

# Occurrence of the bat tick *Ornithodoros (Alectorobius) Kelleyi* Cooley & Kohls (Acari: Argasidae) in Costa Rica and its relation to human bites

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**Abstract:** Several persons from two localities in Costa Rica (San Rafael de Coronado, 1510 m and Dulce Nombre de Tres Ríos, 1445 m) were bitten by ticks, subsequently identified as *Ornithodoros (A.) Kelleyi* (Argasidae), commonly associated with bats. In the attics of their homes, live adults, larvae, nymphs and skins were found in the bat guano. Since there are no records of adult argasids in this country, a laboratory colony was established to observe the biology of these ticks and their association with bats. In this particular case, the bats were Molossidae and Vespertilionidae, both insectivorous.

Adults and last nymphal ticks easily fed on suckling white mice in the dark; feeding lasts from 20 to 40 minutes, when abundant coxal fluid is produced; oviposition occurs from 14 to 27 days later.

Comparison of the most common structures of both whole larvae and larval skins revealed no significant differences, taxonomically important, since according to the habits of the Argasidae, it is easier to find larval molts than live specimens.

In January 1979, a man, 43 years of age, from San Francisco de San Rafael de Coronado, San José, Costa Rica (1510 m), was bitten by ticks and was hospitalized for anaphylactic shock. The specimens were identified as nymphs of *Ornithodoros* spp. The patient lived in on old bat-infested frame house; in the attic live nymphs and skins were found in the bat guano, but no adult ticks. No identification of bats was possible at that time. Again in December 1980 a 72 year old man, was severely bitten by ticks in a different locality, Dulce Nombre de Tres Ríos, Province of Cartago (1145 m). The ticks were also argasids and at this time, adults were collected in the home. The house showed the same conditions as the former and also an attic with abundant bat guano. In both instances the ticks were found in crevices in walls and ceilings.

There are no previous records of adult argasids from Costa Rica. The public health and veterinary significance of these ticks are unknown for this country.

The purpose of this paper is to observe the behaviour of the tick *Ornithodoros (A.) Kelleyi* under laboratory conditions and to study, for

taxonomic purposes, the morphological characters of the larval skins, more frequently found in the habitats than whole specimens.

## MATERIAL AND METHODS

Argasid adults and nymphs were placed in 10 x 3.5 cm glass tubes with plaster of Paris at the bottom. The glass cylinders were covered with muslin and set upright in wet sand to give adequate humidity, a strip of filter paper was placed within the tubes.

Whole larval argasid ticks and larval skins were mounted in polyvinyl alcohol, measured and identified according to the keys of Jones and Clifford (1972), and the different measurements were compared.

Suckling white mice were used to feed the nymphs and adults and histological sections were made of the areas involved by the tick bite.

Bats were identified at the School of Biology, Universidad de Costa Rica.

## RESULTS

According to the keys of Jones and Clifford

TABLE 1

Comparison of measurements between larval skins and whole larvae of *Ornithodoros (A.) kelleyi*

Structure	Larval skin mean (n - 12) ( $\mu\text{m}$ )	Whole larvae mean (n - 3) ( $\mu\text{m}$ )
Body length	1 911.00	938.46
Body width	1 528.00	552.22
Hypostome length	163.55	169.39
width	45.79	42.81
Dentition Ext. file	17.28	17.10
Med. file	16.28	16.00
Inn. file	8.43	8.00
Basis capituli length	285.96	261.32
width	288.46	258.18
PH <sub>1</sub> length	17.23	20.14
PH <sub>2</sub> length	32.17	39.03
Distance between PH <sub>1</sub>	28.17	28.95
Distance between PH <sub>2</sub>	91.13	102.01
Palpi length	276.83	283.35
width	47.53	49.11
Tarsi I length	152.80	188.91
width	71.51	68.63
Dorsal plate length	312.09	316.42
width	179.09	221.97

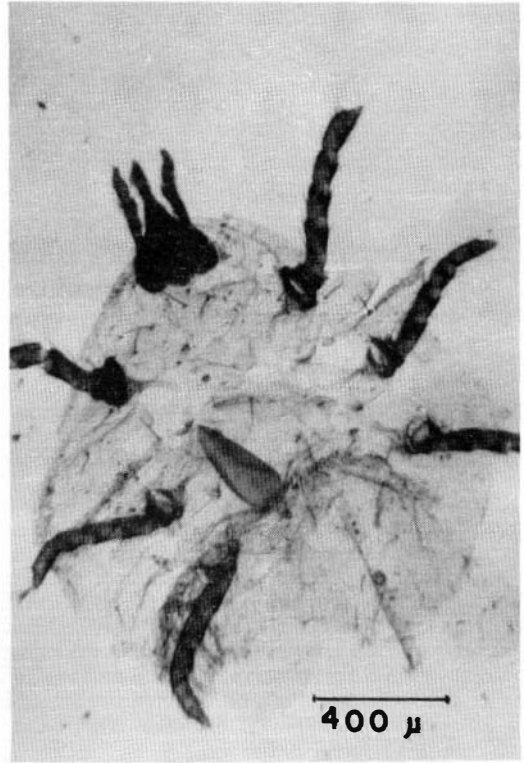


Fig. 1. Larval skin of *Ornithodoros (A.) kelleyi* Ventral view.

(1972) for Western Hemisphere argasids, the specimens are *Ornithodoros (A.) kelleyi* Cooley & Kohls (Figs. 1-5). Table 1 shows measurements of the most important structures for both whole larval specimens and larval skins.

The bats collected in San Francisco de San Rafael were identified as the broad-tailed bat (Molossidae, *Tadarida laticaudata*) and the big brown bat (Vespertilionidae, *Eptesicus fuscus*). The bats from Dulce Nombre de Tres Ríos, were identified as the Brazilian free-tailed bat and Wagner's Mastiff bat (Molossidae, *Tadarida brasiliensis* and *Eumops glaucinus*) and the big brown bat (Vespertilionidae, *Eptesicus fuscus*).

#### DISCUSSION AND CONCLUSIONS

Personal inquiries in each house revealed that in Coronado three people of the same family suffered from tick bites. G.E.F., 43 years old who showed papules and a rash on his back. E. M. L., 76 years old, reported

bitten since 1965, localized lesions appeared on his neck, arm and hand with severe aedema and pain. M. M. T., 24 years old was bitten since 1978 in the axillary region and arms, a rash appeared in scalp and forearms. In the family from Dulce Nombre de Tres Ríos, two persons were involved, F.S.E., 72 years old who reported that the bites caused inflammation, itching and red papules. His wife 63 years old, was especially attacked in many occasions; bites appeared all over her body.

According to the literature, only larvae of *Ornithodoros casebeeri* Jones & Clifford and *O. hasei* have been previously reported from Costa Rica. The former found on the rodent *Ototylomys* sp. 5 km N of Liberia, Guanacaste and the latter from *Artibeus lituratus palmarum* (?) at Mojica Ranch, Guanacaste, and from *Noctilio labialis* 9 miles ENE of Puerto Golfito, Puntarenas (Jones and Clifford, 1972; Kohls *et al.*, 1965).

*Ornithodoros kelleyi* has been found widely distributed in the United States and collected in this country only from bats and bat-inhabited

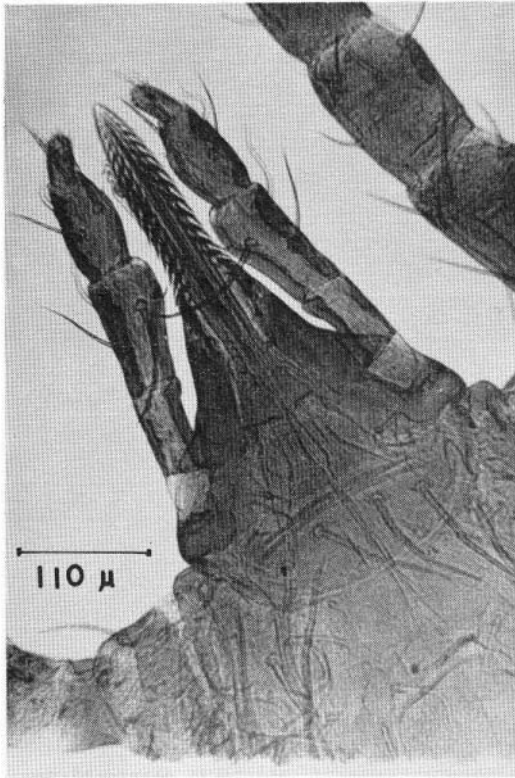


Fig. 2. Larval capitulum of *Ornithodoros (A.) kelleyi*. Dorsal view.

caves and from human habitations or other structures frequented by bats by Sonenshine and Anastos (1960), who originally described the life history of this tick.

All four species of bats, *Tadarida laticaudata*, *T. brasiliensis*, *Eptesicus fuscus* and *Eumops glaucinus*, collected in the two houses are insectivorous and are also very common and widely distributed in Costa Rica. The estimated number of Costa Rican species of bats is 105. (Jorge Jiménez J., personal communication).

The epidemiological importance of bats as hosts and the geographical distribution of *Ornithodoros* should be evaluated, especially the possibility of transmission of diseases both to animals and man.

Our laboratory observations consisted basically in trying to rear the argasids to the larval stage for taxonomic purposes.

Adults and last nymphal stage were easily fed on suckling mice. Bites were very severe and the hosts showed the characteristic local hemorrhagic lesions and strong edema around the bites. Histological sections confirmed these tissue alterations.

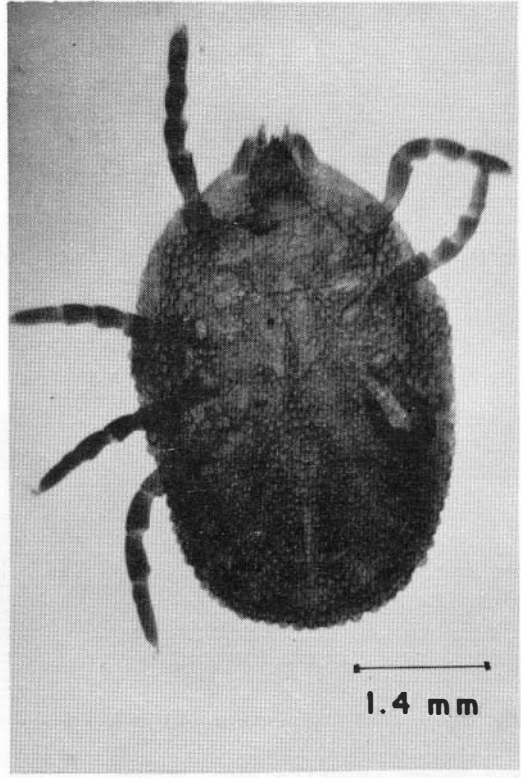


Fig. 3. Nymph of *Ornithodoros (A.) kelleyi*. Ventral view.

Sonenshine and Anastos (1960), insisted in that nymphs and adults do not feed on any host other than bats. In our observations, on the contrary, larvae, last nymphal stages and adults easily feed in the dark on suckling white mice. In this we agree with these authors in that argasids prefer to feed in subdued light or darkness and that in the last nymphal stages and adults, the feeding period is between 20 and 40 minutes.

Coxal fluid was abundantly produced during feeding by nymphs and adults; drops can be easily taken with Pasteur pipettes for other purposes.

Sonenshine and Anastos (1960) reared on bats 15 female ticks from all stages obtaining 20 to 92 eggs per batch oviposited and 5 to 92 larvae from these egg batches; they also obtained from larval ticks reared on rats and from bats, in all other tick stages, 14 to 61 eggs and none to 61 larvae. We in one instance got 35 larvae from a batch of 42 eggs.

Finally, oviposition periods occurred 10 to 210 days after the completion of feeding in the observations of Sonenshine and Anastos

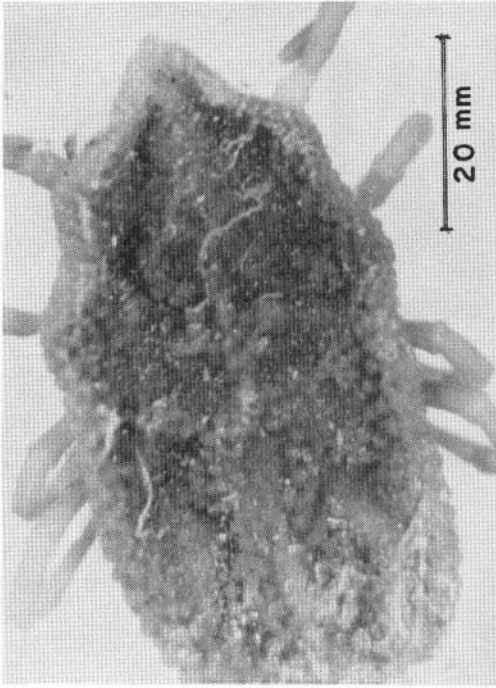


Fig. 4. Female of *Ornithodoros (A.) kelleyi*. Dorsal view.

and we on the other hand, in three groups of females observed, found that oviposition occurred between 14 to 27 days after feeding.

The use of larval skins for taxonomic and epidemiological purposes is an adequate technic (Table 1), especially applied to argasids in which, because of their biting habits, it is necessary to search for the resting places of the different life stages. All structures needed for identification are easily shown in the larval skin. The only measurements that show more variability are length and width because of distortion suffered by the larval skin.

#### ACKNOWLEDGEMENTS

I thank Dr. Manuel Ignacio Salom, Dr. Rodrigo Alvarez, who sent the argasid ticks initially taken from the houses of the persons bitten; Dr. Jorge Jiménez, School of Biology, Universidad de Costa Rica, identified the bats, Roberto Gallardo, Abel Solano, Francisco Fallas and Mayra Solano helped in the inspection of the houses, took photographs of the habitats, collected specimens and processed the guano material in the laboratory; Dr. C. M. Clifford of the U.S. Department of Health, Education and Welfare, P. H. S. National

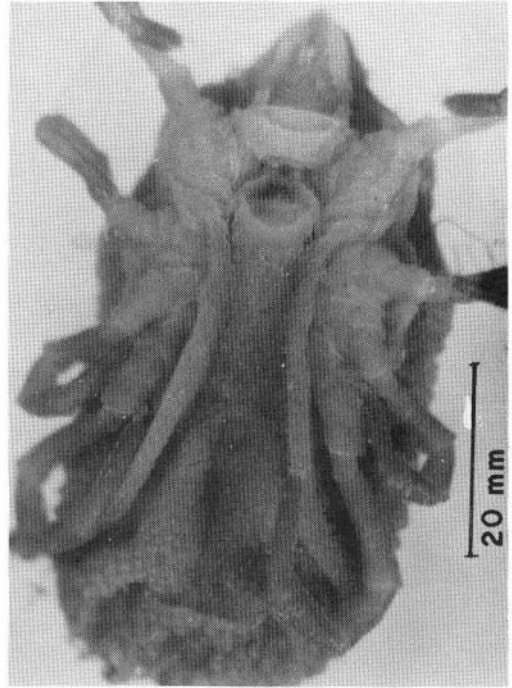


Fig. 5. Female of *Ornithodoros (A.) kelleyi*. Ventral view.

Institutes of Health, N.I.A.I.D. Rocky Mountain Laboratory, Hamilton, Montana 59840, U.S.A. confirmed the identification of the ticks and provided pertinent literature.

#### RESUMEN

Varias personas de dos localidades en Costa Rica (San Rafael de Coronado, 1510 m y Dulce Nombre de Tres Ríos, 1145 m, de las Provincias de San José y Cartago respectivamente), fueron picadas por garrapatas, subsecuentemente identificadas como *Ornithodoros (Alectorobius) Kelleyi*, argásidos asociados con murciélagos. En los áticos de las casas de los pacientes, se encontraron, en el guano, adultos, larvas, ninfas y exuvias. Como no se ha informado de argásidos adultos para Costa Rica, se estableció una colonia de laboratorio para su estudio taxonómico, y para observar la biología de las garrapatas y su asociación con los murciélagos, en este caso particular, Molossidae y Vespertilionidae, ambas familias son especies insectívoras. La colonia se estableció usando tubos de vidrio con yeso en el fondo para dar la humedad adecuada. Tanto el último estadio ninfal como los adultos se alimentan fácilmente de ratones lactantes y en condiciones de oscuridad.

Los períodos de alimentación duran de 20 a 40 minutos, notándose además, abundante producción de líquido coxal. La oviposición ocurre entre los 14 a los 27 días después de la alimentación del adulto.

El estudio de los cortes histológicos de piel de los ratones, muestra lesiones hemorrágicas locales y fuerte edema alrededor de los sitios de las picadas, lo que corrobora la fuerte acción toxigénica de estos argásidos. Se hace una comparación entre las medidas de las estructuras más comunes usadas en la taxonomía de larvas argásidas, tales como la longitud y ancho del cuerpo, hipostoma, basis capituli, palpos, tarsos I y placa dorsal, tipo de dentición, longitud y distancia de PH<sub>1</sub> y PH<sub>2</sub>. Tal estudio no reveló diferencias importantes entre especímenes completos y pieles de los mismos. Este hallazgo es importante si se considera que dentro de los hábitos de los argásidos, es más

fácil encontrar en el habitat las exuvias y no los ejemplares vivos.

## LITERATURE CITED

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