

Evaluate skin microbiome of bears with and without mange

The goal: To characterize the impacts of mange on skin microbiome (bacterial and fungal communities). Because mange impacts the skin, changes in skin microbiome are expected and changes in bacterial communities have been shown for coyotes and fox with sarcoptic mange. However, fungal communities have not been evaluated, although overgrowth of yeast has been noted histologically on bears with mange. These shifts in microbial communities can lead to secondary infections, as noted with humans with “scabies”.

Who can participate: Two states with large numbers of bear mange cases (e.g., AR, VA, WV, PA, NY). A participating state must try to meet the minimum number of bears. *Although we do not currently have funding for testing, we are banking samples for future testing now.*

Bears to be sampled:

- We aim to test 45 bears per state.
 - Bears will be divided into 3 main groups:
 - 15 unaffected or normal bears to act as a control group
 - 15 bears with MILD mange (minimal hair loss, good body condition)
 - 15 bears with SEVERE mange (extreme hair loss and scabbing, poor body condition)
- It is important that *all bears be acquired within a relatively small geographic area* to limit expected differences in microbiome, although we recognize we can't control for all the variables that are likely important, such as sex, age, season, etc.

What we need from each bear:

- Four photos of the bear: 1x of the bear on its most affected side [both sides ideal], 1x of the face head-on [ensure ears are in picture], and 1x of the rump and back of legs head-on. We are requesting several angles to understand % of body impacted, severity of lesions, etc.
- A completed SCWDS Mange Research Submission Form which includes:
 - Basic information (age, sex, location [GPS Coordinates preferred but County adequate])
 - Qualitative assessment of mange severity (mild, moderate, severe, recovering).
 - Outcome (euthanized [please explain why], hit-by-car (HBC), hunter-killed, or found dead)
 - If found dead, please estimate how long it has been dead as mites may leave the bear after death.
- A completed “Mange Matrix” Score (see 2nd page)
- Skin swabs
 - Mild or Severe mange cases: A skin swab from the most impacted area of skin and a swab from the most normal area (usually the back along the spine). You should be using 2 culture tubes per bear.
 - Please *do not* sample near anus, under paws, near genitals, in nose or ear, as these areas will have a very different microbiome than typical skin.
 - Unaffected control bears: One skin swab from the forehead and one swab from the back along the spine. You should be using 2 culture tubes per bear.
 - **Swabbing Directions:** *grasp the swab by the handle and remove swab from the sterile media container, then brush the cotton end of the swab ~10 times over the area you are interested in sampling and replace the swab in the container. Freeze container with swab within 24 hours.*
 - All bears: a skin scrape of the area swabbed to confirm the presence/absence of mange. For skin scrape instructions, please refer to the general **Mange Surveillance Sample Collection** protocol.

What we will be doing:

- Testing for prevalence and diversity of bacteria and fungi on the skin of bears.
- Skin scrapes will be used to confirm mange status via microscopic examination +/- PCR.

To overnight ship: Label swab containers and skin scrape with bear ID, collection site, and date. Double bag all samples and place in a Styrofoam cooler with abundant absorbent material (newspaper, etc.) and re-freezable ice packs (i.e., do not use wet ice) and ship to SCWDS with the Research Case Submission Form and Mange Matrix.

Please email all photographs, submission forms, and mange matrix to raquel.francisco@uga.edu and myabsley@uga.edu

Mange Matrix score

Category	0	1	2	3	Category Severity (0-3)
Hair Loss	None	Hair missing from less than 1/3 of body	Hair missing from 1/3 to 2/3 of body	Hair missing from more than 2/3 of body	
Skin Condition	Normal	Skin not thickened or pigmented, areas of scaly skin small and diffuse	Patches of thickened, crusted, or black pigmented skin	Large areas of thickened, crusted skin, debris flaking from skin or on hair shafts; strong odor	
Body Condition	Normal	Below Average; vertebrae knobby, pelvic crest and ribs can be felt but not protruding	Poor; spinal vertebrae well defined, pelvic crest and ribs visible, skull structures felt but not visible	Emaciated; skeletal muscle gone, zygomatic arches visible, eyes sunken	
				Mange Severity Total Score (0-9)	

Instructions: Each animal should be assigned a score (0 to 3) for each category (hair loss, skin condition, and body condition) based on your observations; this can be written in the far right “Category severity” column. Add up the three scores to determine the “Mange severity total,” which will be between 0 and 9.