

Larval Hannemania sp. Infestations of Spea spp. in the Southern High Plains, Texas, USA

Authors: Torrence, Shannon M., Smith, Loren M., and McMurry, Scott T.

Source: Journal of Wildlife Diseases, 43(4) : 742-746

Published By: Wildlife Disease Association

URL: <https://doi.org/10.7589/0090-3558-43.4.742>

The BioOne Digital Library (<https://bioone.org/>) provides worldwide distribution for more than 580 journals and eBooks from BioOne's community of over 150 nonprofit societies, research institutions, and university presses in the biological, ecological, and environmental sciences. The BioOne Digital Library encompasses the flagship aggregation BioOne Complete (<https://bioone.org/subscribe>), the BioOne Complete Archive (<https://bioone.org/archive>), and the BioOne eBooks program offerings ESA eBook Collection (<https://bioone.org/esa-ebooks>) and CSIRO Publishing BioSelect Collection (<https://bioone.org/csiro-ebooks>).

Your use of this PDF, the BioOne Digital Library, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Digital Library content is strictly limited to personal, educational, and non-commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne is an innovative nonprofit that sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Larval *Hannemania* sp. Infestations of *Spea* spp. in the Southern High Plains, Texas, USA

Shannon M. Torrence,^{1,5} Loren M. Smith,^{2,3,4} and Scott T. McMurry^{3,4} ¹Texas Parks and Wildlife Department, 1502 FM 517 East, Dickinson, Texas 77539, USA; ²Department of Range, Wildlife, and Fisheries Management, Texas Tech University, Mail Stop 2125, Lubbock, Texas 79409, USA; ³The Institute of Environmental and Human Health, Texas Tech University, Box 41163, Lubbock, Texas 79409-1163, USA; ⁴Current address: Department of Zoology, Oklahoma State University, Stillwater, Oklahoma 74078, USA; ⁵Corresponding author (email: shannon.torrence@tpwd.state.tx.us)

ABSTRACT: We describe a case history of larval *Hannemania* sp. (Acari: Trombiculidae) infestations in two spadefoot toads (*Spea* spp. Anura: Pelobatidae) captured from playa wetlands in the Southern High Plains, Texas. *Hannemania* sp. larvae were superficially attached to the skin, not encysted, and dermal changes were not observed. Gross field examinations revealed a presumed occurrence of *Hannemania* sp. in *Spea* spp. at four of 24 wetlands in 2003 and 2004. Although other species of amphibians were present (*Ambystoma tigrinum marmoratum*, *Bufo cognatus*, *Bufo debilis insidiator*, *Pseudacris clarkii*, *Gastrophryne olivacea*, *Rana blairi*, *Scaphiopus couchii*), investigators did not observe infestations in these species. Future research should focus on identifying this *Hannemania* to species level and determining if it influences *Spea* spp. survival.

Key words: Amphibians, chiggers, *Hannemania* sp., playa, Southern High Plains, *Spea* spp.

Chiggers, or Trombiculid mites, have diverse hosts, ranging from arthropods to vertebrates (Flynn, 1973). Researchers have documented infestations of *Hannemania* spp. in several amphibian species (Hyland, 1950). Duszynski and Jones (1973) reported infestations of several *Bufo* spp., *Hyla arenicolor*, *Spea bombifrons*, and *Spea hammondi* in museum specimens from New Mexico. Sladky et al. (2000) documented *Hannemania* sp. from *H. arenicolor*. Jung et al. (2002) found infestations in *Rana berlandieri* along the Big Bend portion of the Rio Grande, Texas.

Spea multiplicata and *S. bombifrons* are common in playa wetlands of the Southern High Plains (Smith, 2003). Spadefoot toads (*Spea* spp. Anura: Pelobatidae) are explosive breeders, and often the most

abundant terrestrial amphibian in the region (Gray et al., 2004). We describe the case history of larval *Hannemania* sp. infestations in two *Spea* spp. individuals, and the presumed infestation prevalence, based on gross lesions, in playa wetlands in the Southern High Plains of Texas.

Two *Spea* spp. specimens with suspected chigger infestations were sent to the United States Geological Survey National Wildlife Health Center in Madison, Wisconsin, USA, for definitive identification. One *Spea* spp. metamorph from a playa (33°56'15.24"N, 101°06'59.13"W) in Floyd County, Texas, USA, was euthanized using MS-222 (Argent Chemical Laboratories, Inc., Redmond, Washington, USA) in 2003, and the other specimen (adult *S. bombifrons*) died en route to the laboratory from a playa (34°24'45.29"N, 101°17'08.20"W) in Briscoe County, Texas, in 2004. *Spea* spp. were collected as part of a pitfall trap/drift fence study. Gross observations were of small (~0.5 mm) raised "orange dots" on the epidermis with light pink surrounding skin, possibly indicating irritation. These orange dots could be removed by scraping the skin with a blunt plane. Infestations were concentrated in the axillae and groin, with a few dots (5–10) on the dorsal and ventral body surfaces.

Infesting organisms were identified as larval *Hannemania* sp. based on general size and genus morphology by light microscope examination of mineral oil squash slides. Specimens were deposited in the Harold W. Manter Laboratory of Parasitology in Lincoln, Nebraska (HWML 48403 and HWML 48404). Larvae had

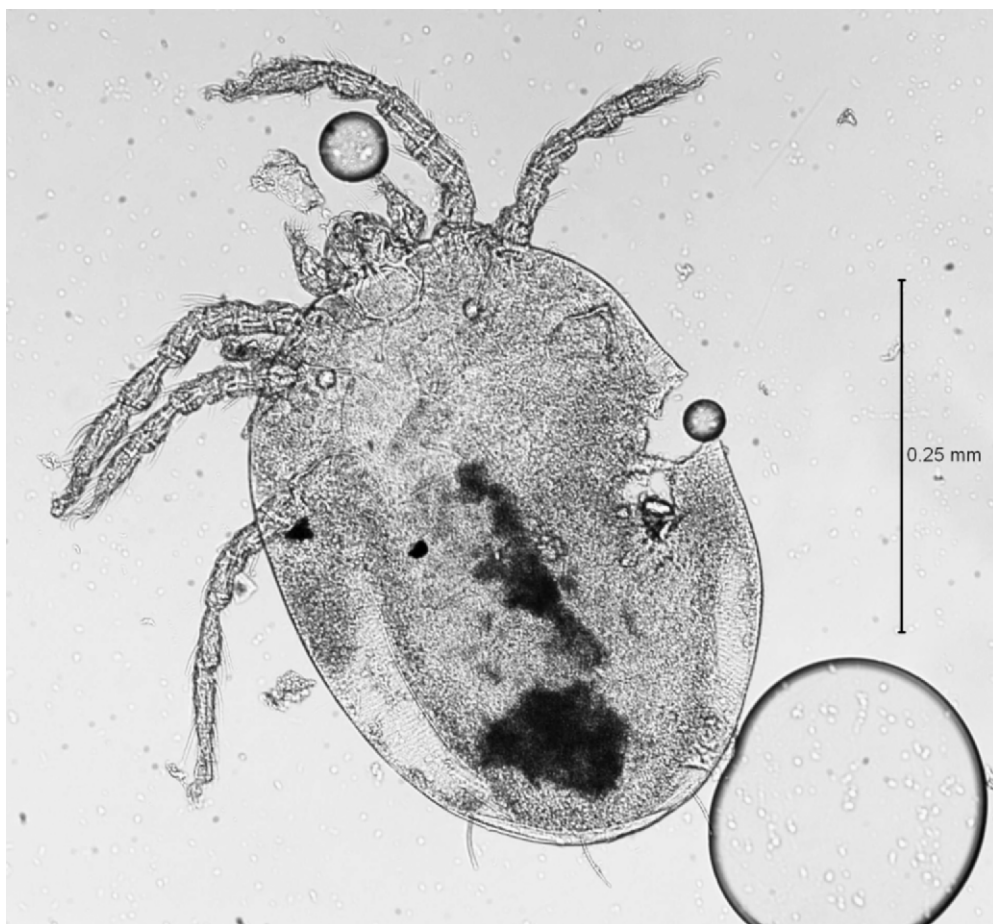


FIGURE 1. *Hannemania* sp. larvae removed from subadult *Spea bombifrons* ($\times 200$) collected from site # 4, Briscoe County, Texas.

three as opposed to the four pairs of legs typical of adults. The ovoid larval bodies had scalloped lateral margins. Ventral body length and width was approximately 0.45 and 0.30 mm, respectively (Fig. 1). Identifying larval forms of this genus to species level is difficult, and in this case, identification to species was not possible due to the condition of the specimens and lack of key characteristics. Examination by dissecting microscope revealed that *Hannemania* sp. larvae were attached superficially to the skin and not encysted (Fig. 2). There were no gross changes to the dermis, and no tissues were taken for histopathologic examination. (M.C. Sterner, Parasitologist, United States Geological Survey, National

Wildlife Health Center, Madison, Wisconsin, USA, pers. comm.).

We calculate that *Hannemania* sp. larvae infestations of *Spea* spp. were present at one of 12 playas in Floyd County in 2003 and three of 12 playas in Floyd and Briscoe Counties in 2004 based on gross examinations. Infested *Spea* spp. were first detected on 3 July 2003 and 19 July 2004, 27 and 42 days after amphibian sampling began, respectively. All age groups of terrestrial *Spea* spp. toads had *Hannemania* sp. infestations (Table 1). The actual prevalence, however, of *Hannemania* sp. infestation of *Spea* spp. cannot be confirmed without positive identification of mites on each individual.

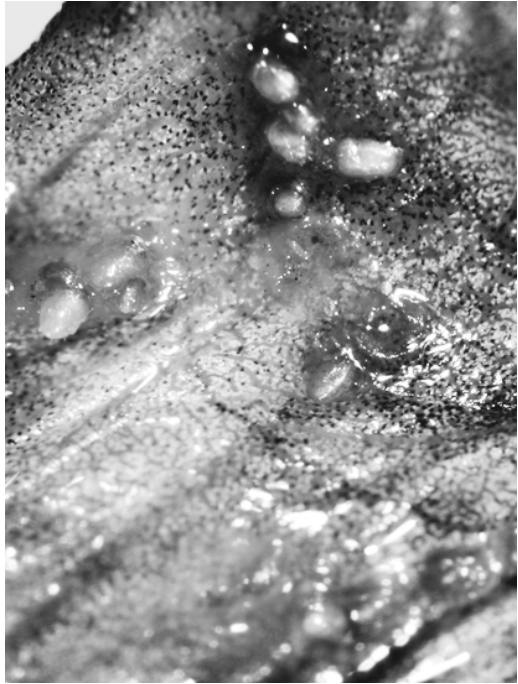


FIGURE 2. Infestation of subadult *Spea bombifrons* by larval *Hannemania* sp. ($\times 35$) from site # 4 in Briscoe County, Texas.

Sympatric amphibian species of *Spea* spp. were not observed with *Hannemania* sp. infestations. *Spea bombifrons* and *S. multiplicata* together comprised the majority (93%) of captured individuals. Sympatric species of *Spea* spp. were *Ambystoma tigrinum mavortium*, *Bufo cognatus*, *Bufo debilis insidior*, *Pseudacris clarkii*, *Gastrophryne olivacea*, *Rana blairi*, and *Scaphiopus couchii*. *Hannemania* sp. may have been present on these sympatric species but not detected because of a different manifestation of infestation.

TABLE 1. Dates and presumed occurrence of *Hannemania* sp. infestation of *Spea* spp. in metamorph, subadult, and adult age groups in playas in the southern High Plains, Floyd and Briscoe Counties, Texas. Sex determination of metamorphs and subadults was not possible.

Playa	County	Land use	First <i>Spea</i> spp. capture	Dates of <i>Hannemania</i> sp. detection	No./age/species/sex infested	Total no. caught on date	% Infested
Site 1	Floyd	Grassland	3 June 2003	3 July 2003	1 adult female <i>S. multiplicata</i>	1 adult female <i>S. multiplicata</i>	100
				6 July 2003	87 <i>Spea</i> metamorphs	2,554 <i>Spea</i> metamorphs	3
Site 2	Floyd	Cropland	11 July 2004	19 July 2004	6 <i>Spea</i> metamorphs	2,074 <i>Spea</i> metamorphs	0.29
				25 August 2004	1 <i>Spea</i> metamorph	8 <i>Spea</i> metamorphs	13
Site 3	Floyd	Grassland	7 June 2004	20 July 2004	3 <i>Spea</i> metamorphs	347 <i>Spea</i> metamorphs	0.87
Site 4	Briscoe	Cropland	13 July 2004	15 August 2004	1 subadult <i>S. bombifrons</i>	1 subadult <i>S. bombifrons</i>	100

Here, we introduce the first published occurrence of *Hannemania* sp. in *Spea* spp. metamorphs. While not confirmed in the laboratory, this is the presumed first documentation of *Hannemania* sp. in *S. multiplicata*. Unlike previous findings (e.g., Rankin, 1937; Duszynski and Jones, 1973; Sladky et al., 2000), *Hannemania* sp. encountered in our study were not encysted in the dermis but were superficially attached to the surface of the skin. Another difference was the location of the infestation on the host. Duszynski and Jones (1973) reported that in museum specimens, chiggers were encysted ventrally, whereas we report that *Hannemania* sp. larvae were concentrated in the axillae and pelvic regions. These two differences may indicate a different species of *Hannemania* not previously observed infesting *Spea* spp.

Since first described in 1911 (Sambon, 1928), *Hannemania* sp. have been documented as parasites of salamanders (Rankin, 1937; McAllister et al., 1995) and anurans (Loomis, 1956; Duszynski and Jones, 1973; McAllister, 1991; Jung et al., 2002) across North America. McAllister et al. (1995) reported that 68% of 41 dusky salamanders, *Desmognathus brimleyorum*, were infested with larval *Hannemania* sp., and Winter et al. (1986) reported 77% infestation of the same species by *Hannemania dunni*. Unlike *Spea* spp. in our study, no juvenile *D. brimleyorum* were reported to be infested (McAllister et al., 1995). The infestation rates of *S. bombifrons* and *S. hammondi* were five of 324 (2%) and 24 of 759 (3%), respectively, in New Mexico museum specimens (Duszynski and Jones, 1973). *Scaphiopus couchii* were examined ($n=144$), but none was infested (Duszynski and Jones, 1973). These percents are within the range of what we observed via gross examination. *Scaphiopus couchii* is uncommon in playas, and we only caught one individual in this two-year study.

Due to low sample sizes of subadults

and adults, we make no conclusions regarding *Hannemania* sp. preference for one age group or sex. No difference was found in parasitism rates of *Eleutherodactylus marnockii* in Texas (Malone and Paredes-León, 2005). However, in *Plethodon ouachitae* and *Plethodon caddoensis*, males were infested more often than females (Anthony et al., 1994). Anthony et al. (1994) hypothesized male-to-male combat for females may weaken their immune system, resulting in greater parasite loads. Because presumed infestation numbers were generally low and capture rates of *Spea* sp. decline naturally, it is difficult to determine if chiggers are negatively affecting *Spea* spp. survival. Trombiculid mites are known to carry viral diseases (Speare, 1990). Whether the chiggers documented here carried diseases is unknown, but Anthony et al. (1994) reported that *Hannemania dunni* can cause structural damage to the nasolabial groove of *Plethodon* salamanders, which can cause loss of chemosensory function and possibly the ability to forage.

The reason(s) *Hannemania* sp. infestations were not detected in other sympatric species is unclear. Infestation rate may be generally low and subject to a variety of factors that dictate the level of infestation in a particular species. *Hannemania* sp. has been found in Texas specimens of the *R. berlandieri* (Jung et al., 2002), a close relative of *R. blairi*, a species present in playas. Although *Hannemania* sp. infestation in *P. clarkii* has been observed (McAllister, 1991), none of the *P. clarkii* individuals examined in this study were infested. Trombiculid mites use semim moist habitats, and *Hannemania* sp. may prefer terrestrial-aquatic over aquatic habitats (Sambon, 1928; Murphy, 1965; Sladky et al., 2000). Murphy (1965) found that in several ranid species from the same geographic area, terrestrial-aquatic species were frequently infested, while more aquatic species were not. *Spea* spp. are burrowers and may have acquired *Hannemania* sp. larvae while estivating. Perhaps

Spea spp. are the amphibian species most likely to acquire infestations because they spend more time in estivation relative to other Southern High Plains species.

We thank D. E. Green and S. Sterner of the United States Geological Survey National Wildlife Health Center in Madison, Wisconsin, for identifying chigger larvae. We would also like to thank technicians J. Hazard, L. Oztolaza, D. Gregoire, E. Toriani, K. Olson, and D. Massey for their help in the field. This project was funded by National Science Foundation grant 0201105. This protocol was approved by the Texas Tech University Animal Care and Use Committee approval numbers 02244-06 and 02235-05.

LITERATURE CITED

- ANTHONY, C. D., J. R. MENDELSON, AND R. R. SIMONS. 1994. Differential parasitism by sex on plethodontid salamanders and histological evidence for structural damage to the nasolabial groove. *American Midland Naturalist* 132: 302–307.
- DUSZYNSKI, D. W., AND K. L. JONES. 1973. The occurrence of intradermal mites (Acarina: Trombiculidae) in anurans in New Mexico with a histological description of the capsule. *International Journal of Parasitology* 3: 531–538.
- FLYNN, R. J. 1973. Arthropods. In *Parasites of laboratory animals*, R. J. Flynn (ed.). Iowa State University Press, Ames, Iowa, pp. 625–626.
- GRAY, M. J., L. M. SMITH, AND R. I. LEYVA. 2004. Influence of agricultural landscape structure on a Southern High Plains, USA, amphibian assemblage. *Landscape Ecology* 19: 719–729.
- HYLAND, K. E. 1950. The life cycle and parasitic habit of the chigger mite *Hannemania dunni* Sambon, 1928, a parasite of amphibians. *Journal of Parasitology* 36 (suppl.): 32–33.
- JUNG, R. E., K. E. BONNIE, M. L. ROSENSHIELD, A. DE LA REZA, S. RAIMONDO, AND S. DROEGE. 2002. Evaluation of canoe surveys for anurans along the Rio Grande in Big Bend National Park, Texas. *Journal of Herpetology* 36: 390–397.
- LOOMIS, R. B. 1956. The chigger mites of Kansas (Acarina: Trombiculidae). *University of Kansas Scientific Bulletin* 37: 1–1143.
- MALONE, J. H., AND R. PARDES-LEÓN. 2005. Characteristics of chigger mite (*Hannemania* sp.) parasitism on *Eleutherodactylus marnockii* (Amphibia: Leptodactylidae). *Texas Journal of Science* 57: 345–348.
- MCALLISTER, C. T. 1991. Protozoan, helminth, and arthropod parasites of the spotted chorus frog, *Pseudacris clarkii* (Anura: Hylidae), from north-central Texas. *Journal of Helminthological Society of Washington* 58: 51–56.
- , C. R. BURSEY, S. J. UPTON, S. E. TRAUTH, AND D. B. CONN. 1995. Parasites of *Desmognathus brimleyorum* (Caudata: Plethodontidae) from the Ouachita Mountains of Arkansas and Oklahoma. *Journal of Helminthological Society of Washington* 62: 150–153.
- MURPHY, T. D. 1965. High incidence of two parasitic infestations and two morphological abnormalities in a population of the frog, *Rana palustris* Le Conte. *American Midland Naturalist* 74: 233–239.
- RANKIN, J. S. 1937. An ecological study of parasites of some North Carolina salamanders. *Ecological Monographs* 7: 169–269.
- SAMBON, L. W. 1928. The parasitic acarians of animals and the part they play in the causation of the eruptive fevers and other diseases of man. *Annals of Tropical Medicine and Parasitology* 22: 67–132.
- SLADKY, K. K., T. M. NORTON, AND M. R. LOOMIS. 2000. Trombiculid mites (*Hannemania* sp.) in canyon tree frogs (*Hyla arenicolor*). *Journal of Zoo and Wildlife Medicine* 31: 570–575.
- SMITH, L. M. 2003. *Playas of the Great Plains*. University of Texas Press, Austin, Texas, 57 pp.
- SPEARE, R. 1990. A review of the diseases of the cane toad, *Bufo marinus*, with comments on biological control. *Australian Wildlife Research* 17: 387–410.
- WINTER, D. A., W. M. ZAWADA, AND A. A. JOHNSON. 1986. Comparison of the symbiotic fauna of the family Plethodontidae in the Ouachita Mountains of western Arkansas. *Proceedings of the Arkansas Academy of Science* 40: 82–85.

Received for publication 28 November 2005.