Batty about Bats:

Why Bat Health is Important for BC Agriculture

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True or False

• Bats are related to mice and rats
  – FALSE. Bats are in the order Chiroptera (hand-wing), not Rodentia. In fact, mice and rats are more closely related to humans than to bats.
True or False

• All bats suck blood
  – FALSE. There are 1200 known species of bats, only 3 feed on blood.
True or False

• More than half of the bat species in North America are listed as threatened or endangered
  – TRUE
Bats are essential for rainforests

- **TRUE** Many rainforest plants depend on seed dispersal by fruit bats. In deforested areas over 95% of rainforest regrowth comes from seeds that have been spread by fruit bats.
More Fun Facts About Bats

• Long-lived
  – If you control for body size only 19 species live longer than humans, 18 of those are bats.
  – Current a focus of longevity research

• Resistant to cancer
  – Very efficient at DNA repair, likely evolved to deal with free radical production during flight

• Can survive infections that kill all other mammals (eg. Rabies).
Bats in BC

• Most bat-diverse province in Canada
  – 16/19 Canadian bat species
  – 7 found nowhere else in Canada
• All insectivorous
• Long lifespans and slow reproductive rates

http://www.warrenpa.net/
Bats and Agriculture

- Agricultural and forest pests
  - 70-100% of body weight/night
  - Value of bats to the agricultural industry in the U.S. = $22.9 billion/year (Range $3.7 billion/year to $53 billion/year) (Boyles et al. 2011).
Bats and Corn

- Globally estimate that bats are worth $1 billion USD in corn alone

Corn Rootworm
Bats detected brown marmorated stink bugs 3–4 weeks earlier than the current standard monitoring tool, blacklight traps, across all sites.
Purpose of Disease Surveillance

• Bat health
  – White Nose Syndrome
  – Other causes of death

• Human Health
  – Rabies
  – Other zoonoses?
What is BC doing to protect bats?

- Prevent introduction of WNS
- Detect WNS as soon as possible
- Improve resiliency of bat populations
Prevent introduction of WNS

Bats Astray

Please don’t take any bats with you!

Bats Live Here!
Help prevent the spread of White Nose Syndrome BC’s bats

October 1 to May 31
Do not enter caves.

June 1 to September 30
Clean shoes, clothing and gear before entering caves. To clean gear, immerse in 55°F water for 20 minutes.

White Nose Syndrome is a fungal disease that has killed millions of bats.

Help prevent the spread of white nose syndrome.
Detect WNS as soon as possible
Improve resiliency of bat populations
Disease Surveillance

• Full necropsy
  – Histology of lung, liver, spleen, kidney, stomach, intestine, plagiopatagium, ears, uropatagium, brain
  – Rabies testing
  – *Pseudogymnoascus destructans* PCR on wing swabs Nov. 1 to May 31.
White Nose Syndrome testing

- 2016 – 36/36 negative
- 2017 – 30/30 negative
- 2018 – 38/38 negative

Problem:
- Sample sizes are small, and areas of the province not sampled at all

Courtesy: Patrick Burke
Causes of death

173 bat cases in 2016 and 2017

- Emaciation – 25% cases
- Trauma – 32%
  - 12% bats domestic cat predation
- Infectious disease – 17%
  - 9% rabies
  - 5% pneumonia
  - 2% dermatitis
- Unknown – 20%
Bats and Human Health

- More than 200 viruses of 28 families have been isolated or detected in bats
  - Rabies, Ebola, Nipah, Hendra, SARS-CoV, MERS-CoV
- Bats infected with more zoonotic viruses per host species than rodents
- Pest control
What is it about bats?

• Second largest order of mammals: ~1200 recognized bat species (= 21% of mammals)
• Long lifespan
  – 10-20 years (41 years = longest recorded)
• Evolutionarily ancient mammals
  – Originated 80 million years ago
• High intra- and interspecific contact rates and large population sizes
• Frequent contact with people
• Immune differences
Rabies in Bats in BC

- 43 bats tested in 2015
  - 4 positive
  - 9% prevalence
- 81 bats tested in 2016
  - 14 positive
  - 17% prevalence
- 44 bats tested in 2017
  - 2 positive
  - 5% prevalence
- 29 bats tested in 2018 (up to end of September)
  - 3 positive
  - 10% prevalence

*bats submitted for wildlife disease surveillance*
<table>
<thead>
<tr>
<th>Species affected with rabies</th>
<th>Percentage positive</th>
<th>Number tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big Brown Bat</td>
<td>38%</td>
<td>13</td>
</tr>
<tr>
<td>Yuma Myotis</td>
<td>17%</td>
<td>12</td>
</tr>
<tr>
<td>Little Brown Bat</td>
<td>9%</td>
<td>11</td>
</tr>
<tr>
<td>California Myotis</td>
<td>0%</td>
<td>8</td>
</tr>
<tr>
<td>Silver-Haired Bat</td>
<td>33%</td>
<td>3</td>
</tr>
<tr>
<td>Western Long-eared/Keen’s myotis</td>
<td>33%</td>
<td>3</td>
</tr>
<tr>
<td>Fringed Myotis*</td>
<td>100%</td>
<td>2</td>
</tr>
<tr>
<td>Northern Long-eared Bat</td>
<td>0%</td>
<td>2</td>
</tr>
<tr>
<td>Western Small-Footed</td>
<td>0%</td>
<td>1</td>
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</tbody>
</table>
Arrows mark Negri Bodies. The “factories” where rabies virus is produced in infected neurons (brain cells).
Rabies immunohistochemistry – the brown pigment is linked to antibodies that bind to rabies virus in the tissue so we can see it.
Human rabies risk?

The last rabies case in BC was in 2003 (bat origin), that was the only case since the early 1980s.
How can you help bats?

• BC Community Bat Program
  – www.bcbats.ca

• Avoid the use of pesticides, particularly near wetlands and riparian areas.

• Protect known roosting sites from disturbance.

• Discourage free-roaming domestic cats, especially near potential bat habitat.

• Report dead bats between Nov. 1 and May 31 for White Nose Syndrome testing