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A survey of the blood parasites of vertebrates in Eastern Columbia.

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and JULIAN DE ZULUETA.

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We present in this paper the results of a survey of the blood parasites of vertebrates carried out in Colombia from 1946 to 1949. The material was collected in the Llanos or plains of Eastern Colombia and studied at the Villavicencio laboratory, originally built as a station for research on jungle yellow fever. At the time of beginning the studies reported in this paper, the laboratory was devoted to investigations on anophelines and human malaria directed by the Rockefeller Foundation, International Health Division. In 1948, the laboratory became directly attached to the Colombian Ministry of Hygiene and the name Instituto de Enfermedades Tropicales "Roberto Franco" was given to it.

Our studies were undertaken with the view of gaining more knowledge on the *Plasmodium* infections of birds and of related parasites in wild animals. We felt that the scarcity on South American data on these subjects justified our studies, and warranted the publication of this report. Before the publication in Colombia of the studies of RENJIFO (1948, 1950) and SANMARTÍN (1948) only occasional references to blood parasites of vertebrates can be found in local publications.

We think it necessary, before discussing the results of our survey, to give a brief description of the area where our studies were carried out. Villavicencio is situated at the foot of the Eastern range of the Andes at the meeting point of the mountain slopes and the vast plains of Eastern Colombia. Villavicencio has developed in recent years as a centre of land and air communications between the high plateau of Bogotá, densely populated, and the Llanos or low plains, still a wild and sparsely inhabited area. The Villavicencio region was until recently heavily forested; the pasture land around the town is due to artificial clearing. The savannas, the natural grassland characteristic of the Llanos, begin only

some 15 km. East of Villavicencio. They increase in width towards the East, where forest areas are reduced to narrow galleries along the rivers. Palm groves are usually found around lagoons or in the flooded savanna. Our material was collected mainly in the piedmont area of Villavicencio, but a good many specimens were also obtained in the savannas and the forests of the Llanos proper; localities of capture are given in the adjoining map.

Rainfall in Villavicencio is heavy, amounting to nearly 4½ m. per year, as shown by our laboratory records covering ten years' observations. This is due to a great extent to the vicinity of the mountain front; observations from other parts of the Llanos show a marked reduction in annual rainfall, but it is always above 1,500 mm. As would be expected, humidity is high; average monthly records of midday readings are always above 70 per cent R.H. The mean maximum-minimum temperature for the last ten years has been 26.3° C. and the variations along the year are very small. There are, however, considerable daily fluctuations in temperature due to the continental character of the Villavicencio climate. The reader is referred for more information regarding the climate and general features of this area to the publications of BATES (1948) and DE ZULUETA (1950).

In spite of the sustained observations made during the last years, the study of the local fauna is far from complete. As regards birds, the number of species so far recorded from the Llanos is above 500. As can be seen in the adjoining Table, a total of 335 birds representing 98 species were examined in our survey. The samples of bats, monkeys, rodents and marsupials are also large enough to indicate the frequency with which blood parasites can be found in these groups. The other samples are, owing to the small number of specimens examined, insufficient to show the incidence of blood parasites.

The general results obtained in the bird survey show a high incidence of blood parasites. *Plasmodium* was found in 7.7 per cent of the birds examined; *Haemoproteus* in 10.1 per cent and *Microfilaria* in 8.9 per cent. Probably the incidence was in fact higher, since in most cases the examination was reduced to the search in blood films, lungs, spleen and liver, made at the time of death. Serial examinations were only performed in a few cases in which the birds were caught alive in traps, like the rail *Aramides cajanea*. But usually the birds were shot, blood taken immediately from the heart and visceral impressions made. In this way, latent infections are likely to pass undetected and infections with low parasitaemia could also be overlooked.

Table

PISCES				
Name	Locality	Date	Number examined	Haemo-parasites
<i>Electrophorus electricus</i>	Caño Suría	Mar. 46	1	—
<i>Unidentified specimens</i>				
?	Puerto López	Jul. 46	1	—
?	?	Jul. 46	2	—

REPTILIA and AMPHIBIA

Name	Locality	Date	Number examined	Micro-filaria	Haemogre-garina
<i>Crotalidae</i>					
<i>Lachesis muta</i>	Ocoa	Mar. 46	1	—	1
<i>Bothrops atrox</i>	Caño Grande	May 46	1	—	—
<i>Boidae</i>					
<i>Boa hortulana</i>	Navajas	Jul. 46	1	—	1
<i>Constrictor constrictor</i>	Boca de Monte	Mar. 46	1	—	1
<i>Ophidia sp.</i>	Villavicencio	Mar. 49	1	—	1
<i>Testudinata sp.</i>	Ocoa	Mar., Apr. 46	2	2	—
<i>Bufo</i>					
<i>Bufo marinus</i>	Villavicencio	May 46	1	—	—

AVES

Name	Locality	Date	Number examined	Plasmo-dium	Haemo-proteus	Trypano-soma	Spirochae-tales	Micro-filaria
<i>Tinamidae</i>								
<i>Crypturellus soui soui</i>	Guatiquía	Mar. 46	1	—	—	—	—	—
» » »	Yurimena	May 46	1	—	—	—	—	—
<i>Ardeidae</i>								
<i>Tigrisoma lineatum lineatum</i>	Quenane	Mar., Apr. 46	2	—	—	—	—	—
<i>Cochlearidae</i>								
<i>Cochlearius cochlearius cochlearius</i>	Ocoa	Mar. 46	1	—	—	—	—	—
<i>Threskiornithidae</i>								
<i>Phimosus infuscatus berlepschi</i>	Ocoa	Feb. 46	2	1	—	—	—	—
<i>Guara rubra</i>	Ocoa	Feb. 46	1	1	—	—	—	—
<i>Theristicus caudatus</i>	Remolino	Feb. 48	1	—	—	—	—	—

AVES

Name	Locality	Date	Number examined	Plasmodium	Haemoproteus	Trypanosoma	Spirochaetales	Microfilaria
<i>Accipitridae</i>								
Harpagus bidentatus bidentatus	Yurimena	May 46	1	—	1	—	—	—
Ictinia plumbea	Guatiquía	Mar. 46	1	—	—	—	—	—
Heterospizias meridionalis meridionalis	Yurimena	May 46	1	—	—	—	—	—
» » »	Yurimena	Feb. 48	1	—	—	—	—	—
Geranospiza caerulescens	Ocoa	Feb. 46	1	—	—	—	—	—
Asturina nitida nitida	Puerto López	Mar. 48	1	—	—	—	—	—
<i>Falconidae</i>								
Daptrius americanus americanus	Ocoa	Feb. 46	2	—	—	—	—	—
Polyborus cheriway cheriway	Quenane	Apr. 46	1	—	—	—	—	—
» » »	Yurimena	Feb. 48	2	—	2	—	—	—
» » »	Remolino	Feb. 48	1	—	1	—	—	—
Milvago chimachima cordatus	Remolino	Mar. 48	1	—	1	—	—	—
<i>Cracidae</i>								
Penelope obscura jacquáçu	Ocoa	Feb. 46	1	1	—	—	—	—
» » »	Yurimena	May 46	1	—	1	—	—	—
<i>Phasianidae</i>								
Gallus gallus domesticus	Navajas	Jun. 46	1	—	—	—	—	—
» » »	Villavicencio	Jan., Mar. 48	6	—	—	—	—	—
» » »	Yurimena	Mar. 48	36	—	—	—	—	—
<i>Opisthocomidae</i>								
Opisthocomus hoazin	Ocoa	Feb. 46	4	—	—	1	—	1
<i>Rallidae</i>								
Aramides cajanea cajanea	Ocoa	Mar., Jul. 46	19	12	—	—	—	9
» » »	Caño grande	Apr. 46	1	1	—	—	—	1
» » »	Acacías	Jun. 46	2	2	—	—	—	1
<i>Scolopacidae</i>								
Tringa solitaria	Guatiquía	Mar. 46	1	—	—	—	—	—
» » »	Remolino	Mar. 48	1	—	—	—	—	—
<i>Columbidae</i>								
Columba speciosa	Ocoa	Feb., Apr. 46	3	—	—	—	—	—
Columba cayennensis cayennensis	Yurimena	May 46	1	—	1	—	—	—
» » »	Yurimena	Jan. to Mar. 48	19	1	13	—	—	3
» » »	Puerto López	Mar. 48	1	—	1	—	—	—
Zenaida auriculata stenura	Yurimena	May 46	2	—	1	—	—	—
Columbigallina minuta minuta	Quenane	Apr. 46	2	—	—	—	—	—
Columbigallina talpacoti rufipennis	Apiay	Mar. 48	2	—	1	—	—	—
» » »	Villavicencio	Mar. 48	3	1	1	—	—	—
» » »	Yurimena	Mar. 48	1	—	—	—	—	—
Leptotila rufaxilla pallidipectus	Quenane	Apr. 46	1	—	—	—	—	—

AVES

Name	Locality	Date	Number examined	Plasmodium	Haemoproteus	Trypanosoma	Spirochaetales	Microfilaria
<i>Psittacidae</i>								
Amazona amazonica amazonica	Yurimena	May 46	1	—	—	—	—	—
Amazona ochrocephala panamensis	Apiay	Mar. 48	2	—	—	—	—	—
Ara manilata	Yurimena	Mar. 48	2	—	—	—	—	—
Aratinga pertinax lehmanni	Apiay	Mar. 48	2	—	—	—	—	—
» » »	Puerto López	Mar. 48	4	—	—	—	—	—
Brotogeris cyanoptera	Ocoa	Feb. 48	1	—	—	—	—	—
Forpus conspicillatus conspicillatus	Villavicencio	Jan. 48	2	—	—	—	—	—
<i>Strigidae</i>								
Otus choliba	Villavicencio	Jun. 46	1	—	1	—	—	—
» »	Yurimena	Feb., Mar. 48	2	—	—	—	—	—
<i>Micropodidae</i>								
Reinarda squamata semota	Yurimena	May 46	2	—	—	—	—	—
<i>Trochilidae</i>								
Phaethornis hispidus	Quenane	Mar. 46	1	—	—	—	—	—
Trochilidae sp.	Villavicencio	Jan. 48	1	—	—	—	—	—
» »	Puerto López	Feb. 48	1	—	—	—	—	—
» »	Apiay	Mar. 48	1	—	—	—	—	—
<i>Momotidae</i>								
Momotus momota microstephanus	Yurimena	May 46	1	—	—	—	—	1
<i>Capitonidae</i>								
Capito auratus punctatus	Ocoa	Feb. 46	1	—	—	—	—	—
Capito niger punctatus	Ocoa	Mar. 48	1	1	—	—	—	1
<i>Ramphastidae</i>								
Pteroglossus castanotis castanotis	Guatiquía	Mar. 46	2	1	—	—	—	—
» » »	Ocoa	Feb. 48	2	—	—	—	—	1
Pteroglossus viridis humboldti	Guatiquía	Mar. 46	1	—	—	—	—	—
Ramphastos tucanus cuvieri	Puerto López	Mar. 48	1	—	—	—	—	—
<i>Picidae</i>								
Chrysoptillus punctigula punctipectus	Guatiquía	Mar. 46	1	—	—	—	1	1
» » »	Ocoa	Feb. 48	1	—	—	—	—	—
Phloeocestes melanoleucus melanoleuc.	Ocoa	Feb. 46	1	—	—	—	—	—
Dryocopus lineatus lineatus	Yurimena	Mar. 48	1	—	—	—	—	1
Picumnus squamulatus squamulatus	Ocoa	Feb. 48	1	—	—	—	—	—
Melanerpes cruentatus	Ocoa	Feb. 48	2	—	—	—	—	—

AVES

Name	Locality	Date	Number examined	Plasmodium	Haemoproteus	Trypanosoma	Spirochaetales	Microfilaria
<i>Dendrocolaptidae</i>								
<i>Dendroplex picus picus</i>	Yurimena	May 46	1	—	—	—	—	—
<i>Xiphorhynchus guttatus guttatoides</i>	Ocoa	Feb. 46	1	—	—	—	—	—
<i>Xiphorhynchus spixii similis</i>	Ocoa	Feb. 46	1	—	—	—	—	—
<i>Lepidocolaptes souleyetii lineaticeps</i>	Quenane	Mar. 46	1	—	—	—	—	1
<i>Dendrocolaptidae</i> sp.	Villavicencio	Mar. 48	1	—	—	—	—	—
<i>Formicariidae</i>								
<i>Taraba major granadensis</i>	Guatiquía	Mar. 46	1	—	—	—	—	—
<i>Thamnophilus punctatus interpositus</i>	Ocoa	Feb. 46	1	—	—	—	—	—
» » »	Quenane	Mar. 46	1	—	—	—	—	1
<i>Thamnophilus doliatus fraterculus</i>	Villavicencio	Mar. 48	1	—	—	—	—	—
<i>Thamnophilus tenuipunctatus</i>	Ocoa	Feb. 48	1	—	—	—	—	—
<i>Pipridae</i>								
<i>Teleonema filicauda</i>	Quenane	Mar. 46	1	—	—	—	—	—
<i>Tyrannidae</i>								
<i>Colonia colonus leuconota</i>	Guatiquía	Mar. 46	1	—	—	—	—	—
<i>Muscivora tyrannus monachus</i>	Quenane	Apr. 46	1	—	—	—	—	—
» » »	Cháviva	Feb. 48	4	—	—	—	—	—
» » »	Yurimena	Mar. 48	1	—	—	—	—	—
» » »	Puerto López	Mar. 48	1	—	—	—	—	—
<i>Myarchus ferox brunescens</i>	Guatiquía	Mar. 46	1	—	—	—	—	—
<i>Myarchus</i> sp.	Villavicencio	Jan. 48	1	—	—	—	—	—
» »	Apiay	Mar. 48	3	—	—	—	—	—
<i>Pitangus sulphuratus rufipennis</i>	Villavicencio	Jan., Mar. 48	5	—	—	—	—	—
» » »	Apiay	Mar. 48	1	—	—	—	—	—
» » »	Yurimena	Mar. 48	1	—	—	—	—	—
<i>Hirundinidae</i>								
<i>Progne tapera tapera</i>	Yurimena	May 46	1	—	—	—	—	—
<i>Corvidae</i>								
<i>Cyanocorax violaceus</i>	Yurimena	May 46	1	—	—	—	—	—
» »	Quenane	Apr. 46	1	—	—	—	—	1
<i>Troglodytidae</i>								
<i>Thryothorus rutilus hypospodius</i>	Guatiquía	Mar. 46	1	—	—	—	—	—
<i>Troglodytidae</i> sp.	Villavicencio	Jan. 48	1	—	—	—	—	—
» »	Puerto López	Feb. 48	1	—	—	—	—	—
<i>Turdidae</i>								
<i>Turdus leucomelas albiventer</i>	Yurimena	May 46	1	—	—	—	—	—
<i>Turdus albicollis berlepschi</i>	Quenane	Mar. 46	1	—	—	—	—	—
<i>Turdus ignobilis debilis</i>	Villavicencio	Mar. 48	3	—	—	—	—	—

A V E S

Name	Locality	Date	Number examined	Plasmodium	Haemoproteus	Trypanosoma	Spirochaetales	...
<i>Parulidae</i>								
<i>Dendroica breviunguis</i>	Quenane	Apr. 46	1	—	—	—	—	
<i>Dendroica petechia aestiva</i>	Villavicencio	Jan. 48	1	—	—	—	—	
<i>Icteridae</i>								
<i>Ostinops decumanus decumanus</i>	Quenane	Apr. 46	1	—	—	—	—	
» » »	Yurimena	May 46	1	—	—	—	—	
» » »	Yurimena	Mar. 48	3	1	—	—	—	
<i>Molotrus bonariensis venezuelensis</i>	Quenane	Apr. 46	1	—	—	—	—	
<i>Gymnomystax mexicanus</i>	Yurimena	Mar. 48	1	—	—	—	—	
<i>Leistes militaris</i>	Cháviva	Feb. 48	1	—	—	—	—	
» »	Yurimena	Mar. 48	1	—	—	—	—	
» »	Remolino	Mar. 48	1	—	—	—	—	
<i>Ostinops angustifrons angustifrons</i>	Puerto López	Feb. 48	3	—	—	—	—	
» » »	Ocoa	Mar. 48	2	—	—	—	—	
<i>Thraupidae</i>								
<i>Tachyphonus surinamus brevipes</i>	Quenane	Apr. 46	1	—	—	—	—	
<i>Schistochlamys melanopis melanopis</i>	Yurimena	May 46	1	—	—	—	—	
<i>Cissopis leveriana leveriana</i>	Villavicencio	Mar. 48	2	—	—	—	—	
<i>Ramphocelus carbo venezuelensis</i>	Villavicencio	Jan. 48	1	—	—	—	—	
<i>Thraupis palmarum melanoptera</i>	Villavicencio	Jan., Mar. 48	3	—	1	—	—	
» » »	Apiay	Mar. 48	2	—	—	—	—	
<i>Thraupis virens leucoptera</i>	Villavicencio	Jan., Mar. 48	5	—	2	—	—	
<i>Fringillidae</i>								
<i>Paruaria gularis nigro-genis</i>	Navajas	Jul. 46	1	—	—	—	—	
<i>Sporophila plumbea whiteleyana</i>	Yurimena	May 46	2	—	—	—	—	
<i>Violatinia jacarini splendens</i>	Yurimena	May 46	1	—	—	—	—	
<i>Arremon taciturnus axillaris</i>	Ocoa	Feb. 46	1	—	—	—	—	
<i>Myospiza aurifrons cherriei</i>	Yurimena	May 46	1	—	—	—	—	
» » »	Remolino	Feb. 48	1	—	—	—	—	
» » »	Villavicencio	Mar. 48	4	—	—	—	—	
<i>Emberizoides herbicola sphenurus</i>	Yurimena	May 46	1	—	—	—	—	
<i>Sicalis flaveola flaveola</i>	Villavicencio	Jan., Mar. 48	9	—	—	—	—	
» » »	Ocoa	Feb. 48	1	—	—	—	—	
<i>Fringillidae sp.</i>	Puerto López	Feb. 48	1	—	—	—	—	
» »	Yurimena	Mar. 48	1	—	—	—	—	
<i>Bucconidae</i>								
<i>Bucco richardsoni richardsoni</i>	Ocoa	Feb. 46	1	—	—	—	—	
<i>Chelidoptera tenebrosa tenebrosa</i>	Puerto López	Mar. 48	1	1	?	—	—	
<i>Charadriidae</i>								
<i>Belonopterus chilensis cayennensis</i>	Remolino	Feb. 48	1	—	—	—	—	
» » »	Yurimena	Mar. 48	2	—	—	—	—	

A V E S

Name	Localiy	Date	Number examined	Plasmodium	Haemoproteus	Trypanosoma	Spirochaetales	Microfilaria
<i>Anatidae</i>								
<i>Cairina moschata</i> var.	Yurimena	Mar. 48	2	—	2	—	—	—
» » »	Villavicencio	Mar. 48	5	—	3	—	—	—
<i>Cuculidae</i>								
<i>Crotophaga ani</i>	Villavicencio	Jan., Feb. 48	4	—	—	—	—	—
» »	Apiay	Feb., Mar. 48	8	—	—	—	—	—
<i>Galbulidae</i>								
<i>Galbula tombacea tombacea</i>	Villavicencio	Jan. 48	1	—	—	—	—	—
<i>Ciconidae</i>								
<i>Jabiru mycteria</i>	Remolino	Mar. 48	1	—	—	—	—	—
<i>Jacanidae</i>								
<i>Jacana jacana</i>	Yurimena	Mar. 48	2	—	—	—	—	—
<i>Meleagridae</i>								
<i>Meleagris gallopavo</i>	Yurimena	Mar. 48	1	—	—	—	—	—
<i>Unidentified specimens</i>								
?	Villavicencio	Feb. to Jul. 46	5	—	—	—	—	—
?	Ocoa	Feb. to Jun. 46	18	—	1	1	—	2
?	Apiay	Jun. 46	2	—	—	—	—	—
?	Quenane	Mar. 46	2	—	—	—	—	—
?	Navajas	Jul. 46	3	1	—	—	—	—
?	Yurimena	May 46	9	—	1	2	—	—

MARSUPIALIA

Name	Locality	Date	Number examined	Haemo-parasites
<i>Didelphidae</i>				
<i>Didelphis marsupialis</i>	Ocoa	Jan. to Mar. 46	18	—
» »	Caño Grande	Apr., May 46	8	—
» »	Ocoa	Jun. 46	7	—
<i>Metachirus nudicaudatus</i>	Ocoa	Mar. 46	1	—
<i>Metachirus longicaudatus</i>	Ocoa	Jun. 46	1	—

XENARTHRA

Name	Locality	Date	Number examined	Trypano- soma	Micro- filaria
<i>Dasypodidae</i>					
<i>Dasypus novemcinctus</i>	Ocoa	Feb., Mar. 46	4	1	2
» »	Caño Grande	Apr., May 46	5	—	—
<i>Dasypus</i> sp.	Ocoa	Jan. 46	2	—	—
<i>Myrmecophagidae</i>					
<i>Myrmecophaga</i> sp.	?	?	1	—	—
» »	Yurimena	Jul. 48	1	—	—
<i>Bradypodidae</i>					
<i>Choloepus didactylus</i>	Caño Grande	Jun. 46	1	—	Adult worms

RODENTIA

Name	Locality	Date	Number examined	Trypano- soma	Micro- filaria
<i>Muridae</i>					
<i>Rattus rattus alexandrin.</i>	Villavicencio	Jan. 46	1	1	—
<i>Cricetidae</i>					
<i>Cricetidae</i> sp.	Villavicencio	Jan., May 46	10	—	—
» »	Ocoa	Jan., Feb. 46	8	—	—
» »	Yurimena	May 46	1	—	—
<i>Echimyidae</i>					
<i>Proechimys o'conelli</i>	Ocoa	Feb., Jun. 46	3	1	2
» »	Caño Grande	Apr., May 46	3	—	1
» »	Yurimena	May 46	2	—	—
» »	Ocoa	Jul., Aug. 48	4	—	—
<i>Cavidae</i>					
<i>Dasyprocta fuliginosa</i>	Ocoa	Mar. 46	1	—	—

CHIROPTERA

Name	Locality	Date	Number examined	Trypano- soma	Micro- filaria	Piro- plasma
<i>Emballonuridae</i>						
<i>Peropteris macrotis macrotis</i>	Villavicencio	Mar., Apr. 46	4	1	—	—
» » »	Ocoa	Jun. 46	1	—	—	—
<i>Rhynchiscus naso</i>	Navajas	Jul. 46	2	—	—	—

CHIROPTERA

Name	Locality	Date	Number examined	Trypano-soma	Micro-filaria	Piro-plasma
<i>Phyllostomidae</i>						
<i>Artibeus jamaicensis</i>	Yurimena	May 46	11	—	—	—
<i>Glossophaga soricina soricina</i>	Restrepo	Jun. 46	1	—	—	—
<i>Carollia perspicillata perspicillata</i>	Villavicencio	Mar., Apr. 46	52	11	19	—
» » »	Villavicencio	May 46	43	6	4	—
» » »	Restrepo	Jun. 46	39	—	—	—
» » »	Villavicencio	Jul. 46	1	—	—	—
<i>Micronycteris megalotis</i> subsp.	Ocoa	Jun. 46	1	—	—	—
<i>Phyllostomus hastatus</i> subsp.	Villavicencio	May, Jul. 46	13	5	—	5
» » »	Yurimena	May 46	3	1	—	—
» » »	Restrepo	Jun. 46	1	—	—	—
<i>Desmodidae</i>						
<i>Desmodus rotundus rotundus</i>	Villavicencio	May 46	3	—	—	—
<i>Diphylla eucaudata</i>	Villavicencio	Mar. 46	5	—	—	—
» »	Ocoa	May 46	2	—	—	—
» »	Restrepo	Jun. 46	1	—	—	—
<i>Molossidae</i>						
<i>Eumops aubryi</i> subsp.	Yurimena	May 46	1	—	—	—
<i>Molossus obscurus</i>	Yurimena	May 46	1	—	—	—
» »	Trinidad	Jul. 46	2	—	—	—
<i>Verperilionidae</i>						
<i>Myotis nigricans nigricans</i>	Villavicencio	Jun. 46	1	—	—	—
» » »	Navajas	Jul. 46	1	1	—	—

ARTIODACTYLA

Name	Locality	Date	Number examined	Micro-filaria
<i>Tayassuidae</i>				
<i>Tayassu</i> sp.	Ocoa	Jun. 46	1	1
<i>Cervidae</i>				
<i>Mazama</i> sp.	Ocoa	Jun. 46	1	—

CARNIVORA

Name	Locality	Date	Number examined	Micro-filaria
<i>Mustelidae</i>				
<i>Eira barbara bimaculata</i>	Ocoa	Mar. 46	1	—
<i>Procionidae</i>				
<i>Nasua</i> sp.	Ocoa	Mar. 46	1	1
<i>Canidae</i>				
<i>Cerdocyon thous</i>	Ocoa	Jul. 46	1	—
» »	?	Mar. 46	2	—

PRIMATES

Name	Locality	Date	Number examined	Plasmodium	Trypanosoma	Microfilaria
<i>Cebidae</i>						
<i>Aotus trivirgatus trivirgatus</i>	Sardinata	Feb. 46	21	—	—	6
» » »	?	Mar. 46	1	—	—	1
» » »	Restrepo	Feb. to Jul. 46	26	—	—	6
<i>Alouatta seniculus seniculus</i>	Quenane	Mar. 46	2	—	—	—
<i>Ateles belzebuth belzebuth</i>	Rio Negro	Feb. 46	1	—	—	—
» » »	Guayuriba	Feb. 46	1	—	—	—
<i>Cebus fatuellus</i>	San Martín	Feb. 46	1	—	—	—
» » »	Los Medios	Feb. 46	1	—	—	—
<i>Lagothrix lagotricha</i>	Ocoa	Feb. 46	1	—	—	—
» » »	Guatiquía	Feb. 46	1	—	—	—
» » »	Restrepo	Aug. 48	1	—	—	—
<i>Callicebus ornatus</i>	Restrepo	Feb. 46	1	—	1	—
» » »	Acacías	Jul. 48	1	—	1	—
<i>Saimiri sciureus</i>	Sardinata	Feb. 46	9	1	—	1
» » »	Acacías	Feb. 46	4	1	—	—
» » »	Ocoa	Feb. 46	1	—	—	1
» » »	Guacavía	Jun. 46	1	—	—	—
» » »	Guayuriba	Jul. 46	1	—	—	—
» » »	Surimena	Jul. 46	1	—	—	—
» » »	?	Mar. 49	1	—	—	—

We must make clear that the diagnosis of *Plasmodium* was only made when there were trophozoites or gametocytes in the blood with morphology which left no doubt about this being a plasmodial infection. Confirmation of the *Haemoproteus* type of infection by the finding of schizonts in the lungs was made in many cases, but not in all, and we think it possible that some of the *Haemoproteus* infections may be in fact *Plasmodium* infections in which asexual forms have disappeared from the blood and only gametocytes remain to be seen.

The finding of infections of the genus *Plasmodium* is probably the most interesting in this kind of survey. A good number of the blood films with *Plasmodium* parasites were kindly examined by Dr. R. D. MANWELL of Syracuse University, New York, to whom we are indebted for the identification of the following species:

Plasmodium nucleophilum in a specimen of *Phimosus infuscatus* and in another of *Guara rubra*, captured in the Ocoa forest near Villavicencio.

Plasmodium cathemerium in a specimen of *Aramides cajanea*, also caught in the Ocoa forest. Dr. MANWELL found also in this case forms likely to be of *P. relictum*.

Plasmodium vauhani, again from an *Aramides cajanea* caught in the Ocoa forest.

As regards the blood films taken from another *Aramides cajanea* caught in the same area, Dr. MANWELL made the following comments: "I am inclined to think that the bird had a mixed infection. One of the species looked very much like some strains of *Plasmodium relictum*, except that the gametocytes showed few grains of pigment, and these grains were massed instead of scattered. However, they are always massed in immature gametocytes; and perhaps these were not full grown. If I am right in thinking, there may have been a mixed infection, the second species is possibly a new one. The segmenters are larger than such species as *hexamerium*, but smaller than *relictum* and *cathemerium*. But, like both these species, the nucleus of the host cell was displaced, at least in some cases. I saw nothing which looked like a second type of gametocytes however."

Among the plasmodial infections not submitted to Dr. MANWELL, we found in a specimen of *Columbigallina talpacoti* caught in Villavicencio an infection due to a small parasite with segmenters having 3 to 8 merozoites and gametocytes of the elongated type with round grains of pigment; the nucleus of the host cell was not displaced. The morphology in general was that of *Plasmodium hexamerium*.

Plasmodial infections were also found in a specimen of *Columba cayennensis* captured in Hacienda Yurimena and in another of *Capito niger* caught in the Ocoa forest, but in both cases the small number of trophozoites and gametocytes makes even a tentative identification difficult.

In a specimen of *Ostinops decumanus* shot in the Hacienda Yurimena, we found a *Plasmodium* infection with low parasitaemia and with morphology similar to *P. vaughani*.

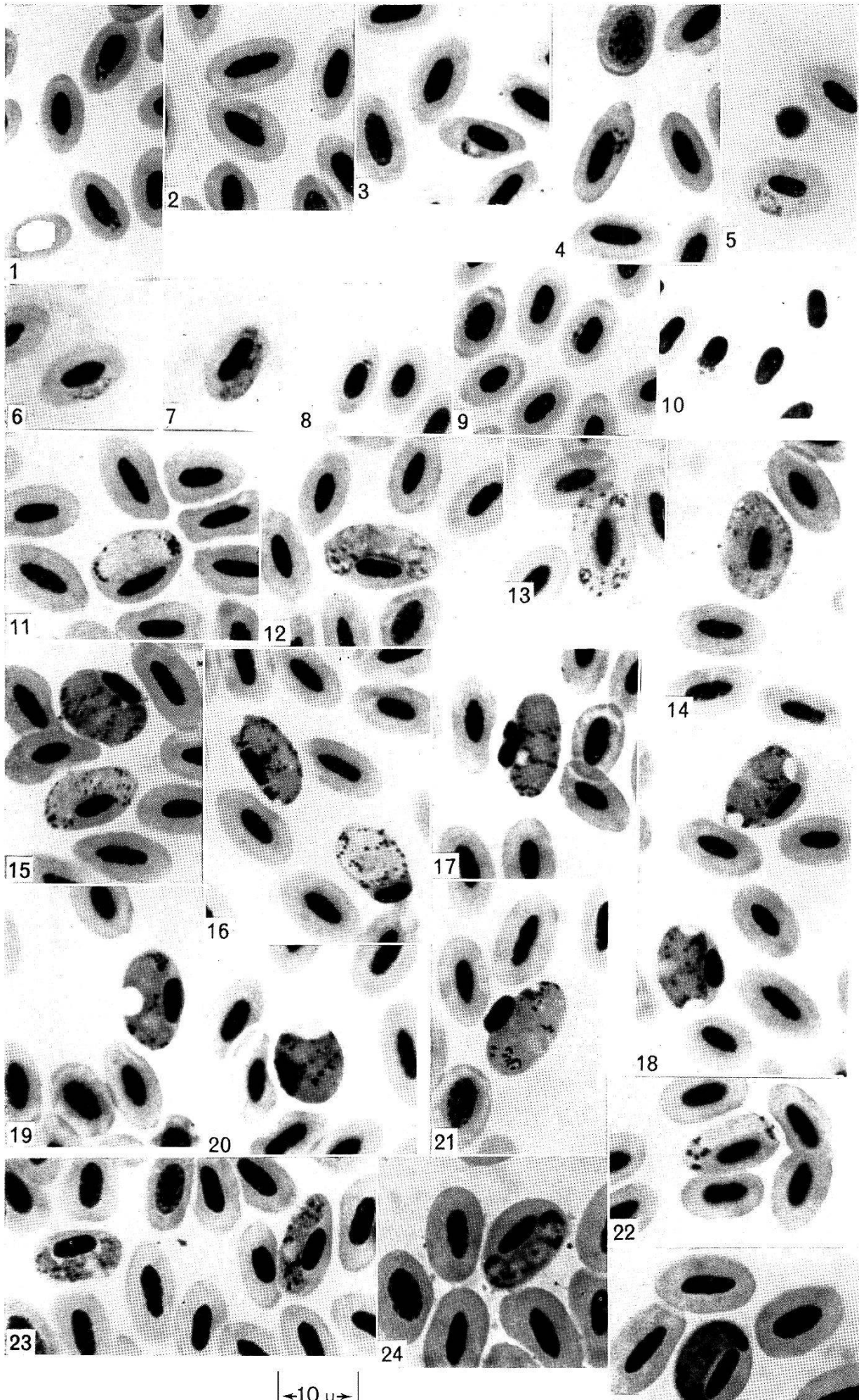
A puzzling finding was made in a specimen of *Chelidoptera tenebrosa* caught near Puerto López. Gametocytes were extremely abundant but no trophozoites could be seen, as in the case of *Haemoproteus* infections. Their morphology, however, was such that we are inclined to believe that it was a *Plasmodium* infection. The tendency in all mature gametocytes was to displace the nucleus of the host cell, but, as can be seen in the following figures, there was considerable variation in the shape of the parasites and in the displacement of the nucleus. The pigment and the characters of the chromatin and cytoplasm were nevertheless the same in all forms and we think it likely that it was in fact a single parasite species.

In the monkeys *Plasmodium* was only found in the *Saimiri sciureus*, which had been found previously infected with *P. brasilianum*.

Microphotographs.

All blood films stained with Giemsa.

- Fig. 1. *Plasmodium* sp. in *Capito niger punctatus*. Trophozoite and young segmenter.
- Figs. 2 and 3. *Plasmodium* sp. in *Capito niger punctatus*. Trophozoites.
- Fig. 4. *Plasmodium* sp. in *Capito niger punctatus*. Segmenter.
- Fig. 5. *Plasmodium* sp. in *Columbigallina talpacoti rufipennis*. Segmenter.
- Fig. 6. *Plasmodium* sp. in *Columbigallina talpacoti rufipennis*. Young gametocyte.
- Fig. 7. *Plasmodium* sp. in *Columbigallina talpacoti rufipennis*. Gametocyte.
- Figs. 8 and 9. *Plasmodium* sp. in *Ostinops decumanus decumanus*. Trophozoites.
- Fig. 10. *Plasmodium* sp. in *Ostinops decumanus decumanus*. Young segmenter.
- Fig. 11. *Plasmodium* sp. in *Chelidoptera tenebrosa tenebrosa*. Male gametocyte.
- Fig. 12. *Plasmodium* sp. in *Chelidoptera tenebrosa tenebrosa*. Male gametocyte.
- Fig. 13. *Plasmodium* sp. in *Chelidoptera tenebrosa tenebrosa*. Two male gametocytes within a single cell.
- Fig. 14. *Plasmodium* sp. in *Chelidoptera tenebrosa tenebrosa*. Male gametocyte encircling the nucleus of the host cell.
- Fig. 15. *Plasmodium* sp. in *Chelidoptera tenebrosa tenebrosa*. Male and female gametocytes.
- Fig. 16. *Plasmodium* sp. in *Chelidoptera tenebrosa tenebrosa*. Male and female gametocytes. The last one showing vacuoles.
- Figs. 17 to 21. *Plasmodium* sp. in *Chelidoptera tenebrosa tenebrosa*. Female gametocytes showing vacuoles in different situations.
- Fig. 22. *Haemoproteus* sp. in *Columba cayennensis cayennensis*. Male gametocyte.
- Fig. 23. *Haemoproteus* sp. in *Columba cayennensis cayennensis*. Two female gametocytes.
- Fig. 24. *Haemoproteus* sp. in *Cairina moschata* var. Male gametocyte.
- Fig. 25. *Haemoproteus* sp. in *Cairina moschata* var. Female gametocyte.



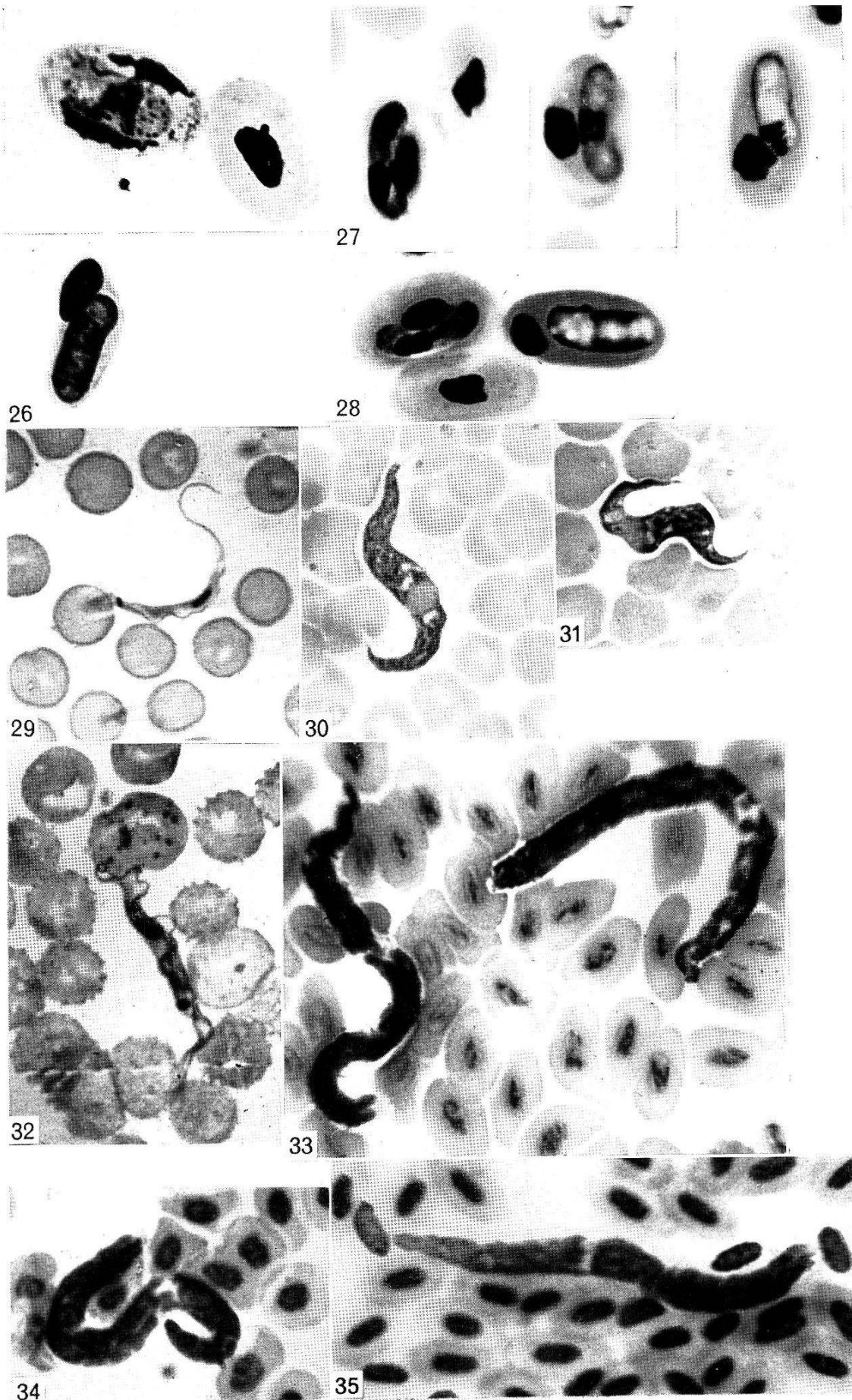


Fig. 26. *Haemogregarina* sp. in *Ophidia* sp.
 Figs. 27 and 28. *Haemogregarina* sp. in *Constrictor constrictor*.
 Fig. 29. *Trypanosoma* sp. in *Proechimys o'conelli*.
 Figs. 30 and 31. *Trypanosoma* sp. in *Callicebus ornatus*.
 Fig. 32. *Trypanosoma* sp. in *Callicebus ornatus*.
 Fig. 33. *Microfilaria* sp. in *Columba* sp.
 Fig. 34. *Microfilaria* sp. in *Aramides cajanea*.

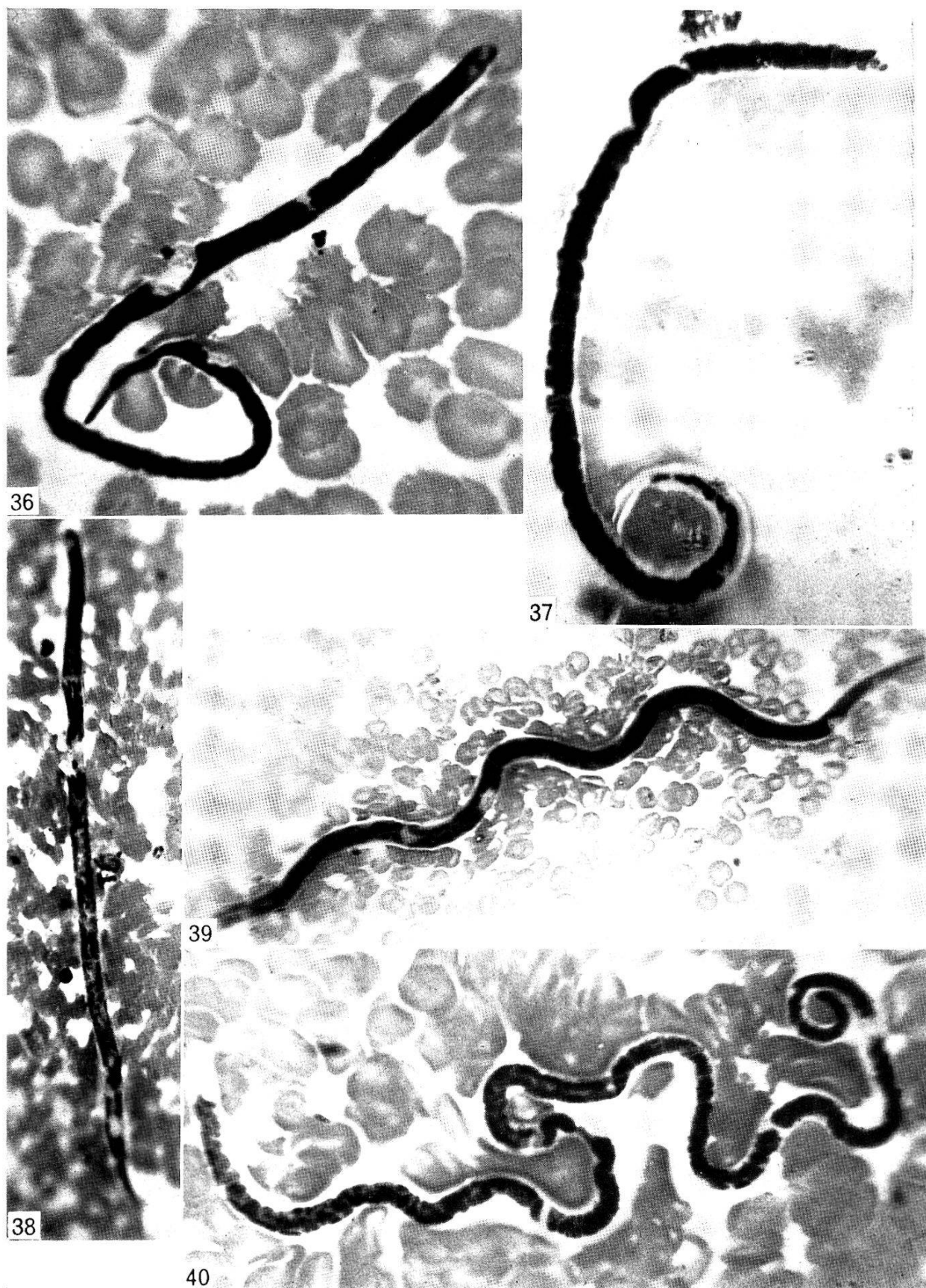


Fig. 36. *Microfilaria* sp. in *Myrmecophaga* sp.

Fig. 37. *Microfilaria* sp. in *Dasyppus novemcinctus*.

Fig. 38. *Microfilaria* sp. in *Tayassu* sp.

Figs. 39 and 40. *Microfilaria* sp. in *Saimiri sciureus*.

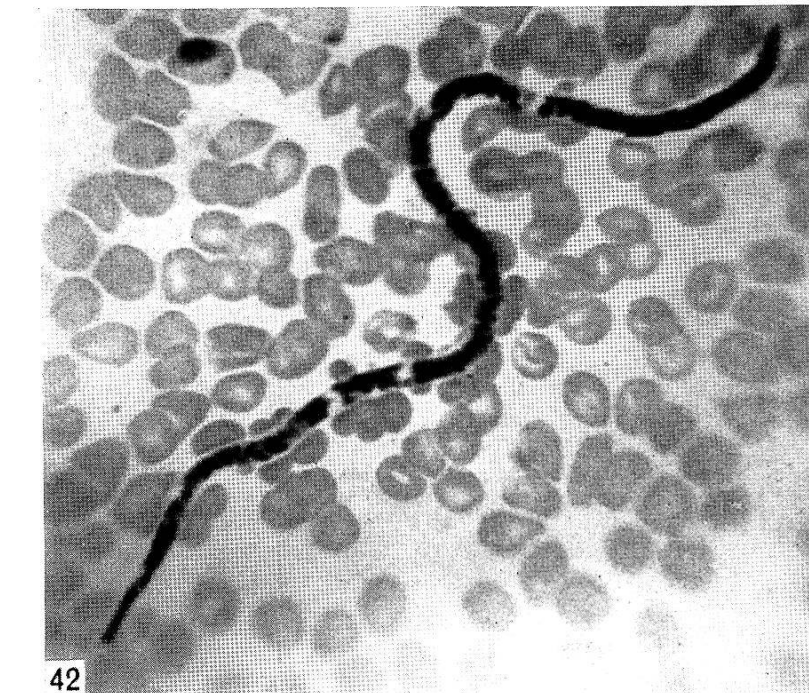


Fig. 42. *Microfilaria* sp. in *Actus trivirgatus*.

Fig. 41. *Microfilaria* sp. in *Proechimys o'conelli*.

The finding of *Trypanosoma cruzi* in the armadillo *Dasyus novemcinctus* is of considerable interest since that was the first demonstration in Colombia of the role of the armadillo as a reservoir of *T. cruzi*. The strain was maintained for several years in white mice to which it was strongly pathogenic. Human cases of Chagas disease were later found in various places in the Llanos.

A detailed description of all the parasites found in the course of this survey would be beyond the scope of this paper. We may add here only that all the material obtained has been kept with the view of enlarging later upon some of the most outstanding findings.

Before concluding this note, we want to express our gratitude to HERMANO NICÉFORO MARIA of the Instituto de La Salle, Bogotá, and to Drs. ARMANDO DUGAND and JOSÉ IGNACIO BORRERO of the Instituto de Ciencias Naturales, Bogotá, for the identification of the vertebrates referred to in this paper and for much help and valuable suggestions.

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Zusammenfassung.

In dieser Arbeit sind die Resultate von Blutuntersuchungen auf Parasitenbefall bei 702 Individuen verschiedener Wirbeltiere zusammengestellt, die in der Ebene von Ost-Kolumbien durchgeführt wurden. Die Zahl der untersuchten Vögel (335 Individuen in 98 Arten) dürfte genügen, um einen Begriff zu vermitteln vom prozentualen Parasitenbefall der Wildtiere jener Gegend. Was die übrigen Wirbeltiergruppen anbelangt, so ist die untersuchte Individuenzahl nicht genügend groß, um statistische Rückschlüsse auf die natürlichen Verhältnisse zu erlauben.

7,7% der untersuchten Vögel waren mit *Plasmodium* infiziert, 10,1% mit *Haemoproteus* und 8,9% mit *Microfilaria*. Trotzdem es sich hier um relativ hohe Prozentsätze handelt, so glauben die Autoren doch, daß der tatsächliche Befall etwas höher ist, da sich die Untersuchungen in den meisten Fällen auf Blut-, Lungen-, Milz- und Leberausstriche beschränken mußten, die an lebendfrischem Material hergestellt wurden. Serienmäßige Untersuchungen waren nur in den wenigen Fällen möglich, wo Vögel lebend in Fallen gefangen werden konnten.

Folgende Vogel malaria-Arten ließen sich feststellen: *Plasmodium nucleophilum*, *P. cathemerium*, *P. vaughani* und *P. hexamerium*. Das Auftreten anderer Blutparasiten bei Vögeln und anderen Wirbeltieren wird im Text kurz diskutiert, und die entsprechenden Daten werden in den beigefügten Tafeln aufgeführt.

Résumé.

Ce rapport expose, dans leurs grandes lignes, les résultats obtenus à la suite d'un examen des parasites du sang chez des vertébrés, effectué dans les Llanos, ou plaines de la Colombie-Est. Les auteurs ont opéré sur un total de 702 individus. Pour donner une idée de la fréquence des parasites du sang dans cette région, on croit pouvoir se baser sur les 335 spécimens, représentant 98 espèces d'oiseaux qui furent examinés. De l'avis des auteurs, les échantillons appartenant à d'autres groupes de vertébrés ne sont pas assez nombreux pour permettre un jugement sur la fréquence des parasites.

Le 7,7 % des oiseaux examinés s'est révélé infecté par *Plasmodium* ; 10,1 % par *Haemoproteus* et 8,9 % par *Microfilaria*. Bien qu'il s'agisse réellement d'un taux d'infection élevé, les auteurs estiment qu'il le fut probablement davantage du fait que, dans la plupart des cas, les recherches se limitèrent à l'examen de frottis de sang, de poumons, de rate et de foie, et s'effectuèrent sur des organismes qui venaient d'être tués, des examens en série n'ayant pu se faire que dans les rares occasions où les oiseaux furent pris vivants dans des pièges. Au cours de cet examen, on a trouvé les espèces suivantes de la malaria des oiseaux : *Plasmodium nucleophilum*, *P. cathemerium*, *P. vaughani* et *P. hexamerium*. Des découvertes relatives à d'autres parasites du sang chez les oiseaux ou chez d'autres vertébrés sont brièvement exposées dans le texte et des indications complémentaires figurent dans les Tables annexes.