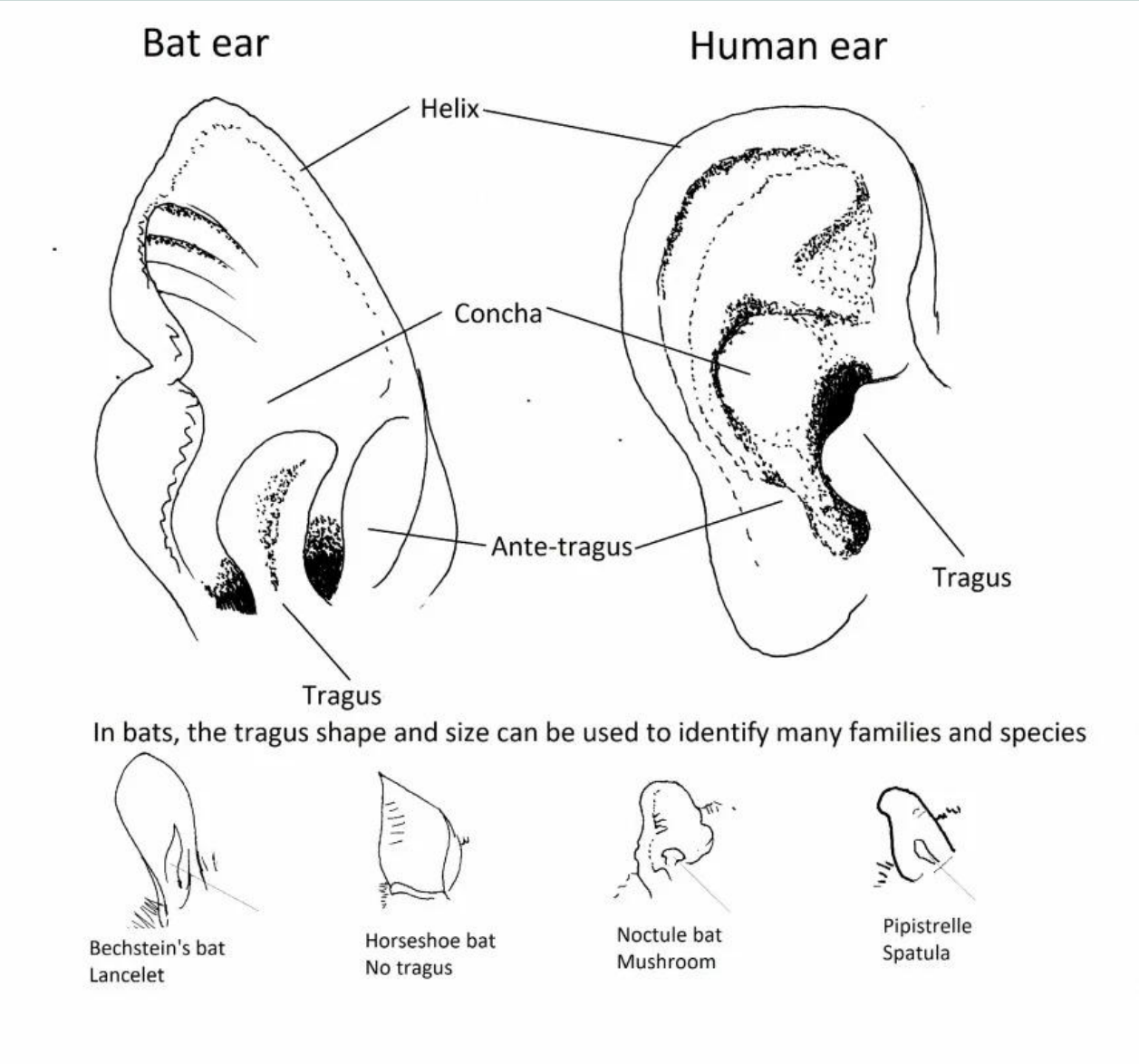


- Bones are thinner and lighter, helps the bat fly, but as a result…can't stand up.
- Long bones rotated 180 degrees- knees bend opposite direction
- Hanging upside down requires less energy.
- Let's them see predators easily for escape
- They can still crawl around though.
- 5 toes have toenails curved back and tendons lock into place to hold them.
- One-way valves in the arteries prevent the blood from flowing backwards.

Amazed yet??
Wait, there's more.....

Tragus

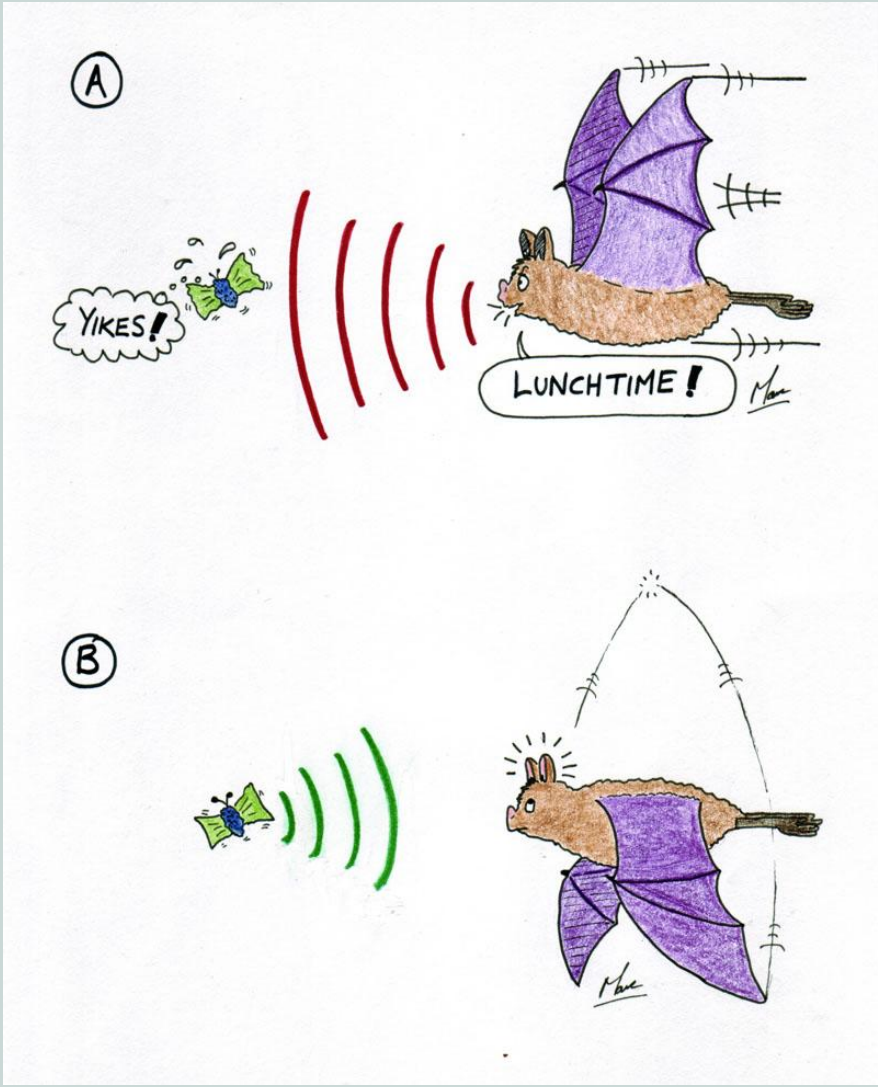
- Directs sound into the ear
- Size and shape of tragus varies species to species
- Plays important role in directing sounds into the ear for prey location and navigation via echolocation.



Echolocation

- Bats can "see in the dark"
- Because bats "see with sound" you want to provide a quiet environment for them in rehab setting.
- Better than eyesight for navigation in low light and darkness.
- When emitting the call, the bat will close off its ears to prevent deafening itself.
- Can make 160 calls/second
- Emit variety of chirps and squeaks at different intervals. Can change the harmonics, rate, length, and intensity to tell a story:
  - Surface
  - Location
  - Distance
  - Speed
  - Size

Doppler effect!
Change in frequency due to relative motion between the source and observer.



Some moths can hear the high frequency, so they can get out of the way. Bats have learned to shut off the echolocation before going in to catch it.

Delayed Fertilization

Most species mate in Autumn when insects are plentiful, requires lots of energy.

Autumn Swarming around mating roosts which are usually near the hibernaculum.

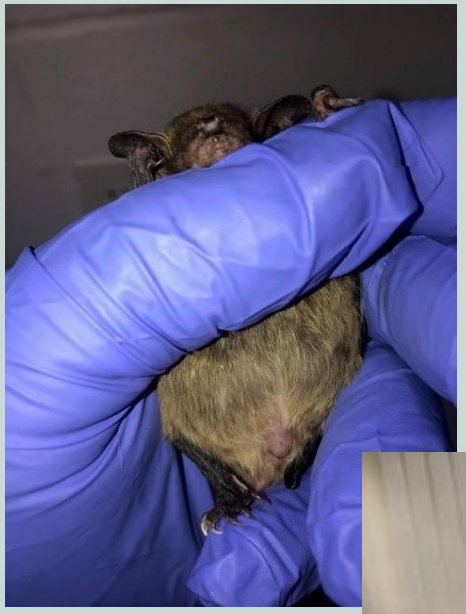
Males use special calls to attract females.

When you wake them in the spring from hibernating-need to watch weather and how long you may have them after wakening.

If you they are warm and being fed consistently-may give birth in captivity and then you will have to keep them longer. Major wight gain is a big clue!

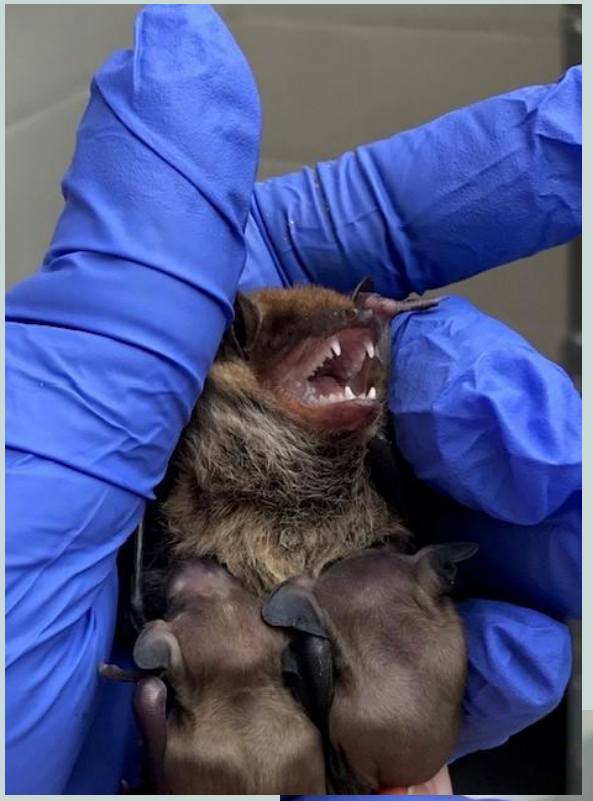
Females store sperm in reproductive tract and egg isn't fertilized until spring.

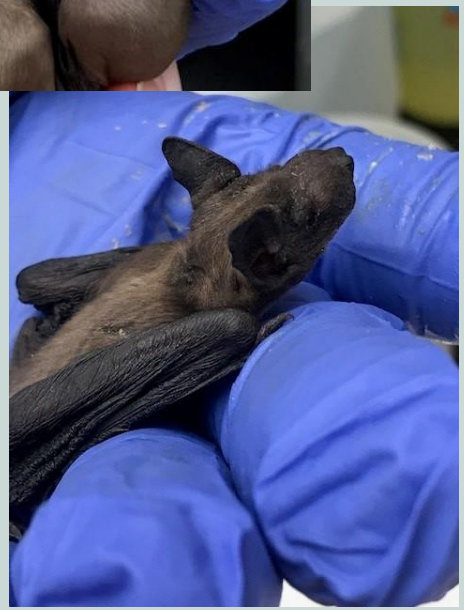
Allows female to control timing of pregnancy so young are born when insect food is readily available, and weather is good.



Little pups....

- Give birth after 40-60 days gestation (species dependent).
- Parturition June-July to 1-2 young. 1 litter per year.
- Females give birth upright.
- Maternity colony dates considered to be between 5/15 thru 8/15.
- Babies are 25-32% of female weight, like a 125 pound woman giving birth to a 40 pound baby
- Babies develop quick, are volant by July-August.
- Young of year survival rate is 65%





Bat Rehabilitation 101

The Basics

Causes of injury

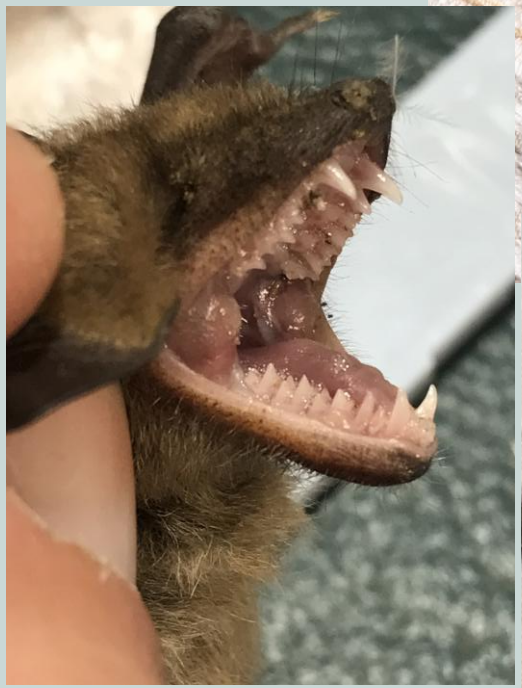
- Window collisions/LOC 80 bats, LABO (29), LANO (36), EPFU (14), MYLU (1)
- Found in buildings-homes, garages, warehouses, stores EPFU 25/92
- Cats and dogs 1
- Weather 3 EPFU
- Found in pools 0
- Mouse traps, glue traps 2
- Orphaned 3 EPFU and MYSE
- Covered in oil 0
- Found on ground and/or injured 33 EPFU (not grounded due to LOC)
- White nose syndrome - 0

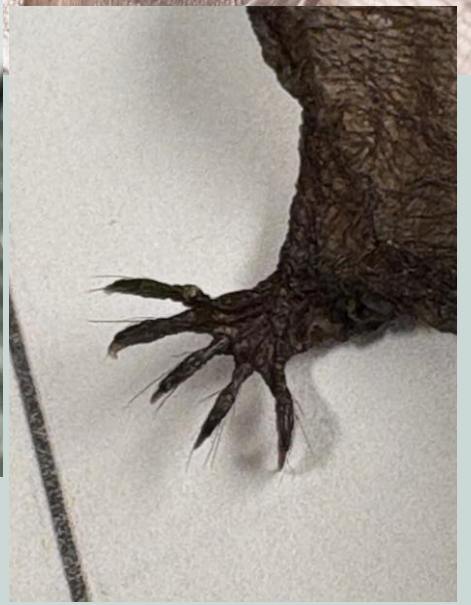
Intake Protocols

- Be prepared, this decreases stress and chance of a bite.
- Following all biosecurity protocols for WNS until you determine they do/don't have it
- Wash hands, wear appropriate PPEs (may need a mask if you are sick). We don't want to make them sick.
- Stabilize the bat first.
  - Warm in incubator if bat arrives cold
  - Hydration is very important-Do not give fluids to a cold bat.
- Have a bat exam kit ready
  - Appropriate gloves
  - UV light (366-385wavelength) to check for WNS
  - Scale
  - Fleece
  - Aviary/housing
  - Water dish
  - SQ fluids ready
  - Items to treat wounds
  - Q-tips
  - Light

Full examination

Full exam means nose to tail, check all membranes, fur condition, body score, behavior, physical ability.

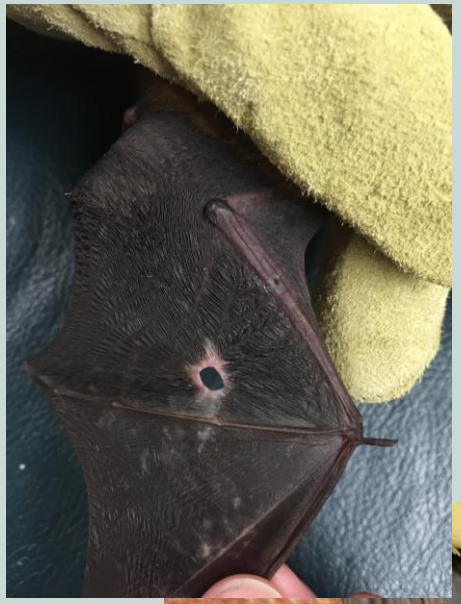


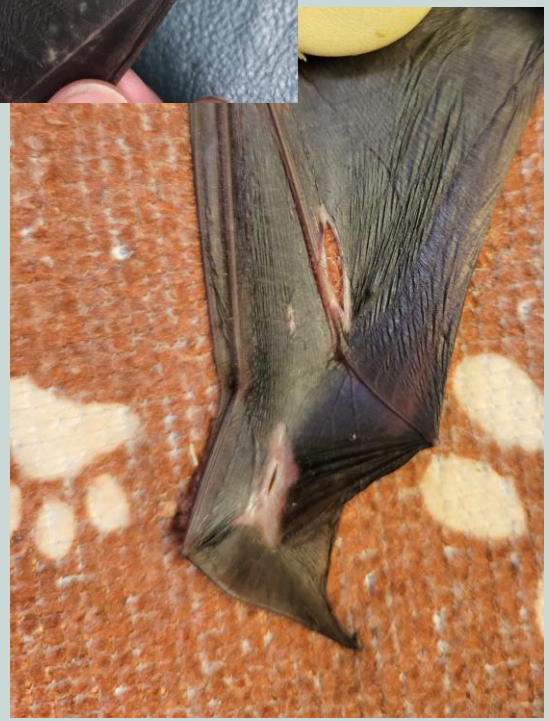


Common Injuries

- Soft tissue damage: holes in wings of various sizes
- Tears in the wing membrane
- Fractures in the wings.
- Teeth broken or missing; swollen muzzle, wounds in the mouth
- Frostbite-wing and tail tips
- Some of wing, toes, tail missing; need to evaluate for survival needs.
- Glue traps
- Skin issues/ depigmentation
- Swollen joints
- Ectoparasites: mites, bat bugs
- Emaciated/severely dehydrated

Membrane Tears, Holes and Hematomas





- Depends on the severity and location.
- Will need NSAIDS and possible antibiotics (cat attacks for sure)
- Can take a long time to heal
- Check for blood supply
- Tears in the leading edge of wings don't heal if parts of membrane are gone, no blood supply, can't line up membranes.

Grounded/weak

Usually a reason grounded:

- Injured
  - Fractured wing/leg
  - Animal attack
  - Head trauma –hit window or building
  - Wounds on face or body
- Emaciated/dehydrated
  - Mouth injury or issue
- Orphan or juvy
- Weather
  - Hypothermia
  - Migration
  - Frostbite
- Grounded mom with babies

Glue trap

Very stressful to remove them from trap. May need sedated.

Go slow and gently to remove.

Can cause membrane issues, tears, or fractures

May be dehydrated and emaciated

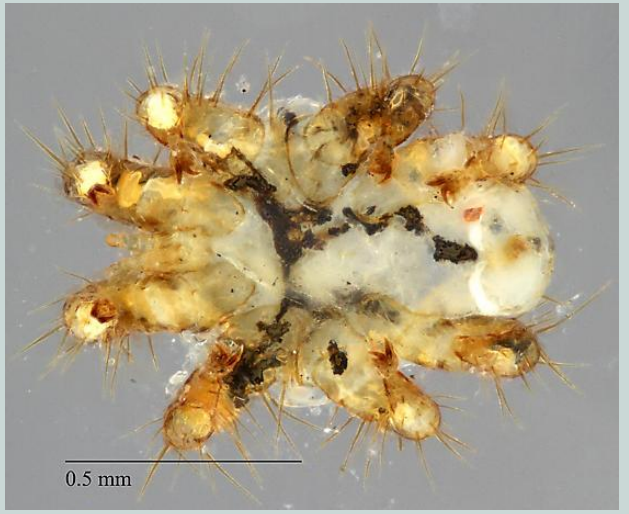
Can use vegetable oil to remove, most likely will need a bath afterward.

Continue checking membranes and fur for stickiness.

Ectoparasites

Bats can have fleas, ticks, mites and bat bugs! Check all bats for ectoparasites so they don't spread.
Do not ever spray bats directly with flea/tick spray. Put parasites directly into container to kill them.

- Mites – remove with wet, warm cloth
- revolution or ivermectin PO
- Can burrow into skin and cause little pimples-egg sacs and larval stages
- Ticks and fleas- remove by hand with tweezers or gauze. Can brush their fur for removal.
- Bat bugs – feed on bat blood
  - Can infest homes and bite people if they have lots of bats
  - Removal by hand is the safest way.



Skin Conditions

1. Depigmentation

Scarring from old trauma, WNS, membrane can look “crispy,” or thin. Can try flaxseed oil, no treatment indicated

2. Dry skin

Low humidity, husbandry, not enough fat in diet, fungal/bacteria infections. Can supplement with fish oil or nutri-cal. Make sure humidity is high enough. (60-100%).

3. Alopecia

Stress can cause overgrooming, or underlying sign of pain or discomfort. Adjust environment, husbandry, handle less, or give meds for anxiety.

Stress Signs

- Over grooming
- Pacing
- Refusing to eat
- Excessive vocalization
- Biting
- Fighting

Euthanasia Considerations

- Human bite or potential exposure-animal needs euth. and tested for rabies.
- Direct contact = A bite or scratch from a bat, or contamination of wounds or mucous membranes (eyes, nose, mouth) with bat saliva.
- Potential exposure
  - Waking up to find a bat in your room.
  - Finding a bat in a room with an unattended child, a person with a disability, or someone who is intoxicated.
  - Direct contact between a person and a bat, even without obvious bites.

- Missing one wing or part of a wing
- Blindness
- Missing or non-functional foot
- Compound fracture with necrotic bone or membranes.
- Severe joint issues where they can't fly, climb or move around normally
- Severe head trauma
- Exhibiting unnatural behaviors

Housing Crevice vs Foliage bats

- All bats need soft sided walls when possible
- Kept in a warm and quiet area
- Food and shallow water dishes should be kept in areas they can access while hanging or get into easily without getting stuck in the dish. (Many foliage bats will not eat out of a dish, but some can be trained to do so).
- All need a place to hide or feel hidden.
- A place to hang (provide foliage bats more natural structures if possible)
- Large enough to stretch wings out, unless you don't want them to for some injury considerations.
- *remember they fit through small areas (size of a dime), and can chew through some materials (so nothing with even the smallest hole-if they find it they will start chewing.

Housing: Crevice vs Foliage

Lots of supportive care!

Daily:

- Re-evaluated
- Fluids if needed
- Food/Hand fed
- Medications:
  - Head trauma
  - Punctures
  - Parasites
  - Injuries
- Wound Treatment
- Physical Therapy
- Incubator
- Brush their teeth
- Brush their fur
- Hibernate them

Bat Mix

Recipe

Emeraid Carnivore Care

1 Tbl. Chicken baby food

1 Tbl. Banana baby food

½ tsp. ground bugs

1 pinch of L-glutamine

Can add as needed: bene-bac, or nutri cal.

Use within 2-3 days.

Keep Refrigerated.

Mealworm Care

- Gut load mealworms
- Give spinach, apples, sweet potato
- Change food every couple days.
- Sprinkle with repti-care or calcium.
- Put in wheat germ bedding.
- Change bedding every few days.

Why Hibernate vs Keeping Awake

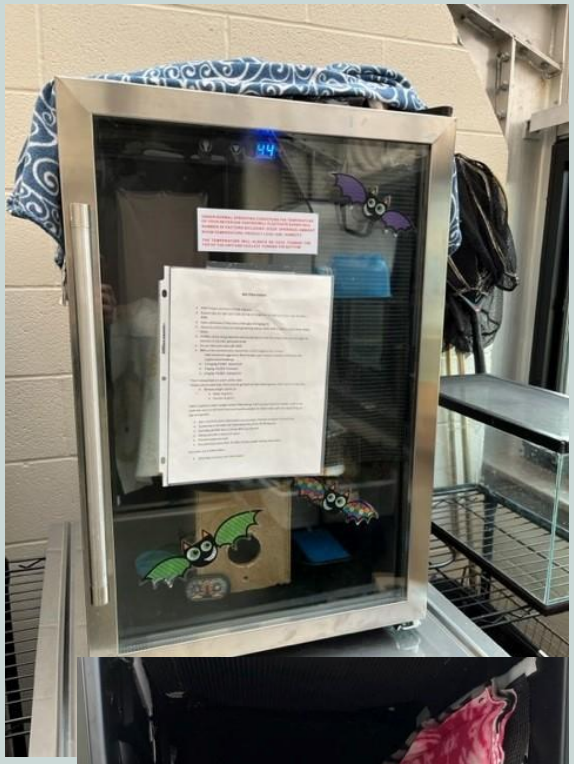
- Saves time, money and resources
- Less food source available-Ohio bats are insectivores.
- Mimics natural behavior-as long as they're natural hibernators
- Increases longevity
- Prevents females from being pregnant
- Bats should be healthy, injury free
- Bats should have appropriate weight for hibernating until spring.

- Not a hibernating species
- Suspected WNS
- Bat has injuries, ill or needs observed
- Underweight

Hibernation Prep/ Checklist

- Bats shouldn't go under a certain weight during hibernation. For EPFU it is common for males 14 g and females 16g.
- So, calculate fating migration, common calculation is add 1g of weight, per month bat will be hibernating.
- Can't just base on weight, check overall body condition, fat pads, no injuries, overall health and demeanor.
- Check if conspecifics can be housed together.
- Paint toenails to recognize individual bats for release.
- 24 hours prior – no feeding, give SQ fluids for hydration; (decreases need to defecate/urinate during hibernation.

Hibernation Housing



- Need to choose the right type of hibernaculum: wine coolers seem to work the best.
- Need to be able to control temperature, humidity as these are species dependent; set up different locations, little to no noise or areas where it will be disturbed.
- Temp 40-48 degrees;
- Humidity – 60-90%
- Room for shallow dishes of water-for bats and to allow for proper humidity.
- Put shelving liner, fleece, pouches on walls to climb and for options.
- Provide separate aviary or a way to keep males and females separate; some males may fight.

Hibernation Check Ins

- Body temp drops from 100° to cave temp ~41-50°
- Heart rate drops from 200bpm to just a few bpm
- Check temp/humidity gauge daily and record.
- Open cooler once a week for air exchange and refill water dishes.
- Once a month, check bats: weigh them, check hydration, check for injuries
- Any bats on the ground may need assistance.

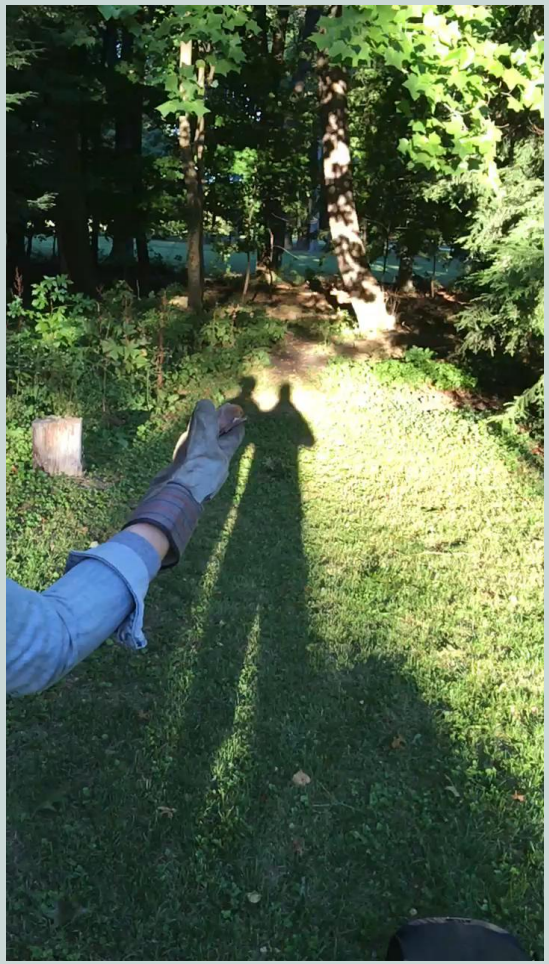
Spring Time....Time to wake up

- Slowly arouse bats and warm them up over 24 hours.
- Do full exam
- Give SQ fluids
- Feed or provide mealworms if self feeding.
- Bats should be released in spring – after April 1st when the temperatures are above 40°F for ten consecutive days, meaning insects and flight conditions are reliably available for bats to forage.
- Should you flight condition? Depends on the bat pre/post hibernation

Release Tent

- Can be used to build flight stamina
- Located where predators can't get into tent
- See how bat handles outdoor temperatures
- Eating/foraging on own
- Juvys, bats with wing injuries

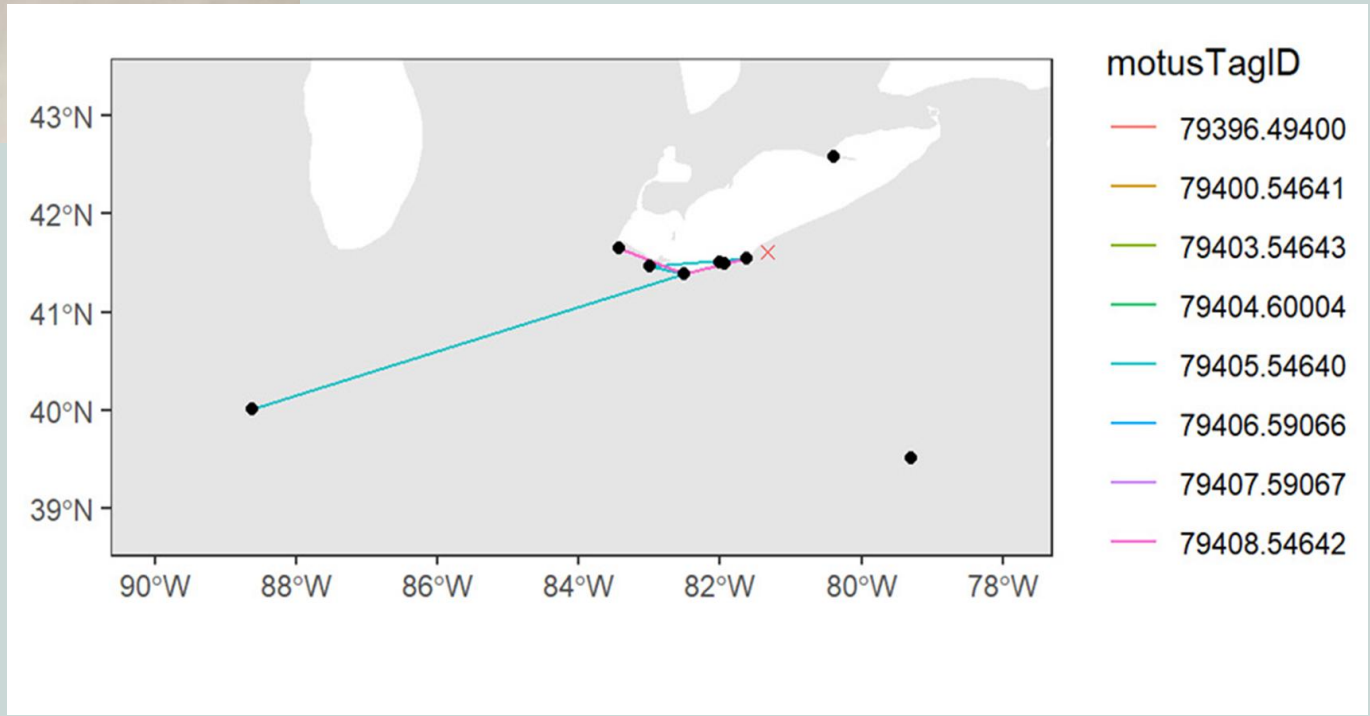
Bye Juveys Bat!!



Release criteria:

- Good body condition
- Climbing, hanging, walking, flying
- Defensive behaviors
- Natural behaviors
- Grooming
- If wing injury has good flight stamina
- Right time of year for the species

Bat Tagging and Motus Tower Results



Thank you!
Questions??