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Ixodes dammini (Acari, Ixodidae) and *Borrelia burgdorferi* in Iowa ¹

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A statewide study to evaluate the presence, distribution and abundance of the deer tick, *Ixodes dammini*, and the spirochete, *Borrelia burgdorferi*, in Iowa was initiated in 1989. Six hundred and seventy-one tick collections were received from health professionals, conservation employees and concerned citizens. Additional ticks were obtained by flagging, small mammal trapping and deer checks in selected areas of Iowa. Nine *I. dammini* were collected in 1989 from seven counties in the eastern half of the state. Six of these were tested for *B. burgdorferi* and all were negative. Flagging, small mammal trapping and deer checks in eastern Iowa failed to produce *I. dammini* in 1989. However, in May 1990 an *I. dammini* female collected by a turkey hunter in Allamakee Co. tested positive for *B. burgdorferi*. Subsequent flagging in this area yielded *I. dammini* adults, 19% of which were infected. Additionally, *I. dammini* larvae and nymphs were collected from *Peromyscus leucopus*. This is the first evidence of *I. dammini* establishment and *B. burgdorferi* presence in Iowa.
INDEX DESCRIPTORS: *Borrelia burgdorferi*, deer tick, Iowa ticks, *Ixodes dammini*, Lyme disease

The primary focus of Lyme disease in the Midwest encompasses much of Wisconsin and eastern Minnesota (Spielman et al. 1985, Osterholm et al. 1984). *Ixodes dammini* Spielman, Clifford, Piesman, and Corwin is the primary vector of Lyme disease in this region. The tick is abundant in parts of Wisconsin and Minnesota (Godsey et al. 1987) and has been reported in northern Illinois (Bouseman et al. 1990). Wilson (1988) reported on *I. dammini* collections in Iowa; however, no information has been published regarding the distribution and abundance of *I. dammini* in Iowa.

From 1983 through June 1990, fifty-three cases of Lyme disease have been diagnosed in Iowa and subsequently reported to the state Department of Health. This may be an overestimate since Centers for Disease Control guidelines for an epidemiologic case definition of Lyme disease were not established until 1989. The majority of cases have been reported from the eastern half of Iowa and epidemiologic evidence indicates that several of these involved in-state exposure (personal communication, R. Currier, Iowa Department of Health).

In April 1989, a statewide study was initiated to determine the presence and abundance in Iowa of *I. dammini* and *Borrelia burgdorferi*, the causative agent of Lyme disease. This report summarizes the collection data through May 1990.

MATERIALS AND METHODS

Ticks were obtained by a variety of methods. The public was informed of the study by newspaper and radio and was encouraged to submit ticks for identification and possible spirochete testing. Posters providing information about Lyme disease and submitting ticks were distributed to all county and state parks. Additionally, seven eastern Iowa counties (Allamakee, Clayton, Dubuque, Fayette, Johnson, Lee and Scott) were sampled for ticks by flagging and/or small mammal trapping. White-tailed deer (*Odocoileus virginianus*) were examined during the 1989 hunting season in Des Moines County, in southeast Iowa. *Ixodes dammini* were tested with an indirect fluorescent antibody (monoclonal H5332) technique (IFA) for the presence of *Borrelia burgdorferi*.

RESULTS

1989 Surveillance

The majority of ticks were obtained from mail-in collections from medical professionals, conservation employees and the general public. Six hundred and seventy-one mail-in collections were received between 1 May and 12 December 1989. A total of 1,198 ticks obtained in Iowa were present in 596 collections. The remaining collections either did not contain ticks or the ticks were acquired outside Iowa. Collections were received from 86 of 99 Iowa counties.

Dermacentor variabilis (Say) and *Amblyomma americanum* (L.) accounted for 96.9% of all Iowa ticks examined. *Dermacentor variabilis* was present in 69.6% of the Iowa collections (640 ticks, 84 counties) (Fig. 1). Five hundred and twenty-one *A. americanum* were identified, although present in only 23.8% of the collections (35 counties) (Fig. 2). Most *A. americanum* collections were from southeast Iowa.

Nine *I. dammini* (0.75% of all ticks received) were identified from seven counties in eastern and central Iowa in 1989 (Fig. 3). Four females and two nymphs were recovered from humans and three females were found on dogs.

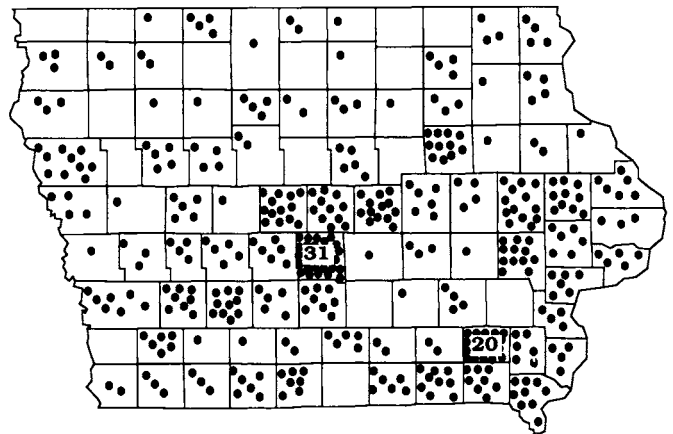


Fig. 1. Collections of *Dermacentor variabilis* in Iowa, 1989 (Each dot may represent more than one tick).

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Table 1. Data for *Ixodes dammini* collections in Iowa, 1989.

| Catalog # | Date | County | Stage | Host | <i>Borrelia burgdorferi</i> |
|-----------|-------------|-----------|-------|-------|-----------------------------|
| LDS 076 | June 8 | Johnson | ♀ | Dog | not tested |
| LDS 288 | July 5 | Linn | N* | Human | negative |
| LDS 552 | August 5 | Jackson | N | Human | not tested |
| LDS 654 | October 13 | Muscatine | ♀ | Human | not tested |
| LDS 653 | October 14 | Allamakee | ♀ | Human | negative |
| LDS 655 | October 16 | Johnson | ♀ | Dog | negative |
| LDS 656 | October 16 | Muscatine | ♀ | Human | negative |
| LDS 658 | October 22 | Marshall | ♀ | Human | negative |
| LDS 662 | November 10 | Fayette | ♀ | Dog | negative |

* N = nymph

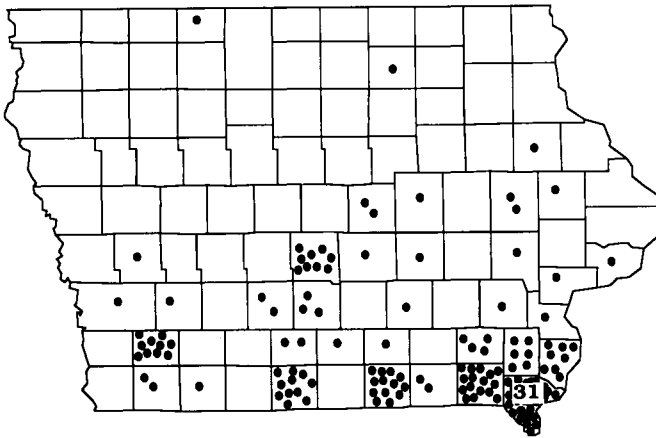


Fig. 2. Collections of *Amblyomma americanum* in Iowa, 1989 (Each dot may represent more than one tick).

Collection location data and travel history were obtained for all submitted *I. dammini*, except LDS 654 (Muscatine Co., 13 Oct. 89). This specimen was forwarded by a physician who provided no details of the patient's location or travel history; follow-up correspondence provided no other details.

Two *I. dammini* specimens were collected at sites bordering Wisconsin and Illinois. Collection LDS 653 (Allamakee Co., 14 Oct. 89) was obtained in Lansing, a town on the Mississippi River with bridge access to Wisconsin. Collection LDS 656 (Muscatine Co., 16 Oct. 89) was from Geneva Island in the Mississippi River. This island borders Rock Island County, Illinois, where *I. dammini* have been collected from deer (Bouseman et al. 1990).

Collection LDS 662 (Fayette Co., 10 Nov. 89) was an engorged female taken from a dog. The owner resided in Fayette County, but the tick may have been acquired during a hunting trip in Winnishiek County two to three days before it was discovered.

Six of the nine *I. dammini* specimens submitted were alive when received and tested by IFA for *B. burgdorferi*. All six ticks were negative for *B. burgdorferi* (Table 1).

A total of 173 trap nights in four counties (Allamakee, Clayton, Dubuque, and Lee) yielded 74 white-footed mice, *Peromyscus leucopus* (Rafinesque). No *I. dammini* were found on these hosts. Approximately 30 hours of flagging in Allamakee, Clayton, Fayette, Johnson, Lee, and Scott counties yielded only *D. variabilis* and *A. americanum*. One hundred and forty-two white-tailed deer were examined at a deer check station in Des Moines Co. (2 Dec. 89). Only

Dermacentor albipictus (Packard) (n = 72) and *A. americanum* (n = 20) were found.

1990 Collections

On 3 May 1990, a turkey hunter in northeast Allamakee Co. (south of New Albin) submitted two *I. dammini* females. One of these was tested and was positive for *B. burgdorferi*. A follow-up tick survey was made in the same area on 9 June. Approximately three hours of flagging yielded 21 adult *I. dammini*. Twenty of these adults were tested; three were positive for *B. burgdorferi*. Additionally, eleven of thirteen *P. leucopus* trapped in this area had a total of 79 larval and 5 nymphal *I. dammini*.

DISCUSSION

Data from the mail-in collections suggest that *I. dammini* is widespread but not abundant in eastern Iowa. Flagging and small mammal trapping support this conclusion; only one locality yielded *I. dammini* by these methods. No *I. dammini* collections were received from western Iowa although a Lyme disease case in Osceola Co. apparently involved local exposure (personal communication, R. Currier, Iowa Department of Health). Wilson (1988) reported on *I. dammini* collection in Iowa; however, this study provides the first evidence that *I. dammini* is established (all stages present in a locality) in the state. Additionally, this study documents the presence of *B. burgdorferi* in Iowa.

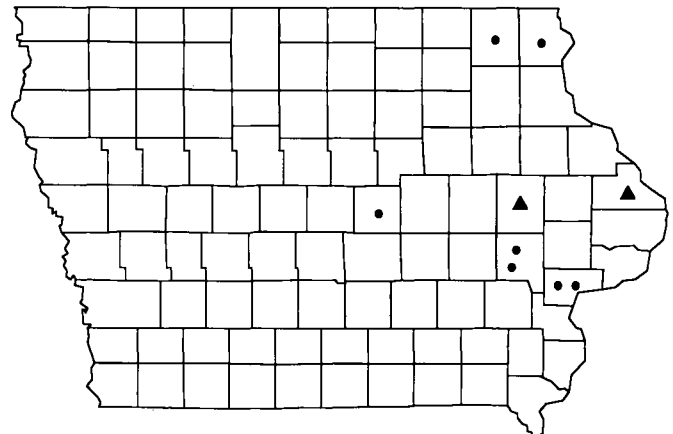


Fig. 3. Collections of *Ixodes dammini* in Iowa, 1989 (Each dot represents a single female, each triangle represents a single nymph).

The southerly spread of *I. dammini* in Wisconsin (Godsey et al. 1987) suggests that the tick and spirochete will likely become more abundant in Iowa. Iowa is a transition area between hardwood forest and prairie remnants. Deer are abundant throughout the state, but are concentrated in greenbelts along waterways in central and western Iowa. Thus, vegetation changes and changes in host habitat may affect tick distribution and abundance. Undoubtedly, movement of deer and other mammals aids *I. dammini* dissemination, but Weisbrod and Johnson (1988) have also suggested that birds migrating from the Upper Mississippi Valley may be important dispersal agents for *B. burgdorferi*-infected ticks. For these reasons, the spread of the tick into Iowa should prove interesting and merits further investigation.

Large populations of *A. americanum* in southern Iowa, particularly in the southeast corner of the state, may also be of concern in Lyme disease transmission. This species has been implicated as a secondary vector of Lyme disease (Schulze et al. 1984) although recent transmission studies (Piesman and Sinsky 1988, Mather and Mather 1990) cast doubt on this role. Lyme disease transmission in Iowa may be affected if the population of *I. dammini* increases and overlaps the *A. americanum* population.

Tick surveillance in Iowa is continuing with increased emphasis on small mammal trapping and flagging in eastern Iowa. Additionally, *A. americanum* are being tested for *B. burgdorferi* to determine if this species plays a role in Lyme disease transmission.

The *I. dammini* specimens have been deposited in the Iowa State Insect Collection located at Iowa State University in Ames, Iowa.

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