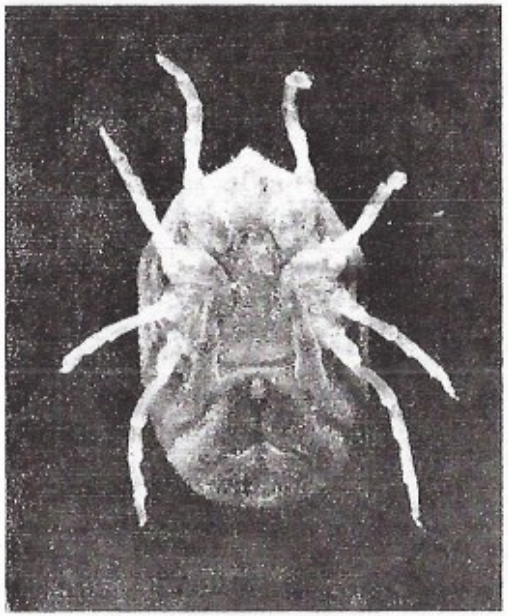

FIGURE 14. *Ornithodoros tartakovskyi,* male, ventral view. Photograph by Dr. T. C. Orihel.

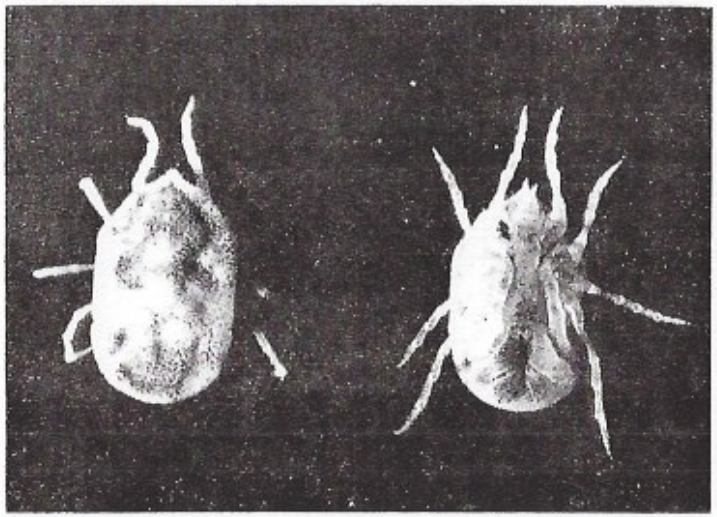

FIGURE 15. Dorsal *(left)* and ventral *(right)* view of *Ornithodoros tartakovskyi,* male.

spect to American ticks. *O. rudis* is synonymous with *O. venezolensis (O. venezuelensis)* and is the vector of *B. venezolensis* Brumpt 1921 and *B. neotropicalis* Bates and Saint-John 1922. *B. neotropicalis* has been reported also from Panama where it is transmitted by *O. rudis. O. talaje* bites animals but not man. Clark (182) believed that it transfers the infection only from animals to animals, whereas *O. rudis* takes part in the animal-vector-man-animal cycle. Davis also discussed the role of coxal fluid in the transmission of borreliae. Coxal fluid is expelled by the feeding tick as it becomes engorged with blood. It contains and transmits borreliae to the wound caused by the bite of the tick. Many ticks, like *O. turicata,* and particularly nymphs, do not expel coxal fluid but infect through their bite. This will be discussed in detail later.

Horsfall (374) added to the list of ticks carrying relapsing fever *O. brasiliensis* that harbors *B. brasiliensis, O. tholozani* as a carrier of *B. babylonensis, O. normandi* as a vector of *B. normandii,* and *O. dugesi* as a carrier of *B. dugesii.* It is doubtful, however, that *B. babylonensis* and *B. normandii* represent independent species. Horsfall emphasized that *O. erraticus* has two subspecies, namely, *O. erraticus erraticus,* the large form, the vector of *B. hispanica;* and *O. erraticus sonrai,* the small form, carrying members of the crocidurae subgroup. *O. e. erraticus* likes some moisture, *O. e. sonrai* dry burrows.

Nicolle and Anderson (524) stated that *Ornithodoros* have to be infected in the nymphal stage to become effective vectors.

Ornithodoros, therefore, may propagate borreliae from one generation to another. The borreliae may be transmitted to man and animals through the coxal fluid which contaminates the site of the insect bite, or, principally by young nymphs and in North American species also by adult ticks, through the salivary glands. The tick does not have to be injured, as does the louse, to transfer *Borrelia* to man or animals.

Observations on individual *Ornithodoros* and *Borrelia* species that are important from the medical point of view follow.

Specific Ticks and Borreliae

Ornithodoros moubata and Borrelia duttonii

Ornithodoros moubata, the eyeless tampan, has four subspecies, *O. compactus, O. apertus, O. porcinus,* and *O. porcinus domesti-*

cus (714, 715). It carries *B. duttonii*. Its principal homes are West and East Africa. Manson and Thornton (467) stated that the infection is severe, with many complications, in Europeans; severe but with few complications in the indigenous population. Moreover, these authors believed that several strains of *B. duttonii* may be carried by *O. moubata*. The organisms were described as 20 to 35 μ long, about 0.25 μ wide, with 5 to 9 spirals. Short and longer forms were common. Of 600 *O. moubata* ticks, 29% harbored borreliae. Dubois (247) also found different serotypes of *B. duttonii* in this tick.

Feng and Chung (270) could observe borreliae for a long time (11 days) in the stomach of *O. moubata* after a blood meal, but the borreliae appeared in the celomic fluid and in the salivary glands, neural ganglion, and coxal glands of the tick as early as within 6 hours. Multiplication of the borreliae took place in the organs and celomic cavity, by transverse division. No borreliae were seen by these authors in the Malpighian tubules or in the feces. The same writers stated later (271) that the central neural ganglion is the predilection site of *B. duttonii*. After long starvation, the borreliae may disappear from the coxal fluid and ovaries (428). The tick can fast long, even a year or more, and remain

FIGURE 16. Holes in fallen trees, where *Ornithodoros turicata* were found.

alive. Adults usually feed every 6 weeks, nymphs every 2 to 3 weeks.

The subspecies of *O. moubata* usually prefer a single animal

FIGURE 17. Rodent burrows harboring *Ornithodoros turicata*.

FIGURE 18. Semidesert in Asia, harboring *Ornithodoros erraticus* with small rodents.