

<b>BROOKHAVEN NATIONAL LABORATORY</b> Safety & Health Services Division <b>INDUSTRIAL HYGIENE GROUP</b> Standard Operating Procedure	NUMBER <b>IH89200</b>
	REVISION <b>Final Rev2</b>
Subject: <b>Field Sampling and Laboratory Analysis of Ticks</b>	DATE <b>02/09/09</b>
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### **1.0 Purpose/Scope**

This procedure provides a standardized method for the collecting ticks to measure the tick population density in a given area. It should be used in conjunction with the SBMS Subject Area *Natural Hazards in the Environment*.

Employee exposure to the hazards of tick borne diseases presents a risk for BNL workers assigned to tasks that occur outdoors in grassy & wooded areas and to BNL employees and visitors who access wooded areas on the BNL campus. This procedure offers a standardized sampling technique to be used to quantify the risk of tick exposure in an area. It also provides the safety measures to ensure the SHSD personnel performing the tick sampling are not exposed to undue risk of contracting a tick borne disease.

### **2.0 Responsibilities**

- 2.1 Use of the procedure is to be limited to persons who act under the direction of a competent hazard assessment person and have demonstrated the competency to satisfactorily use the procedures and its safety measures, as evidenced by experience and training, to qualification criteria set by BNL. See Section 7.
- 2.2 Personnel that perform exposure monitoring with this procedure are responsible to follow all steps in this procedure.

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### 3.0 Definitions none

### 4.0 Prerequisites

- 4.1 Area Access: Use appropriate PPE for outdoor area, see Section 5.
- 4.2 Training prior to using this procedure:
  - 4.2.1 Demonstration of proper operation of the procedure per Section 7 for qualification requirements.
  - 4.2.2 Complete TQ-Lyme1.

### 5.0 Precautions

#### 5.1 **Hazard Determination:**

- 5.1.1 By its very nature, this procedure may be used in areas with a high tick population that pose a risk to the sampler.
- 5.1.2 The procedures do not generate Hazardous Waste. Ticks that are collected are to be preserved in household grade Isopropanol. No waste Isopropanol is generated by this sampling. All Isopropanol is consumed in preservation of the tick samples, but is recycled and not disposed of.

#### 5.2 **Personal Protective Equipment:**

- 5.2.1 See attachment 9.1 for the **REQUIRED** PPE to perform this field testing.

#### 5.3 **Job Risk Assessment:** Consult the *Job Risk Assessment* [SHSD-JRA-15](#) for the risk analysis of this operation based on the hazards and controls of this SOP.

#### 5.4 **Environmental Impact and Waste Disposal:** This sampling does not have adverse impact on the environment or create waste for disposal. See Attachment 9.6.

### 6.0 Procedure

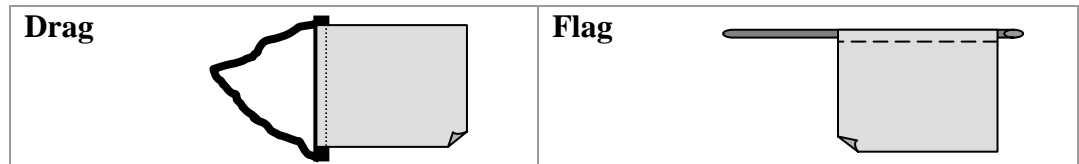
#### 6.1 **Equipment:**

- 6.1.1 Stereo Microscope
- 6.1.2 Isopropanol (household grade is adequate. This is used as a preservative for tick specimens).

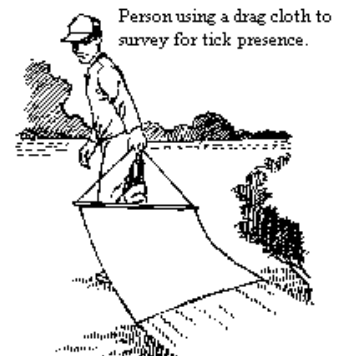


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- 6.1.3 Fine tipped Tweezers
- 6.1.4 1" x 3" polyethylene zip lock storage bags or 1 dram glass vials or 3 ounce plastic jars.
- 6.1.5 100 meter tape measure.
- 6.1.6 Dry Ice
- 6.1.7 Carbon Dioxide Bait Sampler
- 6.1.8 Sampling Flags (1 meter x 1 meter [or 36" x 36"] white flannel.



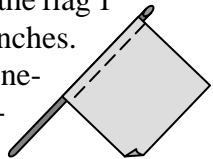
- 6.2 Done the recommended and required PPE described in Attachment 9.1 prior to entering areas with vegetation. Apply tick repellants as described in Attachment 9.1.
- 6.3 Measure out the sample plot using the fiberglass tape measure. The ideal sample plot is 1 meter wide by 30 meters (100 feet) or 1 meter wide by 50 meters (164 feet) long. When sampling is done to quantify the tick population for research or to determine the need for controls, the results need to be normalized to a specific sample area. 50m<sup>2</sup> is an ideal plot size.
  - 1 meters = 3.2808399 feet
  - 1 feet = 0.3048 meters
- 6.4 Plan sampling for maximum effectiveness in determining tick populations:
  - Observe the seasonality of ticks and know the life stage of tick present at any time of year.
  - Avoid high wind periods.
  - Avoid extreme cold periods.
  - Avoid sampling in the heat of the afternoon.
  - Do sample in the mid-morning and early evening.
  - When sampling to determine the need for controls in an area, repeat the same sample plot 3 to 4 days in a row to maximize the effectiveness of the tick population density measurement.



- 6.5 **Drag Sample:** Drag the flannel cloth with the short rod and extension string along low grass, lawns, tall grass

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and very low shrubs. Allow the flag to fully contact the surface. Cover the pre-measured distance of the sample plot in a single pass 1 meter wide. [Note: When using the drag as a tick population control technique, repeat the drag several times over the same plot to capture more of the ticks that are questing. Control by this method is about 10% on only one pass.]

- 6.6 **Flag Sample:** Using the flannel cloth flag on a pole, wave and insert the flag 1 meter deep through low braches, tall grass, shrubs, and low tree branches. Flag all levels of the low level plant canopy (up to shoulder height) one-meter deep over the length of the sample plot. Cover the pre-measured distance of the sample plot. [Note: When using the flagging as a tick population control technique, repeat the flagging of the plot several times to capture more of the ticks that are questing].
- 
- 6.7 **Carbon Dioxide Baited Flannel Cloth Sampling:** Place a 1 square meter flannel flag on the ground in the area to be sampled. In the center of flannel cloth, place about 250 ml of dry ice pellets or a chip of 200 cc size onto the cloth. Return for the cloth in 12-24 hours and transfer ticks into plastic bags or into vials/jars containing Isopropanol.
- 6.8 **Carbon Dioxide Tape Trap Sampling:** Place clear 2-inch packing tape around the perimeter of the base of the trap, with the sticking side facing down. Place about 250 ml of dry ice pellets or a chip of 250 cc size into the plastic container in the trap. Place the trap in the desired sample area. Return for the trap in 12- 24 hours and transfer ticks trapped in the tape into plastic bags or into vials/jars containing Isopropanol.
- 6.9 **Removal of ticks from Flag/Drag Samples:** At the end of sampling using, place the flannel on a flat surface and carefully remove all ticks from both sides of the flannel. Use a hand magnifier to assist in viewing larva and nymph stages. Place the captured ticks into a plastic bag or in a jar or vial containing Isopropanol.
- Avoid using picnic tables and other surfaces that people will occupy later as the surface for counting, unless the surface is covered with Kraft paper or plastic that is removed at the end of the counting session.
- 6.10 **Documenting Field Sample Information:**
- 6.10.1 Record the sample number on the bag/vial/jar.
  - 6.10.2 Record the locations samples, time of day, weather conditions, number of ticks collected, tick species, and the life stage of each specimen on the Field Sampling form (Attachment 9.3).

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**6.11 Preparing the flannel for the next sample:**

- If a large number of larvae are encountered on a sample plot, the collection of all the larvae from the flannel is not likely in the field. It is best to use a new flag for the balance of sampling.
- The exposed flag should be exposed to high heat (left on a paved surface in the direct sun for several hours) or cleaned with a lint roller and then stored prior to the next sampling round.

**6.12 Post decontamination of sampling personnel:** Within 15 minutes of the end of sampling:

- 6.12.1 Remove and closely examine all outer clothing (shoes, socks, pants, shirt, coats, and hat). Check skin & hair for the presence of ticks.
- 6.12.2 Change into non-exposed clothing and shoes.
- 6.12.3 Handle the exposed clothing by one of these techniques:
- Place the clothing on a paved surface in the direct sun for several hours.
  - Clean the fabric with a tape lint roller.
  - Place the clothes in a laundry dryer and run for at least 30 minutes on heated cycle.
  - Spray the clothing with a Permethrin spray, allow the spray to dry, and store in a cardboard box for at least 24 hours before using.
  - If the clothing was pre-treated with a Permethrin spray within the last two weeks and the clothing has not been wetted, store the clothing in a cardboard box or plastic bag until the next use without additional spray.
  - Place the clothing into a gallon size zip lock bag or plastic bag with a tie and store for at least 10 days.
  - Place the clothing into plastic bag that has a desiccant (such as calcium sulfate or silica gel) and store for at least 5 days.
  - Place the clothing into a cardboard box and store in a location that limits the spread of ticks to occupied areas. Store for at least 20 days before the next use.

**6.13 Laboratory analysis of field sampled ticks:** For the nymphal and larval stages of ticks, return specimens to the laboratory for microscopic evaluation of the tick under 10 to 40 x magnification using the stereo microscope. Complete the field sampling form (Attachment 9.3) to document identification results. Use Attachment 9.2 as a reference in the identification of specimens.

**6.14 Lab analysis of specimens submitted for ticks attached to personnel:** For the adult, nymphal, larval stages of ticks, examine the specimens in the laboratory with

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microscopic evaluation under 10 to 40 x magnification using the stereo microscope. Record the analysis on the Lab Analysis form (Attachment 9.4) to document identification results. Use Attachment 9.2 as a reference in the identification of specimens.

**6.15 Disposal of specimens after sampling and identifications:** Do not dispose of any live ticks, either back into the environment or into the trash stream. Keep ticks within a sealed container when disposing of them.

- The plastic bag will kill the tick specimens within a few days. Hold these samples until the ticks are dead (usually 5 days) before disposal of the sealed bag with ticks in the trash stream.
- The Isopropanol in jars/vials will kill the ticks within an hour of the immersion on the tick into the Isopropanol. Remove the ticks from the Isopropanol with tweezers and dispose of the dead ticks in a sealed zip lock bag in the trash stream. Recycle the used Isopropanol for the next tick specimens to avoid need to dispose of it as hazardous waste.

**6.16 Documenting Sampling Data and Work Conditions readings:** Use the *BNL Field Survey Form* (Attachment 9.3) to record field events and information including the locations samples, time of day, weather conditions, number, species, and life stage of the ticks.

**6.17 Results interpretation:** When sampling has been requested by the occupants/owner of an area, a competent person should write a hazard evaluation report that evaluates the survey data and summarizes the potential for occupational exposure to ticks. Ensure that a copy of the hazard evaluation report is sent to the IH Laboratory and is included in the ESHQ Directorate Recordkeeping system.

## **7.0 Implementation and Training**

7.1 Training prior to using this meter includes a demonstration of proper operation of the instrument based on training, education, and experience. All persons must have met the qualification criteria for IH89 Tick Sampler set in *HP65100* [Training and Qualification of Safety & Health Services Professionals](#).

7.2 Personnel are to document their training using Attachment 9.5, the Job Performance Measure Completion Certificate. Qualification on this JPM is required on a 3 year basis, providing the professional is monitoring noise sources frequently.

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7.3 Complete web based class TQ-Lyme1 and review Job Risk Assessment SHSD-JRA-05.

## 8.0 References

- 8.1 US Air Force Technical Information Memorandum No. 26: Lyme disease Vector Surveillance and Control, March 1990.
- 8.2 Web page: [www.paru.cas.cz](http://www.paru.cas.cz), E. Bouman, Institute of Parasitology, CV|BDV 2001 *Ixodes ricinus* breeding.
- 8.3 Falco, R.; Grounds Maintenance: Controlling deer ticks, 2/1/2002.
- 8.4 National Foundation for IPM Education, Pesticide Environmental Stewardship Program, *Risk Reduction: Demonstration of the '4-Poster' Device for Control of Ticks*, U.S. Dept. of Defense. August 22, 2002.
- 8.5 National Foundation for IPM Education, Pesticide Environmental Stewardship Program, *Deer-Target Application of Pesticides for Control of Ticks*, U.S. Dept. of Defense. August 22, 2002.
- 8.6 Hubalek, Z, et. Al: Medical and Veterinary Entomology (2003) 17, 46-51: *Longitudinal surveillance of the tick Ixodes ricinus for borreliae*.
- 8.7 Keirans, J.E. and T. R. Litwak, Key to Adult Ixodidae East of Mississippi River, Journal of Medical Entomology, Vol. 26, No. 5

## 9.0 Attachments

- 9.1 Required Personal Protective Equipment
- 9.2 Tick Identification
- 9.3 Field Sampling form
- 9.4 Lab Analysis form
- 9.5 Job Performance Measure: Qualification record
- 9.6 SHSD Environmental Evaluation of Tick Sample Preservation

## 10.0 Documentation

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### Document Development and Revision Control Tracking

<b>PREPARED BY:</b> <i>(Signature and date on file)</i> <b>R. Selvey</b> <b>Date: 04/24/06</b>	<b>REVIEWED BY:</b> <i>(Signature and date on file)</i> <b>E. Lacina</b> <b>Date: 04/27/06</b>	<b>APPROVED BY:</b> <i>(Signature and date on file)</i> <b>R. Selvey IH Manager</b> <b>Date: 04/28/06</b>
ESH Coordinator/ Date: <i>none</i>	Work Coordinator/ Date: <i>none</i>	SHSD Manager / Date <i>none</i>
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ISM Review - Hazard Categorization <input checked="" type="checkbox"/> High <input type="checkbox"/> Moderate <input type="checkbox"/> Low/Skill of the craft	Validation: <input type="checkbox"/> Formal Walkthrough <input type="checkbox"/> Desk Top Review <input checked="" type="checkbox"/> SME Review Name / Date: R. Selvey 4/27/05	Implementation: Training Completed: Tracked in BTMS Procedure posted on Web: 02/09/09 Hard Copy files updated: 02/09/09 Document Control: 02/09/09

### Revision Log

Purpose: <input type="checkbox"/> Temporary Change <input type="checkbox"/> Change in Scope <input type="checkbox"/> Periodic review <input checked="" type="checkbox"/> Clarify/enhance procedural controls Changed resulting from: <input type="checkbox"/> Environmental impacts <input type="checkbox"/> Federal, State and/or Local requirements <input type="checkbox"/> Corrective/preventive actions to non-conformances <input checked="" type="checkbox"/> none of the above Section/page and Description of change: Added hazard assessment, environmental aspects, RA, and SOEE links to Section 5. Added document control to Attachments 9.3 and 9.4. SME Reviewer/Date: R. Selvey 05/18/07 (Signature on file)
Purpose: <input type="checkbox"/> Temporary Change <input type="checkbox"/> Change in Scope <input type="checkbox"/> Periodic review <input checked="" type="checkbox"/> Clarify/enhance procedural controls Changed resulting from: <input type="checkbox"/> Environmental impacts <input type="checkbox"/> Federal, State and/or Local requirements <input type="checkbox"/> Corrective/preventive actions to non-conformances <input checked="" type="checkbox"/> none of the above Section/page and Description of change: Added Attachment 9.6. revised links in 5.4 and 7.1 SME Reviewer/Date: R. Selvey 02/09/09 (Signature on file)

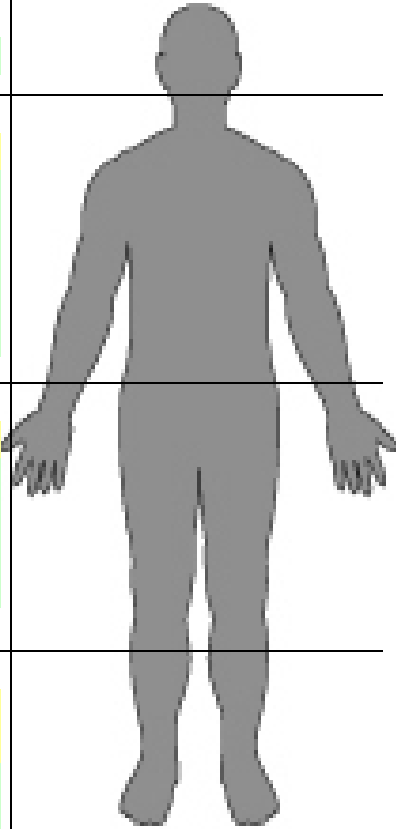


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## Attachment 9.1

### Required & Recommended Personal Protective Equipment

<b>Required =</b>	<b>Minimum, mandatory PPE</b>
<b>Recommended =</b>	<b>Optional clothing/PPE that enhances protection</b>
<b>Alternative =</b>	<b>Optional mechanism that replaces [Required] with additional protection</b>
<b>Prohibited =</b>	<b>Clothing that is not allowed</b>

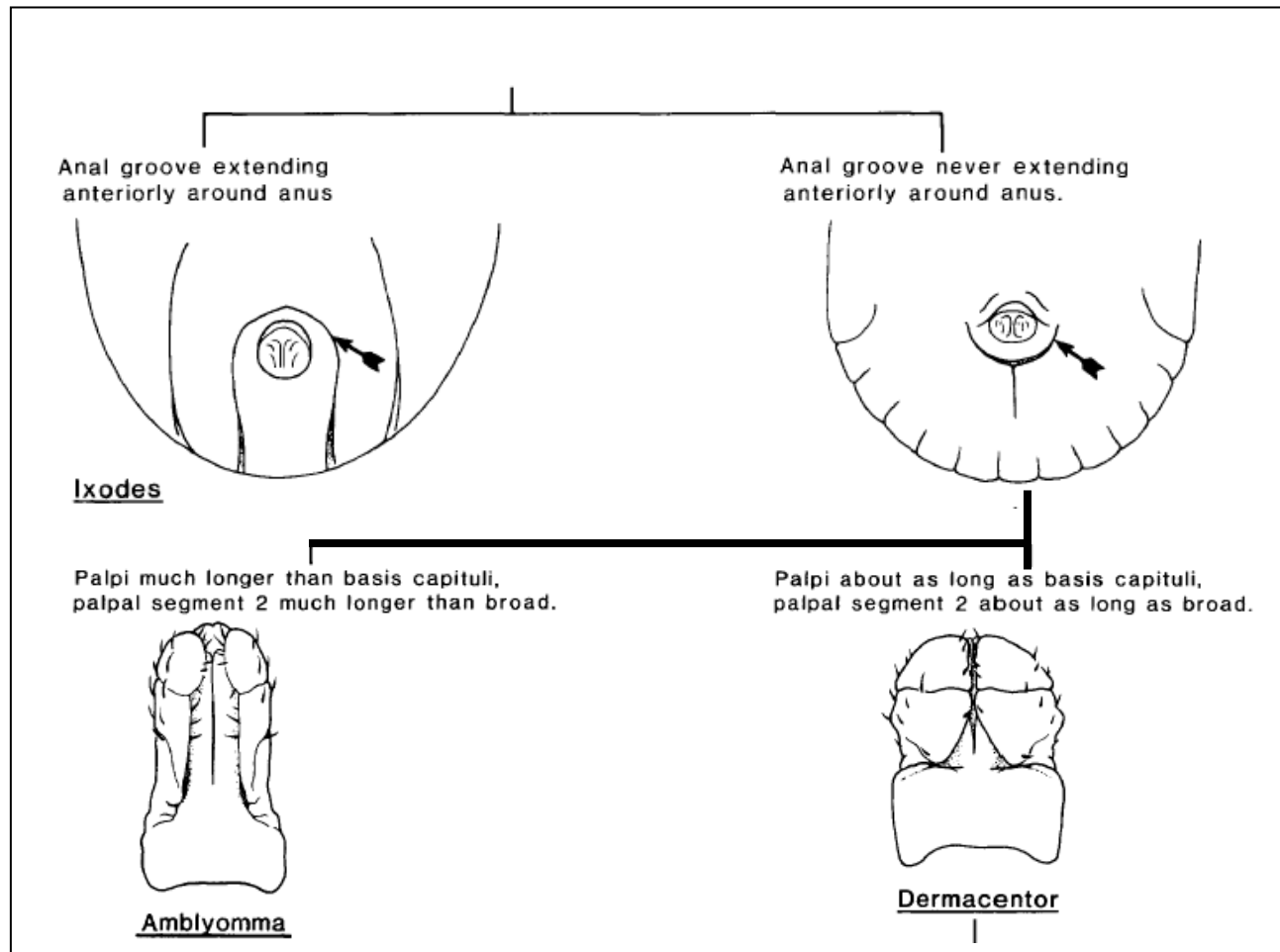
<b>HEAD</b> Light colored hat (Recommended)	
<b>UPPER BODY</b> Light colored, short sleeve shirt (Required) Light colored, Long sleeve shirt (Recommended) Light colored, nylon or polyester wind jacket (Recommended) Tyvek or Kleenguard coverall (Alternative) PVC rain suit (Alternative) Spraying external surfaces with Permethrin Spray (Recommended)	
<b>LOWER BODY</b> Light colored, long pants (Required) Light colored, nylon or polyester wind pants(Recommended) Tyvek or Kleenguard coverall (Alternative) PVC rain suit (Alternative) Spraying external surfaces with Permethrin Spray (Recommended) <b>Short pants (Prohibited)</b>	
<b>FEET</b> White socks (Required) Pants legs tucked into socks (bloused) (Required) Socks taped to pants leg (Alternative) Nylon hose bridging shoes to pants (Alternative) Rubber boots taped to pants (Alternative) Tyvek or Kleenguard suit with attached booties (Alternative) Spraying external surfaces with Permethrin Spray (Recommended) <b>Sandals or open toed shoes (Prohibited)</b>	

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## Attachment 9.2 Tick Identification Principles

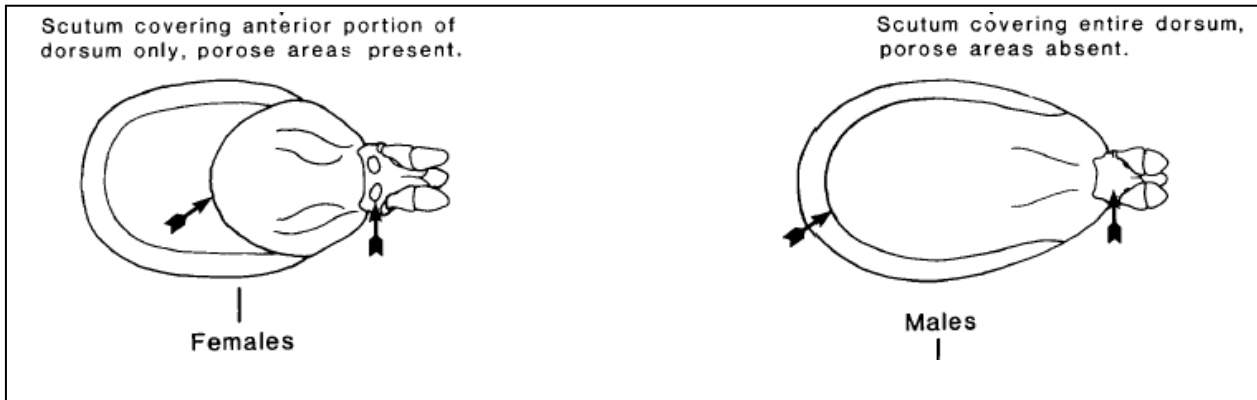
### Taxonomy Key for Long Island Ticks

Adapted from: Keirans, J.E. and T. R. Litwak, Key to Adult Ixodidae East of Mississippi River, Journal of Medical Entomology, Vol. 26, No. 5



### Identification of Female versus Male

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### Phylogenetic Classification of The Deer Tick: *Genus Ixodes*

Phylum [Arthropoda](#) - Arthropods

Subphylum [Chelicerata](#)

Class [Arachnida](#) - Arachnids

Order [Acari](#) - Mites

Suborder [Ixodides](#) - Ticks

Family [Ixodidae](#) - Hard Ticks

Genus [Ixodes](#)

Species [scapularis](#) - Deer Tick

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### Taxonomic Key

Adapted from: US Air Force Technical Information Memorandum No. 26: Lyme disease  
 Vector Surveillance and Control, March 1990.

#### (ADULTS)

J. E. Keirans (unpublished, 1986; revised 1987)  
 Acarology Summer Program  
 The Ohio State University

1. Eyes present (may be difficult to see in some male *Boophilus* and *Anocentor nitens*) ..... 5  
 Eyes absent..... 2
2. Festoons absent; anal groove distinct, extending anteriorly around the anus; Prostriata  
 (cosmopolitan, common)..... *Ixodes*  
 Festoons present; anal groove distinct or indistinct but never extending anteriorly around the anus;  
 Metastriata..... 3
3. Scutum ornate or, uncommonly, inornate; palpi elongate, subcylindrical (almost always on  
 reptiles) ..... *Aponomma*  
 Scutum inornate; palpi elongate or short, conical, not subcylindrical (on birds and mammals, almost  
 never on reptiles) ..... 4
4. Basis capituli square to rectangular dorsally; palpi short, conical, segment II at least as broad as  
 long and usually extended laterally (cosmopolitan, common) ..... *Haemaphysalis*  
 Basis capituli of male quadrangular dorsally with posterolateral margins diverging anteriorly; basis  
 capituli of female hexagonal; palpi elongate, conical, segment II at least twice as long as broad, not  
 extending laterally (Russia, China, Nepal, rare) ..... *Anomalohimalaya*




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5. Spiracular plate with irregular ridges and partially ornamented with ivory coloration; festoons number 9 (Africa, rare) ..... *Cosmiomma*  
 Spiracular plate normal, without ridges or coloration; festoons present or absent, if present, never 9 festoons ..... 6
6. Palpi much longer than basis capituli, palpal segment II much longer than broad ..... 7  
 Palpi about as long as basis capituli, palpal segment II about as long as broad ..... 9
7. Scutum and palpi ornamented, palpal segment III with a dorsal and ventral flange; male with paired adanal, accessory and subanal plates  
 (India, rare) ..... *Nosomma*  
 Scutum ornate or inornate, palpal segment III without both a dorsal and ventral flange; male with or without ventral plates ..... 8
8. Scutum inornate; male with adanal and usually with subanal plates; festoons irregular, partially coalesced (India, Mideast, Africa, common) ..... *Hyalomma*  
 Scutum usually ornate; male without anal and subanal plates; festoons regular, not coalesced (essentially pantropical, common) ..... *Amblyomma*
9. Palpi extremely short, ridged dorsally and laterally; anal groove indistinct, festoons absent (cosmopolitan, cattle ticks) ..... *Boophilus*  
 Palpi not extremely short nor ridged dorsally and laterally; festoons present or absent ..... 10
10. Festoons absent; leg IV of male greatly enlarged (Africa, rare) ..... *Margaropus*  
 Festoons present; leg IV of male norma ..... 11
11. Festoons number 7; spiracular plate round with goblets few (ca. 8) and large (Neotropical, common on horses) ..... *Anocentor*  
 Festoons number 11; spiracular plate round or with dorsal extension, goblets numerous ..... 12
12. Basis capituli rectangular; usually ornate (cosmopolitan, common) ..... *Dermacentor*  
 Basis capituli hexagonal dorsally; usually inornate ..... 13
13. Scutum usually inornate (4 ornate species); adanal and accessory plates present in the male; coxa IV of male not much larger than I-III, without two long spurs, two short pointed spurs absent on female coxa IV ..... *Rhipicephalus*  
 (*Rhipicephalus sanguineus* cosmopolitan, others primarily African)  
 Scutum inornate; adanal and accessory plates absent in the male; coxa IV of male larger than I-III, with two long spurs, two short pointed spurs present on female coxa IV (Africa, rare) ..... *Rhipicentor*

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### Identification of hard tick Life stages

Adapted from: University of Lincoln: Frank L. Ruedisueli & Brigitte Manship

<i>Tick has:</i>		<i>If so, you are observing:</i>
<p><b>Six legs</b></p>	<p><i>Ixodes ricinus larva</i></p>  <p><i>dorsal view</i></p>	<p>1) a <a href="#">Larva</a> (see <a href="#">life cycle</a>)</p>
<p><u>Or</u></p> <p><b>Eight legs</b>  <b>Hardly visible</b>  <b><a href="#">genitalia</a> (A)</b></p>	<p><i>Ixodes ricinus nymph</i></p>  <p><i>ventral view</i>                  A. Genitalia</p>	<p>2) a <a href="#">Nymph</a> (see <a href="#">life cycle</a>)</p>
<p><u>Or</u></p> <p><b>Eight legs</b>                  3) an <a href="#">Adult</a> (see <a href="#">life cycle</a>)  <b>Developed and</b>  <b>visible <a href="#">genitalia</a> (A)</b></p>	<p><i>Ixodes ricinus female adult</i></p>  <p><i>ventral view</i>                  A. Genitalia</p>	<p>3) an <a href="#">Adult</a> (see <a href="#">life cycle</a>)</p>

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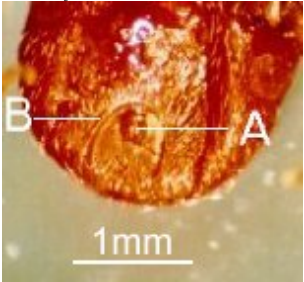
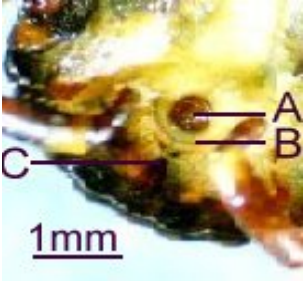
Identification of hard tick Larvae and Nymphs using capituli

**To identify Larval or Nymphal stages use the table below.**  
 The small size of both Larva and Nymph stages (respectively 0.6-1.25 mm and 1.2-2 mm) make their identification difficult. Nevertheless they can be recognized when examining their capituli (under microscope), as all three stages have the same shaped head/palpi.

<i>Does the head have:</i>		<i>The tick is of genus:</i>
* a long <u>capitulum</u> article II (A), three times as long as III (B)	<p><i>Amblyomma hebraeum</i></p>  <p><i>dorsal view</i></p>	<p><u><a href="#">Amblyomma</a></u></p> <p>A. Article II                      B. Article III</p>
* palpi as wide or wider than long * rectangular <u>basis capituli</u>	<p><i>Dermacentor reticulatus</i></p>  <p><i>dorsal view</i></p>	<p><u><a href="#">Dermacentor</a></u></p> <p>A. Article II                      B. Article III</p>
* palp long and broad: - articles II (A) and III (B) longer than width of basis - set wide apart	<p><i>Ixodes ricinus</i></p>  <p><i>dorsal view</i></p>	<p><u><a href="#">Ixodes</a></u></p> <p>A. Article II                      B. Article III                      C. Basis capituli</p>

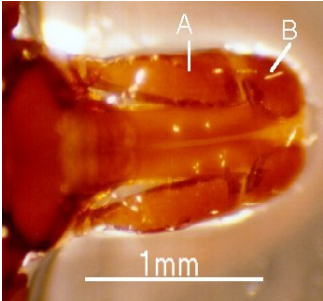

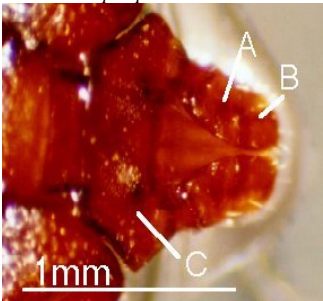



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Adult Identification Step 1: <u>Position of the anal groove</u>		
When looking <u>ventrally</u> :		If so:
The <u>anal groove</u> extends above the <u>anus</u>	<p><i>female Ixodes ricinus</i></p>  <p><i>dorsal view</i></p>	The tick is of genus: <u>Ixodes</u> A. anus B. anal groove
The <u>anal groove</u> extends below the <u>anus</u>	<p><i>male Amblyomma hebraeum</i></p> 	Go to <u>Step 3</u> A. anus B. anal groove C. Postanal median groove




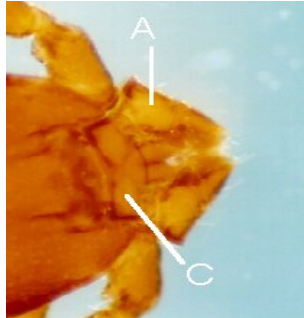
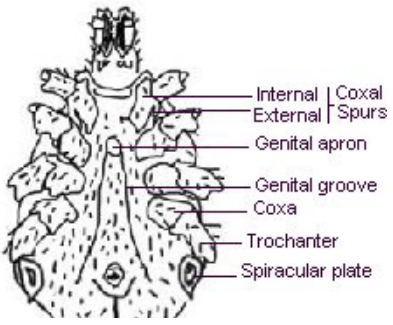
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Adult Identification Step 3: Size of palpi		
On the <u>capitulum</u> :		If so:
<p>The <u>palpi</u> (A &amp; B) are longer than wide and tick ornate</p>	<p><i>Amblyomma hebraeum</i></p> 	<p>The tick is of genus: <u>Amblyomma</u>  <i>male Amblyomma hebraeum</i></p> <p>dorsal view                      A. Article II                      B. Article III</p>  <p>dorsal view</p>
<p>The <u>palpi</u> (A &amp; B) are wider than long and tick has decorations on the <u>scutum</u></p>	<p><i>Rhipicephalus evertsi</i></p>  <p>dorsal view                      A. Article II                      B. Article III                      C. Basis capituli</p>	<p>The tick is of genus: <u>Dermacentor</u>  <i>male Dermacentor reticulatus</i></p>  <p>dorsal view</p>

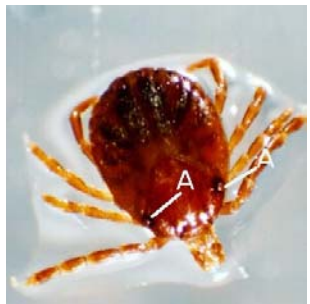
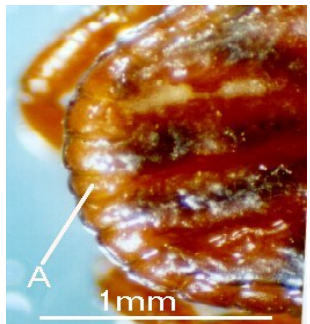
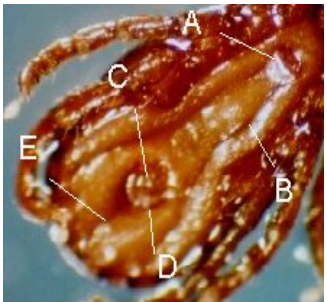
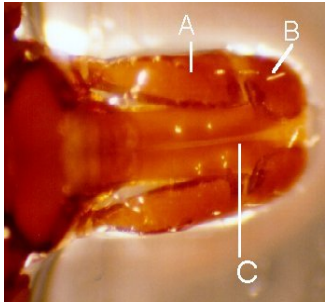
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## TICK IDENTIFICATION GLOSSARY

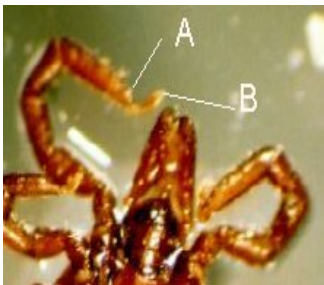

Adapted from: University of Lincoln: Frank L. Ruedisueli & Brigitte Manship

<p><b>Anal groove</b> Part of the genitalia</p> <p><b>Anus</b> Part of genitalia</p>	<p>A. Anal groove B. Anus</p> 
<p><b>Basis capituli</b> Attaches head to body can be various shapes, such as rectangular or hexagonal. Usually comprises porose areas like eyes</p> <p><b>Capitulum</b> Head or mouthpart of the tick made up of palpi and three segments or articles</p>	<p>A. Capitulum C. Basis capituli</p> 
<p><b>Coxa</b> Base of the legs, attachment to body</p>	

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<p><b>Eyes</b> Are present at margin of <a href="#">scutum</a></p>	<p>A. Eyes</p> 
<p><b>Festoons</b> Wrinkles located at the bottom of the back</p>	<p>A. Festoons</p> 
<p><b>Genitalia</b> Reproductive organ of the tick, composed of the genital apron (A), genital groove (B), anal groove (D), postanal median groove (E) and the anus (C)</p>	<p>A. Genital apron                  B. Genital groove                  C. Anus                  D. Anal groove                  E. Postanal median groove</p> 
<p><b>Haller's organ</b> Sensory structure sensitive to humidity and odors situated at the tip of the first tarsus of the first walking leg</p>	
<p><b>Hypostome</b> Extension of the basis capituli, found between palpi</p> <p><b>Articles</b> or segments of palpi or legs</p> <p><b>Palpi</b> Part of mouthpart made up of four segments</p>	<p>A. Article II of palpi                  B. Article III of palpi                  C. Hypostome</p> 



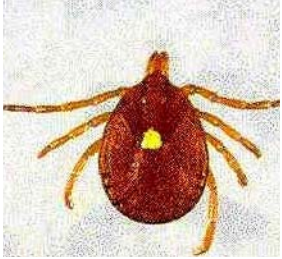









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<p><b>Pulvilli</b> Pads present at the end of the legs</p> <p><b>Claws</b> At the end of pads help tick to attach to host</p>	<p>A. Pulvilli B. Claws</p> 
<p><b>Scutum</b> Hard shield found on the back of the tick. Expands over the whole back in males, but only 1/3 of the back in females</p>	<p>A. Female scutum B. Body</p> 

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## Ticks of Long Island Photos

Adapted from BNL Photos and Internet Site: Entomological Society of America

<b>Deer Tick</b> <i>Ixodes scapularis</i>	<b>Dog Tick</b> <i>Dermacentor variabilis</i>	<b>Lone Star Tick</b> <i>Amblyomma americanum</i>
<b>Adult Female</b> 	<b>Adult Female</b> 	<b>Adult Female</b> 
<b>Adult Male</b> 	<b>Adult Male</b> 	<b>Adult Male</b> 
<b>Nymph</b> 	<b>Nymph</b> 	<b>Nymph</b> 
<b>Larvae</b> 	<b>Larvae</b> 	<b>Larvae</b> 





# BROOKHAVEN NATIONAL LABORATORY

## DEER TICK SAMPLING

DATE:	METHOD: White flannel (3' x 3') SAMPLE SIZE: 100 ft length by 3 ft width	SURVEYOR(S):		
Sky: <input type="checkbox"/> Sunny <input type="checkbox"/> Partial Cloudy <input type="checkbox"/> Overcast	Wind: _____ fpm _____ mph	Temp: shade _____°F; sun _____°F	RH: _____%	DewPt: _____°F

Sample #	Time of Sample	Location of Sample	Field ID of Ticks					
			Total	Adult Male	Adult Female	Nymph	Larvae	





## Tick Laboratory Identification and PCR Test Record

	DATE:	ANALYSIS BY:
<b>Presented By:</b>	NAME:	BNL#:
<b>Patient:</b>	<input type="checkbox"/> Same <input type="checkbox"/> BNL Employee	<input type="checkbox"/> Family Member Name:
<b>Location:</b>	DEPT/DIV:	BLDG:
<b>Contact Info:</b>	BNL phone Number	Email: <input type="checkbox"/> Outlook Other:
<b>Where At BNL:</b>		<b>Date Of Attachment:</b>

### ANALYSIS UNDER MAGNIFICATION

<b>Genus</b>	<input type="checkbox"/> <i>Dermacentor variabilis</i> <b>Dog Tick</b>	<input type="checkbox"/> <i>Ixodes scapularis</i> <b>Deer Tick</b>	<input type="checkbox"/> <i>Amblyomma americanum</i> <b>Lone Star</b>
<b>Life Stage</b>	<input type="checkbox"/> Adult Female <input type="checkbox"/> Adult Male <input type="checkbox"/> Nymph <input type="checkbox"/> Larvae	<input type="checkbox"/> Adult Female <input type="checkbox"/> Adult Male <input type="checkbox"/> Nymph <input type="checkbox"/> Larvae	<input type="checkbox"/> Adult Female <input type="checkbox"/> Adult Male <input type="checkbox"/> Nymph <input type="checkbox"/> Larvae
<b>Signs Of Attachment</b>	Status Of Hypostome: <input type="checkbox"/> Intact <input type="checkbox"/> Partial <input type="checkbox"/> Missing		
<b>Signs Of Engorgement</b>	<input type="checkbox"/> None <input type="checkbox"/> Partial <input type="checkbox"/> Full <input type="checkbox"/> Blood in Body <input type="checkbox"/> Blood Streaking		

### PCR TESTING

<b>Date Sent:</b>		<b>Results Received:</b>
<b>Sample Id:</b>	BNL- _____ - _____ - _____ - _____. <small style="display: inline-block; width: 100px; text-align: center;">MMDDYY                      ORG                      INITIALS                      #</small>	
<b>Sent To:</b>	<input type="checkbox"/> Igenex <input type="checkbox"/> Imugen <input type="checkbox"/> Other:	
<b>Analysis For:</b>	<input type="checkbox"/> <i>Borrelia Burgdorferi</i> <input type="checkbox"/> <i>Babesia</i> <input type="checkbox"/> <i>Ehrlichiosis</i>	
<b>Results</b>	<input type="checkbox"/> Positive <input type="checkbox"/> Negative <input type="checkbox"/> Inconclusive	



**Tick Field Sampling**  
**Job Performance Measure (JPM) Completion Certificate**

Candidate's Name	Life Number:
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**Practical Skill Evaluation: Demonstration of Evaluation Methodology by Oral Exam & Demonstration of Methodology**

Criteria	Qualifying Performance Standard	Unsat.	Recov.	Satisf.
1. <b>Hazard Analysis</b>	Understands the tick hazards and exposure potential to the self as sampler and workers in the area.			
2. <b>Personal Protective Equipment</b>	Understands the need for PPE. Demonstrates the correct use of protective clothing and the proper treatment and storage of exposed clothing.			
3. <b>Sampling Equipment</b>	Knows where equipment needed for the procedure is located and how to properly use it.			
4. <b>Field Sampling methods</b>	Demonstrates correctly setting up sample plots.			
5. <b>Field Sampling methods</b>	Demonstrates correctly dragging of ground vegetation & flagging vegetation in the low canopy.			
6. <b>Field Sampling methods</b>	Demonstrates the correct set up of CO2 Bait traps			
7. <b>Field Sampling methods</b>	Demonstrates the proper method of recovering ticks from the flannel sample cloth.			
8. <b>Lab Analysis</b>	Demonstrates knowledge of the principles of identification of tick species, and life stages.			
9. <b>Specimen disposal</b>	Demonstrates the proper method to dispose of tick specimens and recycle the Isopropanol used as a preservative.			
10. <b>Documentation</b>	Demonstrates correctly filling out IH monitoring forms.			

I accept the responsibility for performing this task as demonstrated within this JPM and the corresponding SOP.

Candidate Signature:	Date:
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I certify the candidate has satisfactorily performed each of the above listed steps and is capable of performing the task unsupervised.

Evaluator Signature:	Date:
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## **SHSD Environmental Evaluation of Isopropanol Preservation of ticks**

**Operation Description:** In field sampling for ticks, collected ticks need to be saved and transported to the lab for analysis. Even if field identification is made, the ticks are not returned to the vegetation they are collected from, as a control measure to protect the Laboratory as a whole. Placing the ticks directly into a plastic bag or jar is an option that is sometimes used. However, when large numbers of tick are collected on a single sample, the ticks need to be placed in Isopropanol to quickly stun them to keep them from escaping or infesting the sampler. A small amount (10 to 20 ml) of rubbing alcohol grade Isopropanol is used in a glass vials. The alcohol is used over and over and disposal of the alcohol as a waste is not required.



**Frequency of Operation:** 2-3 times per month.

**Environmental impact:**

This operation has negligible environmental consequences. No Isopropanol is released to the environment in the field sampling or processed to drains or the Hazard Waste division. The Isopropanol is recycled.

**Waste Disposal:**

- No waste is generated. All is consumed or re-used.