

Relapsing Fever Tick *Ornithodoros turicata* Dugès, 1876 (Acari: Ixodida: Argasidae)¹

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The Featured Creatures collection provides in-depth profiles of insects, nematodes, arachnids and other organisms relevant to Florida. These profiles are intended for the use of interested laypersons with some knowledge of biology as well as academic audiences.

Introduction

Ornithodoros turicata (Figure 1), commonly referred to as the relapsing fever tick, is a soft tick species belonging to the family Argasidae. It is a key vector of *Borrelia turicatae*, a spirochete bacterium responsible for causing tick-borne relapsing fever (TBRF). Known for its elusive behavior, *O. turicata* feeds rapidly and inhabits concealed environments such as caves, animal burrows, and cabins. While *O. turicata* is more commonly found in the southwestern United States, it has been reported in Florida, expanding its recognized range. This tick's ability to survive for extended periods and to rapidly transmit pathogens during blood meals makes it a significant vector of zoonotic diseases and presents major challenges for public health management and disease prevention (Lopez et al. 2016).



Figure 1. A) Dorsal view of an adult female *Ornithodoros turicata* showing the mammillated integument (Photo by U.S. Army Center for Health Promotion and Preventive Medicine, 16 May 2016), and ventral views of B) a female *O. turicata*, and C) male *O. turicata*

Credits: A) U.S. Army Center for Health Promotion and Preventive Medicine, 16 May 201, used with permission; B) and C) Lorenza Beati, US National Tick Collection at George Southern University, used with permission

Synonymy

Ornithodoros turicata has been reclassified numerous times since its initial description. The species was originally described by Antoine Louis Dugès in 1876 under the genus *Ornithodoros*. It was later reclassified as *Alectorobius turicata* by Cooley and Kohls in 1944 during their extensive review of Argasidae. Neumann introduced the synonym *Ornithodoros dugesi* in 1908, which was subsequently invalidated and subsumed under *O. turicata*. Hoogstraal, in his foundational work on tick taxonomy in 1985, placed the species within the subgenus *Ornithodoros*. Beck et al. (1986) revived the subspecies classification of *Ornithodoros turicata*, distinguishing *O. turicata americanus*—found in Florida—from *O. turicata turicata*, which inhabits the arid regions of the southwestern United States, based on observed ecological and biological differences in life cycle characteristics, host associations, and microhabitat preferences.

Distribution

The two subspecies of *O. turicata* currently recognized, exhibiting disjunct geographic ranges with *Ornithodoros turicata turicata*, present throughout the southwestern United States (including Texas, New Mexico and Arizona), and *Ornithodoros turicata americanus*, which occurs in parts of Florida (Donaldson et al. 2016; Figure 4A).

Ornithodoros turicata turicata thrives in arid and semi-arid climates and is commonly found in dark, climatically stable microhabitats, such as the wildlife burrows of rodents and reptiles, as well as natural rock crevices and bat roosts (Donaldson et al. 2016). In Florida, *O. turicata americanus* populations have only been recovered from gopher tortoise (*Gopherus polyphemus*) burrows, which may serve as the tick's primary microhabitat in locations with a more humid climate (Adeyeye & Butler, 1989; Donaldson et al. 2016; Canino et al. 2024). In a statewide survey of Florida, Botero-Cañola et al. (2024) were able to confirm the presence of these soft ticks in 33 counties across the state. This study also utilized Integrated Species Distribution Models (ISDM) to predict the distribution of *O. turicata americanus*, identifying that 62% of Florida comprises suitable habitat for this tick subspecies (Figure 4B). Its

presence in the state underscores the need for increased awareness of its ecology and potential to spread diseases like TBRF (Dworkin et al. 2008).

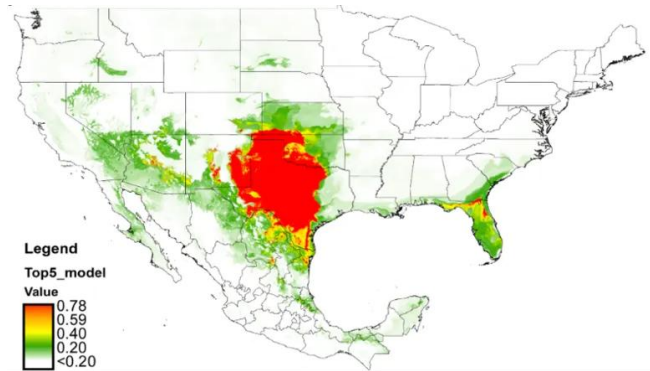


Figure 2. A) Prediction model of *O. turicata* distribution across the United States based on historical data. B) Suitable habitat map of *O. turicata americanus* in Florida based on field surveys and historical data.

Credit: A) prediction model developed by Donaldson et al. (2016), used with permission; and B) Suitable habitat map developed by Botero-Cañola et al. (2024), used with permission

Description

Ornithodoros turicata like all soft ticks is characterized by the absence of a scutum (hard outer plate) and mouthparts that are not visible from above.

Adults

Adults are small in size measuring approximately 4 to 10 mm (3/16 to 1/3 in) in length, are more robust and equipped with functional reproductive organs. They have a rounded body shape, and a wrinkled, leathery texture (Hoogstraal 1985). Their coloration is generally brown or grayish-brown, which helps them blend into their natural environment. Within the genus *Ornithodoros*, *O. turicata* can be identified from other species by its relatively large size, broadly oval shape, and distinct cuticular ornamentation, including granular sculpturing on the dorsal surface (Cooley and Kohls 1944). Morphological differences, such as the arrangement and size of dorsal setae and the characteristics of the dentition of the specialized feeding mouthparts, known as the hypostome, help distinguish *O. turicata* from closely related species like *Ornithodoros parkeri* and *Ornithodoros coriaceus* (Cooley and Kohls 1944; Hoogstraal 1985). The hypostome dentition consists of 3–4 rows of small, sharp, recurved teeth on either side, which enables a secure attachment during feeding and serves as a key diagnostic feature for species identification (Figure 2).

Eggs

After mating with a male, female *O. turicata* can lay eggs in batch of ~100 eggs. Female will lay batches of eggs multiple time throughout their lifespan.

Larvae

Six-legged larvae that typically measuring about 0.5 to 1.0 mm (~1/32 in) in length hatch from the eggs (Hoogstraal 1985).

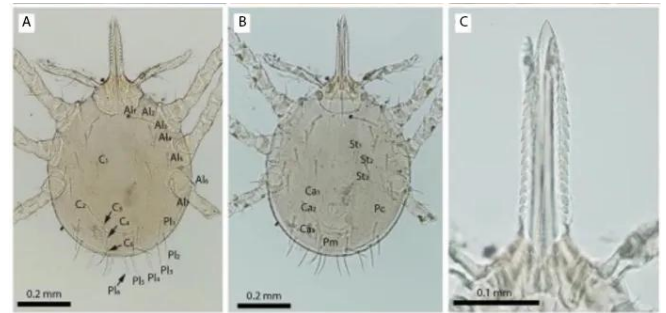


Figure 3. A) dorsal and B) ventral view of *Ornithodoros* sp. larva and C) hypostome

Credit: Subset of images from Muñoz-Leal et al. 2019, used with permission

Nymphs

Nymphs, are larger and range from 1.5 to 3.0 mm (~1/16 to 1/8 in) depending on the instar, lack the reproductive structures seen in adults and are generally less sclerotized

Life Cycle and/or Biology

The life cycle of *O. turicata* includes four stages: egg, larva, nymph, and adult (Figure 3). After hatching from the egg, the larvae feed before molting into eight-legged nymph, which can undergo four to six instars before reaching adulthood (Donaldson et al. 2016). *Ornithodoros turicata* feeding behavior is typical of the one of soft ticks and characterized by rapid attachment and feeding, facilitated by their specialized hypostome and anticoagulant secretions. The rapidity of the bloodmeal minimizes the tick's chances of being detected by the host. As an example, *Ornithodoros turicata americanus* nymphs and adults typically completing a blood meal in less than an hour—often within just 15 to 30 minutes—highlighting the species' efficiency and stealth as a vector (Beck 1986). Larvae, nymphs and adults often taking multiple meals throughout their lifespan. A remarkable feature of *O. turicata* is its ability to survive for years without feeding. This adaptation allows it to endure long periods of host absence, emerging opportunistically when a potential host enters its habitat (Donaldson et al. 2016). Its cryptic lifestyle means it resides in dark, sheltered environments, such as burrows, caves, or beneath loose soil and rocks, avoiding detection. DNA and stable isotope based bloodmeal analyses revealed that *O. turicata* feeds on a wide range of vertebrate hosts, including mammals such as livestock (cattle and pigs), companion animals (dogs), and humans, as well as reptiles, amphibians, and birds. This emphasizes its ecological versatility and potential for spillover of pathogens from wildlife to humans (Kleinerman et al. 2021; Busselman et al. 2021; Kim et al. 2021; Balasubramanian et al. 2024).

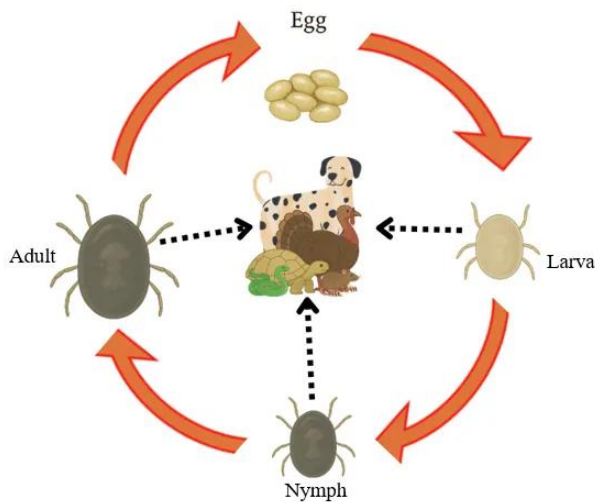


Figure 4. Life Cycle of *Ornithodoros turicata*.
Credit: Moriah Garrison, UF/IFAS; created with Canva

Medical Importance

Ornithodoros turicata is a significant vector of *B. turicatae*, one of the causative agents of TBRF. Transmission of TBRF occurs when an infected *O. turicata* feeds on a human host, injecting the spirochete through its saliva within moments of feeding (Bourret et al., 2019). The ecology of *B. turicatae* remains relatively understudied but the primary reservoirs of *Borrelia* species are rodents. In Texas, *B. turicatae* was commonly found infecting both domestic and wild canine including dogs, grey foxes and coyotes (Krishnavajhala et al. 2021). Krishnavajhala et al. (2021) also demonstrated that geographical populations of *O. turicata* exhibit variations in their vector competence for *Borrelia turicatae*, which could influence the epidemiology of TBRF across regions. Evidence of transovarial transmission of *B. turicatae* from infected *O. turicata* to their offspring is known to occur showing the role of *O. turicata* as reservoir of the virus in nature (Filatov et al. 2023; Francis 1938).

Vector competence assays in controlled laboratory settings show the ability *O. turicata* to transmit African swine fever virus (ASFV) to swine hosts (Hess et al. 1987). Although ASFV is not present in the United States currently, its introduction could devastate domestic and feral swine populations, with *Ornithodoros* ticks serving as a means for virus persistence in the environment (Golnar et al. 2019, Wormington et al. 2019). African swine fever virus introduction could lead to severe economic losses and necessitate strict biosecurity measures to control its spread (Brown and Bevins 2018).

Ornithodoros turicata's ability to feed quickly and in secluded habitats means that exposures to this tick species may go unnoticed. Public health strategies should focus on educating individuals about avoiding high-risk areas, such as caves or cabins and be vigilant while conducting activities near wildlife burrows. The use of protective

measures like tick repellents and proper clothing (e.g.: long pants, long sleeve shirts, tucking pants into socks) can help reduce tick-host contact. More research into the ecology of these soft ticks, the transmission dynamics of the pathogens they carry, and the risk of disease spread to humans and livestock is essential to better understanding this disease vector.

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