ENTOMOLOGICAL INVESTIGATIONS IN THE CHIRIQUI REGION OF PANAMA

By Lawrence H. Dunn

Medical Entomologist and Assistant Director,
Gorgas Memorial Laboratory
Panama, R. de P.

The notes presented in this paper are based largely upon observations made and specimens collected during a visit to the Province of Chiriqui, in the south-western corner of the Republic of Panama, in July, 1929. This expedition was organized by Dr. H. C. Clark, Director of the Gorgas Memorial Laboratory and included also Dr. G. B. Wislocki and Dr. A. H. Schultz, from the Johns Hopkins University, and the writer. The purposes of this visit included medical, embryological, anthropological and entomological studies on the wild monkeys of that region. This report deals with the entomological results. The writer took advantage of the opportunity offered to secure and examine a number of birds and other animals in addition to the monkeys in order to gain some general knowledge of the ectoparasites of the wild animal life of the areas visited. Specimens of the prevalent blood-sucking diptera were collected whenever possible and a few observations on the mosquito breeding occurring in the vicinity of our camp were also carried out. These investigations were conducted at Camp Pital and Puerto Armuelles and covered the period from July 11 to July 29, 1929, sixteen days at the camp and three days at the port.

Dr. Clark made two later visits to Chiriqui, in February, 1930 and August, 1931. On his 1930 trip he spent several days (in camp) at La Vaca, in a more virgin part of the same general area as Camp Pital. In 1931, he made a brief visit to the large banana plantations of the Chiriqui Land Company at Puerto Armuelles and Progreso. The latter station is situated a few miles inland from the coast, on the

Puerto Armuelles-David Railway. Mr. W. H. W. Komp, of the U. S. Public Health Service, accompanied Dr. Clark on his 1930 trip and Dr. Theodore Trimble, of the Rochester University, Rochester, N. Y., was his companion in 1931. On both these occasions a number of ectoparasites were obtained from the various animals examined as well as of the blood-sucking diptera most commonly encountered.

Since the specimens obtained during the three expeditions to Chiriqui represent many of the common species of insects and other arthropods affecting man and animals in that region, they are listed with annotations in the following pages.

Camp Pital was located in the humid lower tropical zone of the fairly level coastal plain of the south-western part of Chiriqui. It was very close to the Costa Rican border, probably not more than eight miles by direct line from the Pacific coast. Here a square area of about twenty acres had been cleared for banana culture. All trees had been felled, larger ones being left to rot and banana sets had been planted in the open spaces between the logs. The area surrounding this clearing was heavily forested, with trees of large size and an undergrowth of luxuriant vegetation. The pita plant, *Ananas magdalense*, was abundant in this locality and it was from this plant that the name of the camp was derived. The undergrowth was not of sufficient density to necessitate the use of a machete when walking in the forest, and since there were several narrow trails leading in different directions, a considerable freedom of movement was possible in the forest nearby.

The animal and bird life in this region was abundant and varied and the easy passage in the forest made good hunting conditions. It was also a nearly ideal location for collecting blood-sucking diptera, since the abrupt change from the deep shade of the forest to the open sunlight of the clearing provided conditions favorable for both shade and sun loving species.

Two native hunters and one of the members of our party were usually out after specimens of animals and birds during the early part of each day. A number of muslin bags

of various sizes were carried by the hunters and each animal or bird shot was immediately placed in one of the bags which was then closed and tied with twine.

At the camp each bag was carefully opened on a large piece of Canton flannel spread out on an improvised table. The bag was slowly turned back until the animal was left lying in the center of the flannel. Any ectoparasites present were usually collected first from the animal and then from the bag, if any adhered to the inner side of it. A comb was sometimes used in examining animals with long hair. With birds it was found advisable to pluck out most of the feathers. Some of the birds were infested with parasitic flies that were quite active and difficult to capture. When such birds were brought in, they were placed, while still in the bags, in a wooden box and sprinkled with chloroform. The vapor of this penetrated the bags and stupefied or killed all the flies that were on the birds, which were then easily collected. The nap of the Canton flannel on which the examinations were made impeded any of the fleas, lice, etc., that attempted to hop or walk on it and facilitated their capture.

Engorged ticks in larval or nymphal forms were placed in pill boxes or glass tubes in order that they might develop to later stages. Dipterous larvæ producing Myiasis were removed from animals and, if nearly mature, placed in wide mouth bottles containing about an inch of damp earth to allow them to pupate and emerge as adults.

Since the study of monkeys was the principal purpose of our expedition to Chiriqui, a few words about the examination of these animals are appropriate. A total of 107 monkeys killed or captured at Camp Pital were examined for ectoparasites. This included 53 Orsted's titi monkeys, *Saimiri orstedii orstedii;* 29 Panama white-throated monkeys, *Cebus capucinus imitator,* and 25 Geoffroy's spider monkeys, *Ateles geoffroyi.* Although the examination of these monkeys occupied a considerable part of my time while at the camp, they were not productive of ectoparasites.

One female tick was found walking about on a freshly

killed titi monkey, but since it was not attached and contained no blood it was not credited with being a parasite of the animal.

The howling monkeys, *Alouatta palliata inconsonans*, at Puerto Armuelles were found to suffer from Myiasis due to dipterous larvæ but no howlers were taken during our stay at the camp and no myiasis was noted in any of the monkeys examined there.

No lice-infested monkeys were found. The freedom of these monkeys from ectoparasites causes me to wonder if the species examined at the camp are habitually free from infestation of parasitic arthropods in this region or if it may have been due to the climate conditions prevailing at the time.

A very large number of blood-sucking and parasitic diptera were collected, various genera in several families being represented.

It was somewhat surprising to find that comparatively few adult mosquitoes were in evidence at the camp. There were a number of streams and pools exposed to sunlight in the cleared area, while in the surrounding forest there were numerous streams, pools and small swamps in dense shade. Thus the conditions in the immediate vicinity of the camp were suitable for mosquito larvæ that preferred either sunlight or shaded environments. There were also many natural depressions present in the large tree trunks lying about the clearing which contained varying amounts of water adapted to certain species. The so-called tin can invasion had preceded us at this camp and a considerable number of tin cans that had previously contained fruits or vegetables had been thrown in a pile near the camp by former occupants. In some of these cans a small amount of the contents had been left and as the cans filled with water from rains this vegetable matter, and also leaves that had fallen into the cans from nearby trees, became decomposed and caused the water to become very foul. Mosquito larvæ were found in a number of these cans. Enamelware soup bowls were used for breeding out the larvæ investigated. It is to be regretted that the opportunity did not permit a more

extensive study of the mosquitoes breeding in this region, since in my opinion such observations would very probably be repaid by finding many interesting species.

Anopheles albimanus Wiedemann. From one to four adults of this species were collected each morning on the inside of the wall netting and cloth ceiling of the camp. They probably gained entry through numerous small holes and rips in the netting. Cursory examinations of several of the nearby pools and streams were made but no larvæ of this or other species of Anopheles were found.

Anopheles punctimacula Dyar and Knab. Two females of this species were captured on the ceiling inside the camp.

Culex bonnexæ Dyar and Knab. Adults of this species were bred from the larvæ present in considerable numbers in a ground pool (in which the end of a tree trunk was lying). The finding of this species in Panama increases our knowledge of its distribution since it previously has been reported only from Dutch Guiana where it is a common species and breeds in artificial receptacles, tree holes and ground pools.

Culex corniger Theobald. Larvæ of this species were numerous in several small ground pools.

Culex coronator Dyar and Knab. Numerous larvæ were present in a ground pool surrounding the base of a large stump in the cleared area.

Culex declarator Dyar and Knab. This species was breeding in profusion in water in a natural hollow in a log in the clearing.

Culex inflictus Theobald. Breeding in old tin cans where it occurred both alone and in association with *Joblotia digitata*. The larvæ were also found in a hollow in a log in company with *Hæmagogus lucifer*.

Aëdes angustivittatus Dyar and Knab. Represented by three females that were captured while biting man at the edge of the forest.

Aëdes quadrivittatus (Coquillett). Several females were captured near the camp while in the act of biting man. They

were taken in late afternoon and on cloudy days. Finding this species at Camp Pital indicates that it has a rather unusual altitudinal range since it previously has been reported only from higher elevations, having been taken up to 9,000 feet, and was considered as an *Aedes* of high altitudes only.

Mansonia titillans (Walker). Two females of this species were taken within our camp and a third was captured outside while biting man. It was remarkable that this mosquito was not more in evidence since masses of the floating water plant, *Pistia stratiotes*, to the roots of which the larvæ of this species remain attached, were present in the Madre Viejo River about two miles from Pital.

Hæmagogus lucifer Howard, Dyar and Knab. Many adults reared from larvæ collected from water in a hollow in a log. *Culex inflictus* larvæ were also present in this water.

The entomological fauna of Camp Pital was found to be rich in blood sucking flies of the family Tabanidæ. The door of the camp had evidently been open for some time previous to our arrival and many flies of various families had entered and were grouped about on the inside of the screens when we moved in. A number of these were captured and thirty-eight proved to be Tabanidæ, with four genera and seven species represented.

A mule used for transporting supplies was kept at the camp and during the greater part of the day it was tied at the edge of the forest to graze. This animal proved to be good bait for attracting Tabanidæ and numerous specimens were collected from it. It also gave me an opportunity for making a few observations concerning the biting habits of some of the species.

Pangonia prasiniventris Macquart. Flies of this species were quite numerous and caused much annoyance to the pack animals at Camp La Vaca in February, 1930. Dr. Clark collected ten specimens at this time.

Stibosoma flavistigma Hine. Only one specimen of this large fly was captured on the mule at Camp Pital. It was noted approaching with a swift circling flight and a loud

buzzing sound. It made several attempts to alight on the belly of the mule but each time it struck with so much force and noise that the animal flinched and twitched its skin to prevent it. After a number of trials it succeeded in alighting on the inside of the upper part of the hind leg and began to feed. This gave me a chance to capture it. A second specimen was also seen making several efforts to alight on the mule but, like the first one, it struck so forcibly and noisily that it startled the animal each time and caused it to flinch and stamp its feet. The fly finally ceased its attempt to alight and flew away. It did not return while I was observing the mule.

Lepidoselaga lepidota Wiedemann. Three of these flies were captured inside the camp at Camp Pital. They were taken some days after our arrival and apparently had gained entrance through holes in the screening or while the doors were open. A fourth specimen was captured as it was feeding upon an ox in a pasture near Esperanza Station. Since this species appears to pass its larval and pupal stages at the base of the crown of leaves of the water lettuce, *Pistia stratiotes*, it is quite probable that these flies were much more numerous in closer proximity to rivers, streams, pools, etc., in which these plants were present.

Chrysops melænus Hine. Twenty-four flies of this species were captured while they were feeding upon the mule at Camp Pital. They seemed to confine thier attacks mainly to the region about the animal's ears.

Chrysops calogaster Schiner. One of the small flies of this species was found inside the camp at Camp Pital upon our arrival.

Dichelacera analis Hine. Flies of this species were found to be much more numerous than any other of the Tabanidæ and were the most persistent in their attacks on man and animals. A total of 165 specimens were collected at Camp Pital and Puerto Armuelles. Twenty-two of these were found inside the camp upon our arrival, where they had entered apparently for shade. The remainder were taken while biting either man or the mule. They were present

throughout the day and until late in the evening, seeming to become more active at twilight. They were vicious biters and very persistent in their attempts to obtain blood. They apparently were attracted by motion and when one was moving in the forest they followed to circle about with a vicious hum and dart at one's face, hands or any exposed part of the body and immediately begin biting. If one stood or sat quietly for a few minutes most of these flies gradually disappeared, although a few invariably remained and continued their efforts to feed. They were to be found by the hundreds attacking the mule at nearly all times. Some preference seemed to be shown for the neck and head but they were found on nearly all parts of the animal's body at times. They were rather slow in filling with blood and when gorged became quite sluggish. The wings were held partly extended while feeding. Although this species was much more common along the edge of the forest, they frequently appeared in bright sunlight as well.

Dichelacera submarginata Lutz. This was nearly as abundant as *D. analis* and 94 specimens were collected, fifteen found inside the camp resting on the screens. They seemed to center their attacks upon the mule and apparently were not much attracted by humans, only one being taken while biting man. They attacked the mule all during the day and early evening and, strangely enough, never attempted to feed on any part of the animal except the lower legs. From 20 to 50 were usually present on each leg and it was very seldom that a single individual was noticed biting above the knees. They gathered in masses at the fetlocks and around the coronary region at the top of the hoofs. They are slow feeders and required some little time to engorge. The mule did not seem to experience much annoyance from their attacks and seldom stamped its feet to prevent their bites. When brushed from the animal's legs these flies flew only a few inches and immediately returned to resume their feeding. They seemed to be noiseless in flight when approaching or leaving the mule.

Tabanus albocirculus Hine. Flies of this species were

quite common at Camp Pital and were present in considerable numbers on the mule. It was noted that most of those on the animal at any one time were located about the head and neck.

Tabanus calignosus Bellardi. This species was represented in our collections by only two specimens. One of these was taken inside the camp and the other was captured while feeding upon the mule.

Tabanus festivus Hine. Five of these flies were collected at Camp Pital, three on July 13th and two on July 20th. They were not in evidence except while feeding, or about to feed, on the mule. They approached with a swift flight and after a short circling about darted at the animal and settled on the lower frontal area of its head. All five seemed to attempt to bite at almost the same spot. The first three captured were taken within an hour and although they came only one at a time the sites of the three bites could have been covered with a silver dollar. These flies were very wary and it was almost impossible to capture them until after they had begun to take blood.

Tabanus fumomarginatus Hine. Five specimens were taken at Camp Pital, two in the camp on the evening of our arrival and three others later on the mule.

Tabanus inanis Fabricius. Two flies of this species were collected by Dr. Clark as they were attacking the pack mules at Camp La Vaca in February, 1930.

Tabanus leucaspis Wiedemann. Two of these flies were collected from the mule at Camp Pital.

Tabanus occidentalis Linnæus. This species was present in abundance and attacked the horses and mules at Progreso in August, 1931. Two specimens were collected by Dr. Clark at this time.

Tabanus stenocephalus Hine. This species was quite common at Camp Pital and a number of specimens were captured as they fed upon the mule. They did not appear to favor any particular part of the animal.

Tabanus unistriatus Hine. Many flies of this species were

present at Camp Pital and Puerto Armuelles. They bit man and animals with equal readiness.

Lynchia augustifrons (Van der Wulp). A male and female of this species were collected from a Swainson's toucan, *Rhamphastos swainsonii* Gould, at Camp Pital.

Stilbometopa ramphastonis Ferris. Two females of this species were found on a Swainson's toucan, *Rhamphastos swainsonii* Gould, at Camp Pital. These proved to be a new species and were named and described by Ferris.

Ornithoica confluenta (Say). Three specimens of these flies were collected from two Swainson's toucans, *Rhamphastos swainsonii* Gould, at Camp Pital.

Olfersia vulturis Pan der Wulp. Flies of this species were collected from four black vultures, *Catharista urubu* (Viellot), that were examined at Camp Pital. Three of these birds yielded three flies each, and five were taken from the fourth.

Olfersia spinifera (Leach). Several of these flies were taken from a king vulture, *Gypagus papa* Linnæus, by Dr. Clark at Camp La Vaca. There were many of these flies present on the bird but they were very difficult to capture. So many escaped that a bed net was hung from a limb of a tree and the dead bird placed in it in order to secure the flies. Four specimens were collected inside the net. The following day one of these flies was captured as it alighted upon the head of the native cook and attempted to crawl into his hair. The second day another fly of this species was found on the outside of the bed net, in which the bird had been placed. (It had been left suspended in order that it could be used if others with parasitic flies were taken.) Probably these two flies were among those that had left the bird to escape capture (one or two days previously and had later returned to seek their host again.)

Lipoptena mazamæ Rondani. Twelve of these small parasitic flies were found on a brocket deer, *Mazama sartorii reperticia* Goldman, that was killed in the forest near Camp Pital.

Cuterebra bæri Shannon & Green. Four large, mature larvæ of this species were collected by Dr. Wislocki from a young, black howling monkey, *Alouatta palliata inconsonans* Goldman, that was killed at Puerto Armuelles on July 27, 1929. These four larvæ were located in the skin in the region of the neck and an empty nodular pocket from which a fifth larva apparently had emerged was nearby. Three other young howling monkeys were shot at the same time. One of these was infested with a small, immature larva of this species. The other two each bore a number of empty nodular pockets from which it is more than likely that larvæ of this species had emerged a short time previously. Specimens of the larvæ were reared to adult flies in order to confirm the identifications. Larvæ of this species were collected in the Darien region by J. L. Baer, in 1924, and have been reported upon by Shannon and Green (1). Since there seems to be no record of this species having been taken in Chiriqui this is probably the first report of its presence in Western Panama.

Dermatobia hominis Linnæus. A larva of this species located itself on the inner side of Dr. Clark's elbow at Camp La Vaca in February, 1930. Two coatis, *Nasua narica panamensis* Allen, killed at Camp Pital, were found to be infested with larvæ of this species. A mature larva, about 21 mm. in length, was located in the right femoral region of one of the animals. The second coati was infested with two of the larvæ. They were approximately two-thirds mature and were situated at about the middle of the animal's tail, but little more than an inch apart. The tail was badly swollen, crooked at an obtuse angle and looked as though it were broken. From the appearance of the lesions one would assume that both these animals had suffered a considerable amount of pain and discomfort from the presence of these larvæ.

Gastrophilus nasalis Linnæus. A total of 58 of the larvæ, or "bots," of this species was found in a horse that was autopsied at Progreso, Chiriqui, on August 25, 1931. Fifty-six of these larvæ were clustered to form a rosette near the

pyloric orifice of the stomach while two were found unattached in the stomach contents. These larvæ were large and apparently nearly mature. This seems to be the first record of this species in Panama and since it was found in an animal that had always been on the Isthmus there is no doubt regarding it being established in Chiriqui, at least.

Stomoxys calcitrans Linnæus. These flies were very common in the vicinity of Camp Pital and great numbers of them could be found feeding upon the pack mule all during the daylight hours. They apparently made no attempts to attack man.

Cochliomyia macellaria Fabricius. The screw worm flies were extremely abundant in the vicinity of Camp Pital during our stay there. They usually appeared in large numbers as soon as animals that had been killed were brought into camp and they became very active in darting about and attempting to deposit their eggs on the carcasses. The hunters, after killing and bagging animals, frequently left them lying by the side of some forest trail or hanging from the branch of a tree to be carried into camp on their return. Sometimes these bagged carcasses were left for periods of three or four hours and when much bleeding occurred the bags become blood soaked and large masses of eggs, most of which were probably of *C. macellaria*, were deposited on them. Occasionally these masses of eggs were several inches in diameter and nearly half an inch thick, and must have represented the ovipositions of large numbers of the flies. There were often a number of such masses attached to a bag, adhering very tightly to the cloth and difficult to remove completely by washing or scraping. A novel method finally evolved for cleaning the bags was to hang them in a stream and let the countless numbers of small minnows that were present tear the eggs from the cloth and devour them. These minnows came in great numbers as soon as an egg-bearing bag was placed in the water and they remained to feed as long as a single egg was available.

Simulium quadrivittatum Loew. The small blood-suck-

ing flies of this species were numerous in the vicinity of Camp Pital and proved to be very annoying. They were persistent in their attacks and seemed to be ready to bite at nearly any time during the day or early evening. They would attack freely while in bright sunshine in open spaces but under such condition usually selected the under side of one's arms or hands and did not direct their attacks to the face. On rainy or cloudy days they seemed to appear in greater numbers. While feeding they became swollen and the abdomen when distended with blood assumed a deep red color. After becoming engorged they were very sluggish and could easily be picked off with one's fingers. A large number of specimens of this species was collected.

Culicoides fluviatilis Lutz. The small sandflies of this species were very prevalent at Camp Pital. Any of the members of our party who remained seated in a shady situation for a few minutes were attacked by numbers of these bloodthirsty diptera. They seemed to become more active and persistent in their attacks during late afternoon and early evening.

Culicoides parænsis Goeldi. Only one specimen of this species was taken at Camp Pital. They were, however, very common in the vicinity of Puerto Armuelles. One morning while at the latter place I was engaged in watching the actions of a group of monkeys in the forest about a mile from the sea-shore and remained seated in a small open area for nearly thirty minutes. During this time I was bitten by a number of these flies. Their attacks seemed to be mostly on my arms and hands. A number of specimens captured at this time all proved to be *parænsis*.

Lasiohelea sp., probably *stylifer* Lutz. One specimen was collected at Camp Pital. It was taken while feeding upon my arm in the early evening as I was seated under a palm-thatched shelter.

Ctenocephalides felis Bouché. A few fleas of this species were taken from a dog owned by one of the native hunters at Camp Pital. Undoubtedly this species may be found in abundance throughout all parts of Chiriqui where cats or dogs are present.

Rhopalopsyllus australis tupinus Jordan and Rothschild. Several males and females of this species were taken from two agoutis, *Dasyprocta punctata nuchalis* Goldman, that were captured at Camp Pital.

Rhopalopsyllus lugubris cryptoctenes Enderloin. This species was represented by five specimens on one of the agoutis.

Pediculus (*Parapediculus*) *atelophilus* Ewing. This species of sucking lice was found in abundance upon two baby monkeys purchased at Camp Bogamani by Dr. Clark in 1930. Camp Bogamani is located about five miles from Camp Pital. It is one of the District Camps of the Chiriqui Land Company and many of the men employed in clearing work and banana culture kept monkeys and other animals as pets. Those obtained there consisted of several very young red spider monkeys, *Ateles geoffroyi* Kuhl, and one white-throated monkey, *Cebus capucinus imitator* Thomas. One of the red spider monkeys was noted as being infested with lice at the time it was purchased. It was necessary to confine these six monkeys in the same cage during a period of about three days while being brought to this laboratory. On their arrival many lice were found on the white-throated monkey. It would seem that it must have been infested before being purchased at Bogamani. Both of these infested monkeys were also heavily infected with malaria at this time and were in very poor condition. The heavy infestation of the white-throated monkey was probably due to its weak and emaciated condition. Under normal conditions the *Cebus* monkeys keep themselves well picked over and seldom become infested with lice. The other four red spider monkeys each showed an infestation with lice a few days after arrival at the laboratory. It is of interest to note that no lice were found upon twenty-five red spider monkeys and twenty-nine white-throated monkeys that were examined soon after being captured or killed at Camp Pital while one, probably two, out of six monkeys that had been kept as pets proved to be infested with *Pediculus* (*Parapediculus atelophilus*.

Since nineteen species, representing eleven genera and

four families, of Mallophaga were collected from the comparatively small number of infested animals and birds, it is probable that many species of biting lice would be found on more extensive collecting. Seven species were taken from the tinamous, four from the black headed vulture and three from the Swainson's toucans. In listing these species I have followed Harrison's (2) work of 1916, since this seems to be the latest comprehensive paper.

Menopon alternatum Osborn. Specimens of this species were found in small numbers on two black vultures, *Catharista urubu* (Vieillot), examined at Camp Pital.

Menopon balfouri Waterston. This species was present in all stages on five Swainson's toucans, *Rhamphastos swainsonii* Gould. It seems to be the prevailing species infesting these toucans.

Menopon ortalidis Carriker. Many males, females and immature specimens were collected from a curassow, *Crax globiceri* (Linnæus).

Colpocephalum kelloggi Osborn. A few males and females of this species were present on four black vultures, *Catharista urubu* (Vieillot).

Myrsidea extranea Carriker. A number of males, females and young forms were found upon three Swainson's toucans, *Rhamphastos swainsonii* Gould.

Myrsidea mirabilis Carriker. Several males and females of this species were collected from a Wagler's oropendula, *Zarhynchus wagleri wagleri* (Gray).

Læmobothrion glutianans Nitzsch. Several specimens of males and females of the large lice of this species were taken from three black vultures, *Catharista urubu* (Vieillot), examined at Camp Pital.

Trichodectes nasuatis Osborn. The small lice of this species were present in considerable numbers on each of three young coatis, *Nasua narica panamensis* Allen.

Goniodes aberrans Carriker. This species was found to be abundant in all stages on eight tinamous, *Tinamus major castaneiceps* Salvadori, that were eximined. Two of

these birds were taken at Camp La Vaca and six at Camp Pital. This species may be considered the most constant and the most numerous of the Mallophaga found in tinamou in Western Panama.

Goniodes laticeps Piaget. A few specimens in various stages of development were found on five out of eight tinamous, *Tinamus major castaneiceps* Salvadori, that were examined.

Goniodes minutes Carriker. Several specimens were collected from each of two tinamous, *Tinamus major castaneiceps* Salvadori.

Goniodes spinosus Piaget. A number of males and females of this species were taken from two tinamous, *Tinamus major castaneiceps* Salvadori, at Camp La Vaca.

Kelloggia brevipes Carriker. Taken in considerable numbers from each of eight tinamous, *Tinamus major castaneiceps* Salvadori, examined.

Ornicholax robustus Carriker. Present in small numbers on each of six tinamous, *Tinamus major castaneiceps* Salvadori, examined.

Philopterus cancellosus Carriker. Several males and females were collected from a Swainson's toucan, *Rhamphastos swainsonii* Gould.

Degeeriella francisi Carriker. This species was represented by six specimens taken from a Wagler's oropendula, *Zarhynchus wagleri wagleri* (Gray), at Camp Pital.

Esthiopterum assesor Giebel. This appears to be the predominating species of Mallophaga found upon the black vultures, *Catharista urubu* (Vieillot). Four of these birds were examined at Camp Pital and each yielded many specimens.

Esthiopterum columbæ Linnæus. One specimen was found on a Cassin's dove, *Leptotila cassini cassini* (Lawrence), at Camp Pital.

Esthiopterum tinami Carriker. One female of this species was taken from a tinamou, *Tinamus major castaneiceps* Salvadori.

Although these records of ticks from Chiriqui represent only seven species, probably only a small part of the total number present, they include two species which do not seem to have been recognized in Panama previously.

Ixodes ricinus (Linnæus). A number of males and females were collected from a forest deer, *Mazama sartorii reperticia* Goldman, killed near Camp Pital.

Dermacentor nitens Neumann. Several specimens of this tick were taken from a horse at Progreso by Dr. Clark. Since this species is commonly found on horses in many parts of Panama it is undoubtedly abundant throughout Chiriqui.

Amblyomma cajennense (Fabricius). One of the native hunters found an unengorged female of this species crawling about on him soon after his return from a trip in the forest near Camp Pital. Several specimens were also collected from a horse at Progreso by Dr. Clark. It is probable that this species is as ubiquitous in Chiriqui as in other parts of Panama.

Amblyomma cœlebs Neumann. A dead female of this species was found in the bag in which a spectacled owl, *Pulsatrix perspicillata* (Latham), had been placed a short time previously at Camp Pital. The tick was quite dry and it is possible that it may have been carried on the feathers of the bird from some nest or dead host. Two females were also taken from a horse at Progreso by Dr. Clark. One of these, partly engorged, was more than 11 mm. in length. This appears to be the first record of this species in Panama.

Amblyomma mantiquirense Aragao. A number of males, females and engorged nymphs were collected from a collared peccary, *Pecari angulatus crusnigrum* (Bangs), that was killed near Camp La Vaca. This seems to be the first occasion on which this species has been found in Panama.

Amblyomma oblongoguttatum Koch. This species was found to be present in abundance upon a collared peccary, *Pecari angulatus crusnigrum* (Bangs), that was killed near Camp La Vaca. Numerous males, females and nymphs were

also taken from a forest deer, *Mazama sartorii reperticia* Goldman, killed near Camp Pital.

Amblyomma ovale Koch. A female of this species was found crawling about on a titi monkey, *Saimiri orstedii orstedii* (Reinhardt), when the latter was removed from the bag in which it had been placed two or three hours earlier. Since this tick was not attached and contained no blood it is believed that the monkey was only an accidental host.

Trombicula dunni Ewing. The mites, or "red bugs," of this species were present in great numbers upon two agoutis, *Dasyprocta punctata nuchalis* Goldman, and three coatis, *Nasua narica panamensis* Allen, at Camp Pital. They were scattered in small groups over nearly all parts of the agouti with additional large masses appearing as bright red spots, nearly 10 mm. in diameter, on either side of the upper and lower jaws, along the edges of the ears and at various places on either side of the body over the ribs on both these animals. One of them also had one of the masses beneath its chin. They were not so abundant on the coatis and were confined mostly to large masses on both ears of each of the animals. One of these coatis also had a large patch of the red bugs located on the dorsal line about midway of its back. These mites proved to represent a new species and were named and described by Ewing.

I wish to express my thanks and appreciation to Dr. H. C. Clark, for his aid in collecting many of the specimens, and also to Dr. C. T. Greene, Dr. J. Bequært, Dr. O. Krober, Dr. G. F. Ferris, Dr. H. E. Ewing, Dr. Karl Jordan and Dr. F. W. Edwards for their kindness in identifying many specimens of the various groups for me.

REFERENCES

(1) Shannon, R. C., and Greene, C. T.: A Bot-fly Parasitic in Monkeys. Zoopathologica, Vol. 1, No. 7, pp. 285-290. 1926.

(2) Harrison, L.: The Genera and Species of Mallophaga. Parasitology, Vol. IX, No. 1, pp. 1-155. 1916.