portion bears a chitinous plate, the rest of the integument being soft to admit of its distension by the blood which is imbibed in quantity by members of this sex. For a longer or shorter period of their lives ticks are parasitic upon vertebrate animals of various kinds; but although the belief that the bite of certain tropical species is poisonous has long been held by the natives of the countries they infest and has been recorded with corroborative evidence by European authors in books of travel, it is only of recent years that accurate information has been acquired of the part played by these Arachnids in transmitting from one host to another protozoal blood-parasites which cause serious or fatal diseases to man and other animals.

Both the Argasidae and Ixodidae contain pathogenic species, of which the best known are the following: *Ornithodores monbata,* belonging to the Argasidae, and called *bibo* in Uganda, *monbata* in Angola, and *tampan* on the Zambezi, is widely distributed in tropical Africa from Uganda in the north to the Transvaal in the south. It was first recorded as poisonous by Livingstone and is now known to be the carrier of the Spirochaetc of relapsing fever, in man, known as tick fever. Although Europeans suffer from this disease far more severely than negroes, death seldom follows. The tick especially infests old huts and camping grounds and is nocturnal in habit, spending the day hidden in crevices of the walls or floor and coming out at night to feed upon the sleeping inmates. An allied species, *O. turicala,* occurs in Mexico and Texas, where it causes considerable destruction amongst poultry and is a pest to mankind as well. A similar bad repute attaches to other species in different parts of South America; while *Argas miniatus* has been proved to be the carrier of the Spirochaete causing spirillosis in fowls in Rio Janeiro, and also in New South Wales whither it has been introduced with imported poultry. *Argas persicus* has been introduced in the same way into South Africa from Europe. As its name indicates it was first discovered in Persia, where the belief in the venomous nature of its bite to human beings is both widespread and historical. It is singular that the Argasidae, which arc for the most part parasitic upon birds, contain the only species of ticks, especially *O. monbata,* which are known to be seriously harmful to mankind; whereas amongst the Ixodidae no human pathogenic species has been ascer­tained to exist, although several forms have been proved to be highly destructive to domestic mammals of different species. The most important of these are the following; *Dermacentor reticulatus,* a species widely distributed in Europe, Asia and America, infects dogs in Europe with the Haematozoon causing the disease known as "biliary fever,” and has been asserted to be answerable for the so-called spotted or tick fever in man in the Rocky Mountains. The same canine disease results in South Africa from the bite of *Haemaphysalis leachi. Amblyommahebraeum,* the bont or variegated tick of the Cape Colonists, infects sheep with the Sporozooπ causing “ heart-water ” sickness, and in Europe sheep are inoculated with the same disease by another tick, *Rhipicephalus bursa.* The so- called “ coast fever’’ in cattle in South Africa is conveyed by two distinct species of the genus *Rhipicephalus,* namely by *R. appendicu- latus* and *R. simus,* which are locally known respectively as the “brown tick” and the “black-pitted tick.” Finally *Margaropus annulatus, of* which there are several geographical races, is the carrier of the germ causing the destructive cattle-disease variously known as “ Texas ” or “ red water ” fever in America, South Africa and Australia. In the United States alone the annual pecuniary loss in cattle stock occasioned by the ravages of this tick disease was computed in 1907 at one hundred million dollars. With one or two possible exceptions, like *Argas vespertilonis,* which has only been obtained from European bats, no species of tick is known to be confined to a particular host. The common sheep-tick *(Ixodes vicinus)* of England, for example, infects cattle and dogs as well as sheep; and the pathogenetic Ixodidae above mentioned occur parasitically upon other mammals than those to which they convey the diseases specified. Reptiles are infested as well as mammals, and it is no uncommon thing to find specimens of Ixodidae of various kinds adherent to tortoises, snakes and lizards. Ticks belonging to the Ixodidae differ to a certain extent in their life-histories.

Mature males and females are found together upon the same host. Fertilization, is effected by the male transferring spermatophores into the genital orifice of the female by means of his proboscis. The gorged and fertilized female quits her hold of the host, and falling to the ground, proceeds after a short delay to lay her eggs in some sheltered spot. The number of eggs laid is enormous, one computa­tion putting it at twenty thousand. After oviposition, which may extend over several weeks, the female dies. The newly-hatched young has only three pairs of legs and is without spiracular and genital orifices. These young, or larvae as they are called, after the integument has hardened by exposure to the air, climb up the stalks of grain or herbage and cling wñth outstretched legs waiting for passing animals. They seize hold of the first that brushes by, and crawling to a suitable place become engorged with blood. After about a week’s feeding they drop to the ground, lie dormant for a month, during which time they acquire their fourth pair of legs

and spiracles, and, moulting, emerge from their old skin as *nymphs.* Nymphs repeat the behaviour of the larvae, and finally moult into the adult, showing the generative orifice, which is the mark of maturity. The adult secures a host in the same way as the young. Both sexes feed upon blood; whereas the male alters but little in appearance, the female becomes enormously distended.

From the foregoing epitome which applies to many species, *Rhipicephalus appendιculatus* for example, it is evident that every individual tick has to find a host on three occasions, namely, as larva, nymph and adult. In *R. bursa,* however, the moult that

transforms the larva into the nymph takes place on the host, and in *Margaropus annulatus* the transformation of larva into nymph and nymph into adult is effected without the temporary sojourn on the ground. Another species, *Hyalomma aegyptium,* the so-called camel-tick of Egypt and Arabia, is alleged to be parasitic only in its mature stage. Again, in *Ornithodorus monbata,* which is parasitic apparently only, at night, the young does not hatch from the egg until it has attained the nymphal stage.

It is an interesting and important fact that the newly hatched young of certain species, *Margaropus annulatus* for instance, before it has fed, if produced by a female carrying the germs of spirillosis, can infect healthy organisms with the disease. From this it is evident that the Spirochaetes pass directly from the mother tick to her offspring.

Duration of life in ticks depends upon the conditions of their existence. Under favourable conditions, when food is obtainable, growth is rapid, the time from the hatching of the young until it reaches maturity and dies after oviposition bçing, for example, about eleven weeks in *R. appendiculatus* and only about three weeks in *Μ. annulatus.* On the other hand, when food is not obtainable, life may be indefinitely prolonged if the tick be guarded from enemies and from atmospheric conditions inimical to existence. Examples of *Ixodes vicinis* have been kept for two years and three months with­out feeding, and specimens of *Argas persicus* were still alive after four years’ starvation. (R. I. P.)

**TICONDEROGA,** a village in the township of Ticonderoga, Essex county, New York, U.S.A., on the outlet of Lake George, 100 m. by rail N. by E. of Albany. Pop. (1890), 2267; (1900), 1911; (1905), 1749; (1910), 2475. Ticonderoga is served by the Delaware & Hudson and the Rutland railways. The water