Ticks with “black legs” and the discovery of *Ixodes affinis* in North Carolina

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The “Blacklegged tick” (previously called the “Deer tick”) or *Ixodes scapularis*, is the tick species confirmed as the vector of Lyme disease spirochetes to humans in the eastern United States.

- **Blacklegged tick nymph**
  - This one!

- **Lone Star tick nymph**
  - Not this one!
However, there are at least seven other species of *Ixodes* in NC that have “black legs” and most of these do not transmit the spirochete that causes Lyme disease in humans.

Also, there are two additional species of *Ixodes* that have light brown legs or banded legs.

You cannot identify these ticks to species based on “black legs”. Other more obscure morphological structures must be used that are difficult to see.
Ticks in NC with “black legs” and their known hosts

- *Ix. affinis* – 15 mammals and 1 bird species
- *Ix. angustus* – rodents and their predators (*humans*)
- *Ix. dentatus* – rabbits, their predators and birds (*humans*)
- *Ix. marxi* – squirrels, chipmunks, and their predators
- *Ix. muris* – mice, rats, and birds (*humans?*)
- *Ix. scapularis* – 41 mammal, 57 bird and 11 reptile species (*humans*)
- *Ix. texanus* – raccoons, opossums, and rabbits (*humans*)
- *Ix. woodi* – woodrats, predators, and birds (*humans*)
The life cycle for all of these species is basically the same, but there are distinct biological differences

- **Habitats** usually match that of the primary host species utilized by the immature stages and adults. Also birds can transport them to abnormal areas.

- **Hosts** can be highly variable, as some tick species are very specific in selecting their hosts, while others are generalists.

- **Distribution** is also associated with the primary hosts, but also determined by latitude, elevation, temperature, rainfall, humidity, vegetation type, etc.

- **Phenology (seasonality)** of the life stages is variable. Some species have the immature stages during cool-cold months, while others including the Black-legged tick have the immatures during the warm months.
Tick life cycle
Ticks collected by PHPM since Oct. 2008

- 31,108 total specimens
- 24,882 *Am. americanum* (Lone Star tick)
- 1,050 *D. variabilis* (American dog tick)
- 3,108 *Ix. scapularis* (Blacklegged tick)
- 853 *Ix. affinis* (no common name)
- 1,215 other species
Status of Tick Collections
PRELIMINARY DATA

All Species Collected by County

Tick Collections thru Jan. 2010

- Lonestar: 78%
- Black Legged: 11%
- American Dog: 3%
- Ix Affinis: 2%
- Other: 6%

Legend:
- 2 - 120
- 121 - 288
- 289 - 603
- 604 - 1023
- 1024 - 2279
- 2280 - 5054

Data: Preliminary as of 1-31-2010
Data & Maps: Marcee Toliver
Public Health Pest Management
The 2008 Collection of *Ix. affinis* in NC

Where: Gates Co.

When: April 2008

Who: Walker Rayburn

**Explanation**: This tick was not correctly identified until April 2009. Later, we found an earlier published record of one specimen from a deer in Hyde County in 1987.
Ixodes affinis: Basic Information

• Originally a Central-South American species
• First found in Florida in 1953, spread to Georgia and South Carolina, and finally identified in NC in 2009
• Easily misidentified as *Ixodes scapularis*, because they are both collected in the same habitats in spring and fall
• Adults active March – November, and easily collected during the summer months, except for August
• No published documentation that they bite humans, but they feed on many other mammals and at least one bird
• Common in coastal plain counties of NC
• Implicated as an enzootic (or maintenance) vector of *Borrelia burgdorferi s.s.* in small rodent hosts in South Carolina and Georgia
Female – *scap vs affinis*

*Ixodes scapularis*  
*Ixodes affinis*

Photos by Marcee Toliver
Ix. affinis female

Marcee Toliver
Ix. affinis male

= large central pores

Marcee Toliver
Ix. scapularis

Ix. affinis

Males
(ventral views)

Marcee Toliver
Recent discovery of widespread *Ixodes affinis* (Acari: Ixodidae) distribution in North Carolina with implications for Lyme disease studies

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Status of Tick Collections
2008-2010
Ixodes affinis

PRELIMINARY DATA

Ixodes affinis
1 - 7
8 - 15
16 - 43
44 - 103
104 - 342

Counties Collected: 24

Data: Preliminary as of Jan 21, 2011
Data & Maps: Marcie Toliver
Public Health Pest Management
Classic habitat for *Ix. affinis* is in moist shaded woods near water.

**NOT IN DIRECT SUNLIGHT**

Marcee Toliver
# Known mammal and bird hosts for *Ix. affinis* in the USA

<table>
<thead>
<tr>
<th>Common name</th>
<th>Scientific name</th>
<th>Primary Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bobcat</td>
<td><em>Lynx rufus</em> (Schreber)</td>
<td>Kohls and Rogers (1953)</td>
</tr>
<tr>
<td>Dog</td>
<td><em>Canis lupus familiaris</em> L</td>
<td>&quot;</td>
</tr>
<tr>
<td>White-tailed deer</td>
<td><em>Odocoileus virginianus</em> Zimmermann</td>
<td>Gerrish and Ossorio (1965)</td>
</tr>
<tr>
<td>Cougar</td>
<td><em>Puma (Felis) concolor</em> (L.)</td>
<td>Forrester et al. (1985)</td>
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<tr>
<td>Carolina wren</td>
<td><em>Thryothorus ludovicianus</em> (Latham)</td>
<td>Oliver et al. (1987)</td>
</tr>
<tr>
<td>Cotton mouse</td>
<td><em>Peromyscus gossypinus</em> (Le Conte)</td>
<td>&quot;</td>
</tr>
<tr>
<td>Cotton rat</td>
<td><em>Sigmodon hispidus</em> Say and Ord</td>
<td>&quot;</td>
</tr>
<tr>
<td>Eastern wood rat</td>
<td><em>Neotoma floridana</em> (Ord)</td>
<td>&quot;</td>
</tr>
<tr>
<td>Gray squirrel</td>
<td><em>Sciurus carolinensis</em> Gmelin</td>
<td>&quot;</td>
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<tr>
<td>Southern short-tailed shrew</td>
<td><em>Blarina carolinensis</em> (Bachman)</td>
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<tr>
<td>Virginia opossum</td>
<td><em>Didelphis virginiana</em> (Kerr)</td>
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<tr>
<td>Raccoon</td>
<td><em>Procyon lotor</em> (L.)</td>
<td>Durden and Oliver (1999)</td>
</tr>
<tr>
<td>Marsh rice rat</td>
<td><em>Oryzomys palustris</em> Harlan</td>
<td>Nelder and Reeves (2005)</td>
</tr>
<tr>
<td>Cottontail rabbit</td>
<td><em>Sylvilagus floridanus</em> (Allen)</td>
<td>Yabsley et al. (2009)</td>
</tr>
<tr>
<td>American black bear</td>
<td><em>Ursus americanus</em> (Pallas)</td>
<td>this report</td>
</tr>
<tr>
<td>Housecat</td>
<td><em>Felis catus</em> (L.)</td>
<td>&quot;</td>
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</tbody>
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Table 2. Chronological list of known mammal and bird hosts for *I. affinis* in the United States
Seasonal (Phenological) Differences

Ixodes affinis

Ixodes scapularis
Some of the following are My Opinions!
(Not everyone in PHPM may agree with me!)
In northeastern U.S.A. the immatures of *Ixodes scapularis* feed on the white-footed mouse and the adults feed on deer. What is happening along our coast where this mouse does not occur? We still have Lyme cases reported in that area of the state.
Apperson et al. (1993) established that the primary hosts for *Ixodes scapularis* larvae and nymphs along the coast in North Carolina are reptiles. Whether this holds in the piedmont is another question.

Photos/maps by Jack Dermid in Beane et al. (2010), Amphibians and Reptiles of the Carolinas and Virginia
What about *Ixodes affinis* and Lyme disease in Virginia?

- You have *Ixodes affinis* in southeastern Virginia (Ft. Eustis) and a large concentration of humans in the Norfolk area.
- What do the *Ix. scapularis* nymphs and larvae in southeastern VA feed on? Do they feed on reptiles as they do in NE North Carolina?
- Do you have a second enzootic cycle of *Borrelia burgdorferi* s. s. in southeastern VA based on the cotton mouse or other rodents beside the white-footed mouse?
- What are the human case rates for *B. burgdorferi* s. s. in southeastern VA compared to the rest of the state?

*in Webster et al. 1985*
All Testing Combined: *I. scapularis*

(383 specimens)

- **Borrelia miyamotoi**
  - 0.0% (1/383)

- **Borrelia burgdorferi s.s.**
  - < 1% (3/383)

- **Neg, 379, 99%**

M. Toliver, in part
All Testing Combined: I. affinis

(186 specimens)

- B. burgdorferi s.l.: 1% (2/186)
- B. bissetti, 48, 26%
- B. burgdorferi s.s.: 31% (58/186)
- Borrelia mixed: 3% (6/186)

Marcee Toliver, in part