



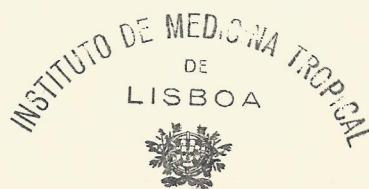
THE OCCURRENCE OF SOME *LEUCOCYTOZOOM*
AND *HAEMOPROTEUS* SPECIES IN GUINEA FOWL,
CHICKEN AND PIGEON OF MOÇAMBIQUE

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THE OCCURRENCE OF SOME *LEUCOCYTOZOON*
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INTRODUCTION

Members of the genus *Leucocytozoon* Danilewsky, 1890, and *Haemoproteus* Kruse, 1890, belong to the family *Haemoproteidae*. They are closely related to the true malarial organisms, the other genus of the family — *Plasmodium*. The principal significant between the latter and the other two genera is that the asexual stages (schizonts) of the *Plasmodium* occur in erythrocytes of the circulating blood, while those of the genera *Leucocytozoon* and *Haemoproteus* occur in the internal organs, such as lung, liver, spleen and kidney, etc. — presumably inside endothelial cells. Therefore, *Plasmodium* can be transmitted from one susceptible host to another by injection of infected blood from the vessels or heart, while in the case of the other two this procedure will not result in infection, because the stages in the blood are solely gametocytes which continue development only in the proper invertebrate host.

The adult gametocytes of both *Leucocytozoon* and *Haemoproteus* species can be distinguished as male (microgametocyte) and female (macrogametocyte). The former consists of more hyaline cytoplasm

and staining more lightly than the latter; which consists of denser cytoplasm. The nucleus of the microgametocyte is larger and contains within its membrane numerous chromatin granules, while that of the macrogametocyte is more compact and frequently has a well marked karyosome.

The *Haemoproteus* differs from the *Leucocytozoon*, principally in the effect of the developing gametocyte on the parasitized cell. In the case of *Leucocytozoon*, it becomes spindle-shaped with attenuated ends in most species, while in the case of *Haemoproteus* it retains approximately its normal shape. When fully formed, the gametocyte of *Haemoproteus* may push the host-cell nucleus to the side, but the parasite conforms to the shape of the nucleus which it partially encloses «like a halter». This led Labbê (1894) to introduce the name *Halteridium*, by which this parasite is commonly called. Its young gametocytes enter the red corpuscles and during their growth within the host-cells they produce pigment granules from the haemoglobin.

The genus *Haemoproteus* occurs widely in owls, woodpeckers, ducks, pigeons and other types of birds. *Haemoproteus lophortyx* is a pathogenic parasite of California Valley quail. *Haemoproteus* in the blood of three of ten domesticated turkeys was found by Atchley (1951). The best known species is *H. columbae*, which is widely distributed throughout the tropical and subtropical world. It is generally considered a nonpathogenic protozoa, but Coatney observed one bird with a very heavy infection that was definitely abnormal.

A bird may have more than one species of *Haemoproteus*; e.g. the mourning dove is the host of both *H. maccallumi* and *H. sacharovi*. Incidentally, both species have been transferred to the pigeon by means of the vector *Pseudolynchia maura* (Huff, 1932).

It is probable that the *Haemoproteus* species has not been hitherto recorded from domestic chicken (*Gallus domesticus*). As for guinea-fowl, H. G. Plimmer and H. R. Bateman reported the following in their paper «Further Results of the Experimental Treatment of Trypanosomiasis: Being a Progress Report to a Committee of the Royal Society (1910)»: «...Guinea-fowl (*Numida ptilorhyncha?*): The first (blood smear) (15.11.08) shows a very scanty infection of *Halteridium*. The second (27.11.08) shows *Halteridium* and *Leucocytozoon*... The fifth (3.1.09) shows a fairly abundant infection of *Halte-*

ridium... The occurrence of *Halteridium* in this bird has also been noted by Wenyon...»

In 1948, João Tendeiro has found a species of *Haemoproteus* in another species of guinea fowl (*Numida meleagris galeata* Pall.) in Portuguese Guinea, and named it *H. pratasi*.

The peculiar fusiform shape of the cells parasitized by the gametocytes of *Leucocytozoon* is explained by suggesting that it might be due to compression during transit through the capillaries, and that loss of elasticity in the degenerated cells prevents a return to the normal shape (Laveran, 1903). There is considerable doubt concerning the true nature of the host cell. Some authors described it as immature red blood cell while others maintained that it may indeed be a leucocyte or lymphocyte, hence the name «*Leucocytozoon*». It was stated formerly by various researchers that the gametocytes were lack of pigment. In 1929, however, Hartman describe that the gametocytes of *Leucocytozoon anatis* definitely contain pigment in very small granules scattered throughout the cytoplasm. Moreover, O'Roke stated in 1934 that «pigment granules numerous» as a character of the cytoplasm of nearly mature gametocytes of this species.

The nucleus of the host cell of *Leucocytozoon* sp. is deeply stained and drawn out at one margin of the cell along one side of the parasite. The gametocytes themselves are elongated, oval or rounded. The microgametocyte, both nucleus and cytoplasm stains less deeply than the macrogametocyte, and its nucleus tends to be larger in volume, as mentioned.

The members of *Leucocytozoon* occur widely in domesticated and undomesticated birds. Some of the well known representatives of the genus are: *L. ziemanni* of the little owl; *L. neavei* of the Sudan guinea-fowl; *L. anseris* of geese; *L. smithi* of turkeys; *L. simondi* of ducks; and *L. struthionis* of the ostrich. In South Africa, members of the genus were recorded in the domestic pigeon, *Columba livia*; in Namaqua dove, *Oena capensis* L. and in the Ring dove, *Afropelia capicola*, etc.

O'Roke (1934) noted mortality of 35 % in an outbreak infected by *L. anatis* (*L. simondi*) among young ducks in Michigan. *L. anseris* Knuth and Magdeburg, 1922, was reported in Germany to cause serious and often fatal disease to the young geese. *L. bonasae* from

the ruffed grouse has been recorded by Clark (1935) to cause mortality in the grouse population. *L. smithi* is known to affect turkeys, poult are affected mainly, death in association with coma may follow. Wild turkeys appear to act as a natural reservoir of the parasites in the United States of America.

L. andrewsi is a species with round gametocytes, described by Atchley (1951), who found it in 15.3 % of 400 chickens examined in South Carolina, U.S.A.

Mathis and Leger have described two species for the chicken in Tonkin, Indochina: *L. sabrazesi* (1909) and *L. caulleryi* (1910). They stated that after as long as ten months' observation, the parasitized chickens were all quite normal and healthy, and therefore considered these parasites to be nonpathogenic to the chicken.

In Moçambique, Dr. J. A. Travassos Santos Dias reported various species of *Haemoproteus* in birds of Alto Limpopo (1953), in which he was collaborated with Dr. F. Zumpt of South Africa. Five of the species found were considered as new species and named by him: *H. figueiredoi* in sparrowhawk (*Accipiter melanoleucos*); *H. montezi* in lourie (*Gallirex porphyreolophus porphyreolophus*); *H. morneti orientalis* in black-bellied glossy starling (*Lamprocolius corruscus corruscus*); *H. tendeiroi* in long legged Korhaan (*Lissotis melanogastes notophila*); *H. vilhenai* in spurming goose (*Plectropterus gambensis gambensis*) and three were not new species, they are: *H. eçae* Tendeiro, 1947, in pied kingfisher (*Ceryle rudis rudis*); *H. coraciae* Valles, 1939, in lilacbreasted roller (*Coracias candata candata*); *H. morneti* Tendeiro, 1947, in east African blue-eared glossy starling (*Lamprocolius chloropterus elisabeth*).

Dr. T. S. Dias has also described and named two species of *Leucocytozoon* in Moçambique: *L. peãlopesi* in francolin (1951) in Massinga and *L. beaurepairei* in secretary bird (*Sagittarius serpentarius*) in Maputo, 1952. He stated that the parasitized secretary bird was definitely abnormal.

In April, 1960, the writer had the opportunity of studying some blood smears at Laboratório de Investigação da Missão de Combate às Tripanossomíases, and found some recorded and unrecorded *Leucocytozoon* and *Haemoproteus* species in domestic chicken, guinea-fowls and pigeon; which form the basis of this report.

The blood smears of both chicken and guinea-fowls were prepared by the writer's colleague, Dr. J. Marques da Silva, from sick birds of the Govuro district, Moçambique. The blood smear of pigeon was prepared by the writer from a Homer died due to sickness, in Lourenço Marques.

OBSERVATIONS

Blood smear n.º 4, blood of guinea-fowl:

Examination showed the presence of a moderate infection of *Leucocytozoon* species and a few gametocytes of a *Haemoproteus* species.

Leucocytozoon: about 88 % of the gametocytes seen were microgametocytes, the rest being half macrogametocytes and half immatured gametocytes. The macrogametocytes were oval or elongated in shape, their cytoplasm was bluish with very fine granulation and small vacuoles of ununiform sizes. The microgametocytes were slightly smaller and hardly take the stain. The immatured gametocytes were small and round, with a comparatively large rounded nucleus situated at the central and their cytoplasm were bluish. These young gametocytes generally located at the longitudinal side of the host cells beside their underformed nuclei. In contrast to the rose stained nuclei of the adult parasites of both sexes, the young gametocyte's nucleus was stained with a bluish tint. Measurements of these *Leucocytozoon* in microns:

Macrogametocytes:

Whole length of the host cell	25.50-34.00	average	28.25
Length of the parasite	12.75-15.30	»	13.32
Breath of the parasite	4.25- 9.35	»	4.44
Length of host cell's nucleus	7.65- 9.35	»	8.50
Breath of host cell's nucleus	4.25- 8.50	»	4.94
Length of parasite's nucleus	0.40- 4.25	»	2.01
Breath of parasite's nucleus	0.40- 5.10	»	1.80

SON, C. K. — *Leucocytozoon* and *Haemoproteus*

Microgametocytes:

Whole length of the host cell	19.55-28.05	average	22.10
Length of the parasite	12.75-13.60	»	12.80
Breath of the parasite	4.25- 9.35	»	5.44
Length of host cell's nucleus	8.50- 9.00	»	8.85
Breath of host cell's nucleus	2.55- 4.25	»	3.06
Length of parasite's nucleus	1.70- 3.60	»	3.03
Breath of parasite's nucleus	1.40- 3.00	»	2.25

Immatured gametocytes:

Whole length of the host cell	17.00-23.50	»	19.00
Whole breath of the host cell	2.20- 4.20	»	2.80
Length of the parasite	2.20- 5.50	»	3.95
Breath of the parasite	2.20- 5.20	»	4.85

Haemoproteus: both microgametocytes and macrogametocytes were seen in this blood smear. They resembled *H. columbae* very closely but differ from it by the following: (1) Rose granules on the cytoplasm were very clear and rounded; (2) The macrogametocytes only very slightly stained with blue and without vacuoles. Blue-black pigments were not rounded like those of *H. columbae's*, and much smaller in size and not evenly distributed throughout the cytoplasm; (3) The microgametocytes with rounded rose pigment granules. Their blue black pigments were not rounded and smaller.

Blood smear n° 5, blood of guinea-fowl:

Only *Leucocytozoon* sp. occurred in this smear.

Leucocytozoon: 50 % of the gametocytes seen were microgametocytes, 38 % immatured gametocytes and 12 % were macrogametocytes. These gametocytes had the same appearance as those of the blood smear n° 4, just described above. Several host-cells were seen each parasitized by two young gametocytes — one on each side of the host nucleus.

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Measurements of the *Leucocytozoon*, in microns:

Macrogametocytes:

Whole length of the host cell	26.90-35.50	average	30.10
Length of the parasite	14.60-20.00	»	15.82
Breath of the parasite	4.25- 7.00	»	5.10
Length of host cell's nucleus	6.55- 9.60	»	8.00
Breath of host cell's nucleus	4.50- 8.50	»	5.95
Length of parasite's nucleus	3.00- 4.20	»	3.80
Breath of parasite's nucleus	0.04- 4.80	»	2.50

Microgametocytes:

Whole length of the host cell	24.00-33.20	»	25.50
Length of the parasite	10.00-12.75	»	11.50
Breath of the parasite	3.50- 7.25	»	3.85
Length of host cell's nucleus	8.20- 9.25	»	8.50
Breath of host cell's nucleus	2.50- 3.80	»	3.25
Length of parasite's nucleus	1.00- 1.50	»	1.20
Breath of parasite's nucleus	1.00- 2.25	»	2.20

Immatured gametocytes:

The measurements were about the same as those of the blood smear n° 4.

Blood smear n° 6, blood of guinea-fowl:

Leucocytozoon: 40 % of the gametocytes seen were immatured, 35 % were macrogametocytes and 25 % were microgametocytes. They were the same as those in the blood smear n° 4 in appearance. Two host cells were seen with their nuclei centrally situated and the encircling parasites were not clear enough to show that whether there were one or two parasites in each of these host cells.

SON, C. K. — *Leucocytozoon* and *Haemoproteus*

Measurements of the *Leucocytozoon*, in microns:

Macrogametocytes:

Whole length of the host cell	25.00-42.10	average	31.70
Length of the parasite	14.40-20.40	»	16.33
Breath of the parasite	4.25- 7.00	»	5.80
Length of host cell's nucleus	5.95- 5.35	»	7.40
Breath of host cell's nucleus	2.45- 4.50	»	3.45
Length of parasite's nucleus	3.00- 4.20	»	3.60
Breath of parasite's nucleus	2.20- 2.55	»	2.43

Microgametocytes:

Whole length of the host cell	24.00-32.30	»	26.80
Length of the parasite	10.00-12.10	»	10.20
Breath of the parasite	3.80- 5.00	»	4.10
Length of host cell's nucleus	7.00- 7.40	»	7.20
Breath of host cell's nucleus	3.00- 3.80	»	3.40
Length of parasite's nucleus	3.60- 5.10	»	4.35
Breath of parasite's nucleus	1.80- 2.65	»	2.50

Immatured gametocytes:

Whole length of the host cell	15.50-21.00	»	18.87
Whole breath of the host cell	2.50- 3.50	»	3.00

Haemoproteus: The same as those described in the blood smear n° 4.

Blood smear n° 7, blood of chicken:

Leucocytozoon: 93 % of the gametocytes seen were microgametocytes, 4 % immatured gametocytes and only 3 % were macrogametocytes. They resembled to those described in blood smear n° 4, except that the macrogametocytes were not so blue stained and were rounded generally. Only two macrogametocytes were oval in shape and no elongated ones observed.

SON, C. K. — *Leucocytozoon* and *Haemoproteus*

Measurements of the *Leucocytozoon*, in microns:

Macrogametocytes:

Whole length of the host cell	24.00-38.00	average	28.50
Length of the parasite	5.95-12.70	»	8.94
Breath of the parasite	4.00- 7.50	»	5.50
Length of host cell's nucleus	5.95-10.00	»	7.79
Breath of host cell's nucleus	2.50- 3.40	»	2.87
Length of parasite's nucleus	4.00- 6.10	»	4.30
Breath of parasite's nucleus	2.50- 3.40	»	3.00

Microgametocytes:

Whole length of the host cell	21.50-35.00	»	27.17
Length of the parasite	6.80-10.00	»	8.42
Breath of the parasite	4.25- 7.80	»	5.36
Length of host cell's nucleus	8.00-15.00	»	10.24
Breath of host cell's nucleus	2.10- 3.40	»	2.56
Length of parasite's nucleus	2.50- 6.10	»	3.85
Breath of parasite's nucleus	1.80- 2.80	»	2.10

Immatured gametocytes:

Whole length of the host cell	21.00-32.50	»	26.50
Whole breath of the host cell	3.20- 4.85	»	3.45

Haemoproteus: The *Haemoproteus* sp. in this blood smear resembled those of the blood smear n° 4, except that not all parasites were sausage-shaped and many of them were rounded or oval and alteration of the shape of the host cell was noted.

Blood smear n° 9, blood of guinea-fowl:

Only a few gametocytes of a *Haemoproteus* sp. were found. They appeared to be the same species as those described in blood smear n° 4.

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Blood smear n° 11, blood of guinea-fowl:

Leucocytozoon: the *Leucocytozoon* sp. appeared to be the same as those of the blood smear n° 4.

Measurements of the *Leucocytozoon*, in microns:

Macrogametocytes:

Whole length of the host cell	23.80-38.00	average	30.90
Length of the parasite	15.30-24.00	»	18.80
Breath of the parasite	4.35- 7.05	»	6.00
Length of host cell's nucleus	6.00-10.20	»	7.95
Breath of host cell's nucleus	3.40- 5.00	»	4.20
Length of parasite's nucleus	1.00- 1.50	»	1.30
Breath of parasite's nucleus	1.00- 1.40	»	1.20

Microgametocytes:

Whole length of the host cell	28.00-29.10	»	28.55
Length of the parasite	8.50-12.75	»	11.10
Breath of the parasite	3.40- 5.10	»	3.97
Length of host cell's nucleus	8.20- 9.30	»	8.78
Breath of host cell's nucleus	2.00- 2.80	»	2.55
Length of parasite's nucleus	2.10- 2.80	»	2.50
Breath of parasite's nucleus	1.00- 1.90	»	1.20

Haemoproteus: appeared as the same species as in blood smear n° 4.

Blood smear n° 12, blood of pigeon:

A mild infection of *Haemoproteus columbae* and a heavier infection of another species of this genus were found. The latter was rounded and a few of them a little oval; the pigment granules were very fine and not rounded spreading along the rim of the cytoplasm in the microgametocyte, the central part of the parasite was very

scantly scattered with the pigments. The cytoplasm of the macrogametocyte was denser, with small vacuoles and the pigment granules were slightly bigger and scattered irregularly through the whole gametocyte. The nuclei of both sexes of the parasite were faintly rose stained and obscure. This species was noted to alter the shape of the host-cell. Occasionally two parasites were found on the same host-cell.

DISCUSSION AND CONCLUSION

The *Leucocytozoon* in blood smears n° 4, 5, 6 and 11 from blood of guinea-fowl (*Numida mitrata*) described above is identical to *Leucocytozoon neavei* Balfour, 1906. The following is a description given to *L. neavei* by Wenyon:

«...Only gametocytes seen enclosed with oval or fusiform cells, with one or both extremities drawn out to fine points, and with nucleus enlarged, flattened, and deeply staining. The macrogametocytes are of an oval shape, more or less elongate, and measure from 15 μ to 20 μ in length, by 5 μ to 8 μ in breadth. Their cytoplasm is markedly granular, takes on a very deep blue color, and presents minute vacuoles. Their nucleus is either rounded or oval, and usually median. The microgametocytes are slightly smaller and hardly takes the stain. Occasionally two parasites are enclosed within the same host cell, and may be either of the same or different sex.»

Beside this species (*Leucocytozoon neavei*) discovered by Neave (1906) in the Sudan guinea-fowl (*Numida ptilorhyncha*), in 1948 João Tendeiro reported another species (*L. costae*) found in another species of guinea-fowl (*Numida meleagris*), in Portuguese Guinea, which is very large in size as compared with *L. neavei*. *L. neavei* has not been hitherto recorded from common guinea-fowl (*Numida mitrata*).

The *Leucocytozoon* in blood smear n° 7, blood of chicken (*Galus domesticus*), differs from *L. neavei* by the following two points:

1. Both macrogametocytes and microgametocytes are smaller than those of the *L. neavei*. The macrogametocyte of *L. neavei* measured from 15 μ to 20 μ in length but those of the blood smear n° 7

measured only from 5.95 μ to 12.70 μ , and being 8.94 μ in average in length.

2. The macrogametocyte of *Leucocytozoon* observed on blood smear n° 7 is rounded or a very little oval in shape, but never elongated; those of the *L. neavei* is mainly elongate or a little oval in shape.

L. sabrazesi (1909) and *L. caulleryi* (1909) were described for the chicken in Tonkin, by Mathis and Leger. They differ apparently from the *Leucocytozoon* in discussion, both in shape and size. The host-cells of *L. caulleryi* are without fusiform elongations. *L. sabrazesi* averaged 15 μ by 6 μ in size in the macrogametocyte and the microgametocyte is smaller, both of them are oval in shape.

L. andrewsi was described by Atchley (1951) as a species from chicken in South Carolina with round gametocytes. Due to insufficiency of literature on hand, the writer is not able to ascertain that whether the species he has found in blood smear n° 7 is identical to *L. andrewsi* or he is dealing with a new species.

Haemoproteus sp. found on blood smears n° 4, 6, 9 and 11 appeared to be the same species. They resembled *H. columbae* Celli and Sanfelice, 1891. The difference between them is mentioned previously when describing the parasite in the blood smear n° 4.

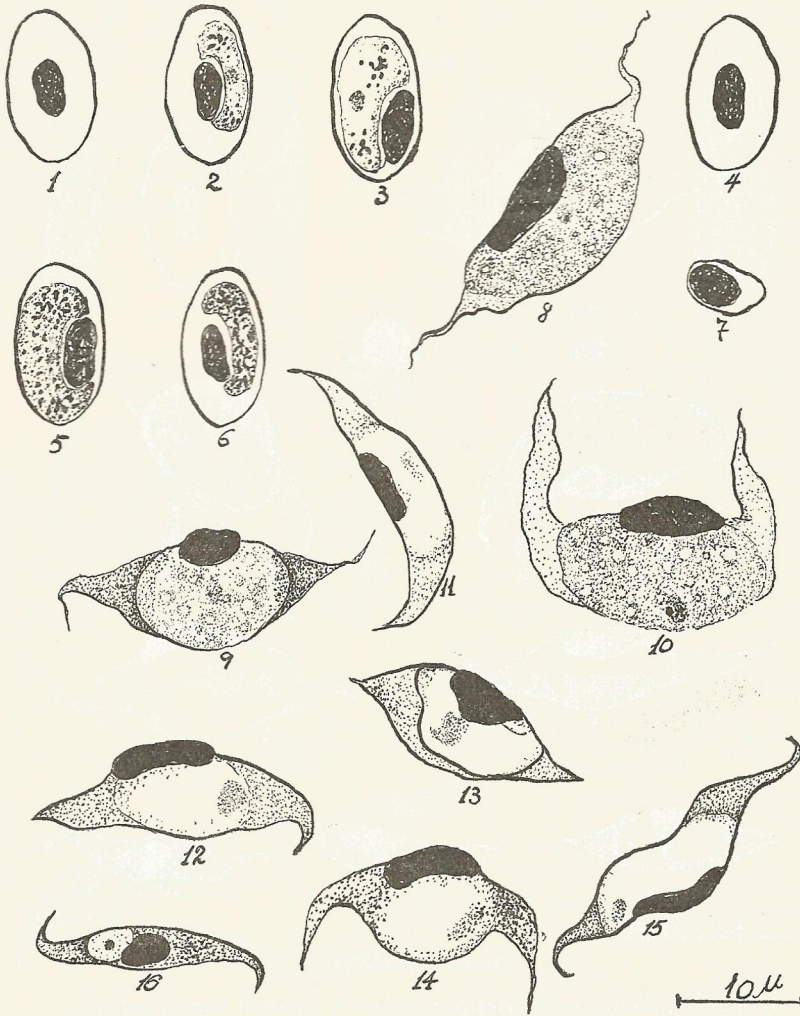
In 1948, J. Tendeiro has found a species of *Haemoproteus* in guinea-fowl of India (*Numida meleagris galeata* Pall) in Portuguese Guinea and named it *H. pratasi*. This species differs from the species in discussion by the following:

1. Both male and female gametocytes are short and situated apart from the host nuclei and near the edge of the host-cell.
2. Nuclei of the gametocytes are very small.
3. Macrogametocyte with yellow and brown pigments spreading throughout the cytoplasm.

Haemoproteus sp. has not been hitherto recorded from *Numida mitrata*. The writer considers the *Haemoproteus* sp. in discussion to be a new species, and proposes it to be named *Haemoproteus silvai* n. sp., in honour of Dr. José Marques da Silva, chief of the veterinary section, Missão de Combate às Tripanossomíases, Lourenço Marques, who has collected the materials for this study as well.

The *Haemoproteus* in blood smear n° 7 differs from *H. silvai* n. sp., as alteration of the forms of the host-cells is very pronounced in the case of the former. *Haemoproteus* sp. has not been recorded

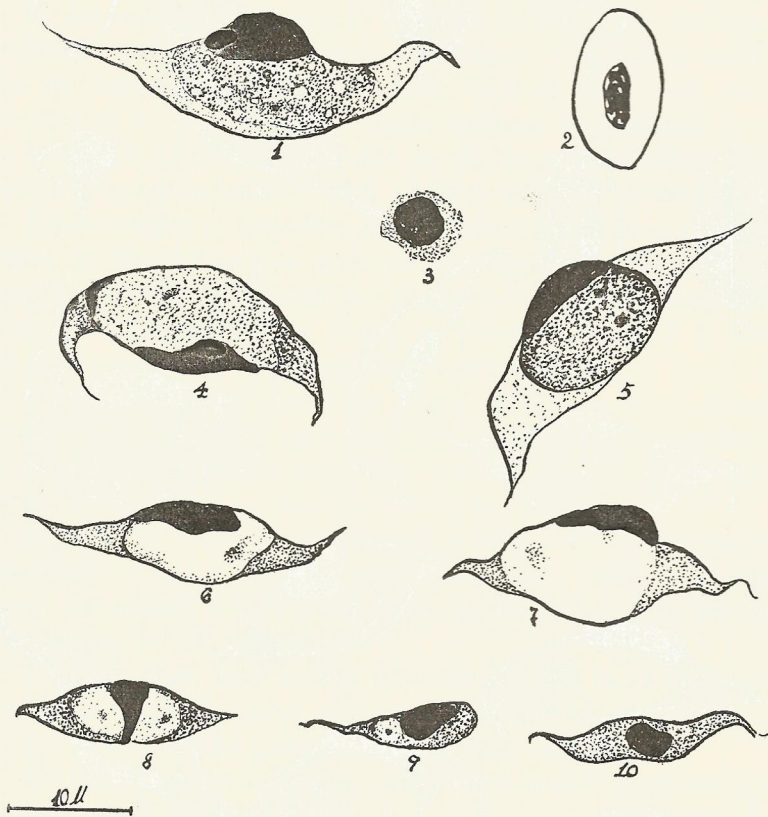
PLATE I



BLOOD SMEAR N° 4

- 1 and 4, erythrocytes from blood of *Numida mitrata*, normal.
- 2 and 3, microgametocytes of *H. silvai* n. sp.
- 5 and 6, macrogametocytes of *H. silvai* n. sp.
- 7, lymphocyte, normal.
- 8, 9 and 10, macrogametocytes of *L. neavei*.
- 11, 12, 13, 14 and 15, microgametocytes of *L. neavei*.
- 16, Immatured gametocyte of *L. neavei*.

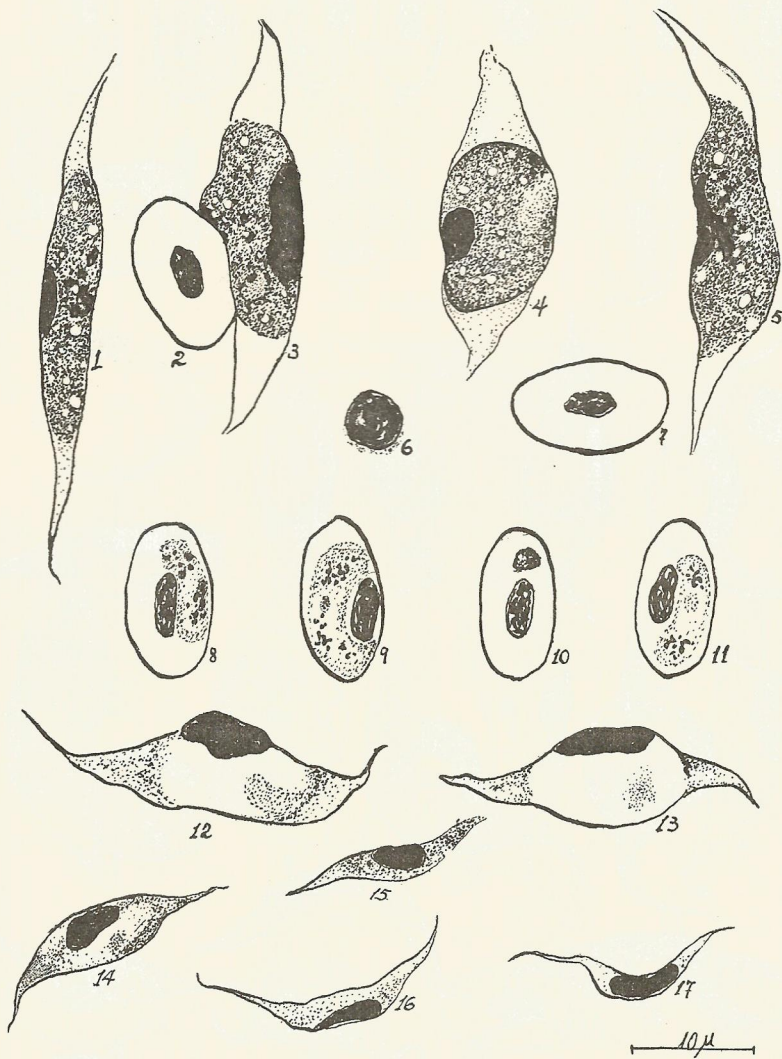
PLATE II



BLOOD SMEAR N° 5

- 1, 4 and 5, macrogametocytes of *L. neavei* in blood of *Numida mitrata*.
- 2, erythrocyte of *Numida mitrata*, normal.
- 3, lymphocyte, normal.
- 6 and 7, microgametocytes of *L. neavei*.
- 8, 9 and 10, immatured *L. neavei*; two parasites in the same host-cell in 8.

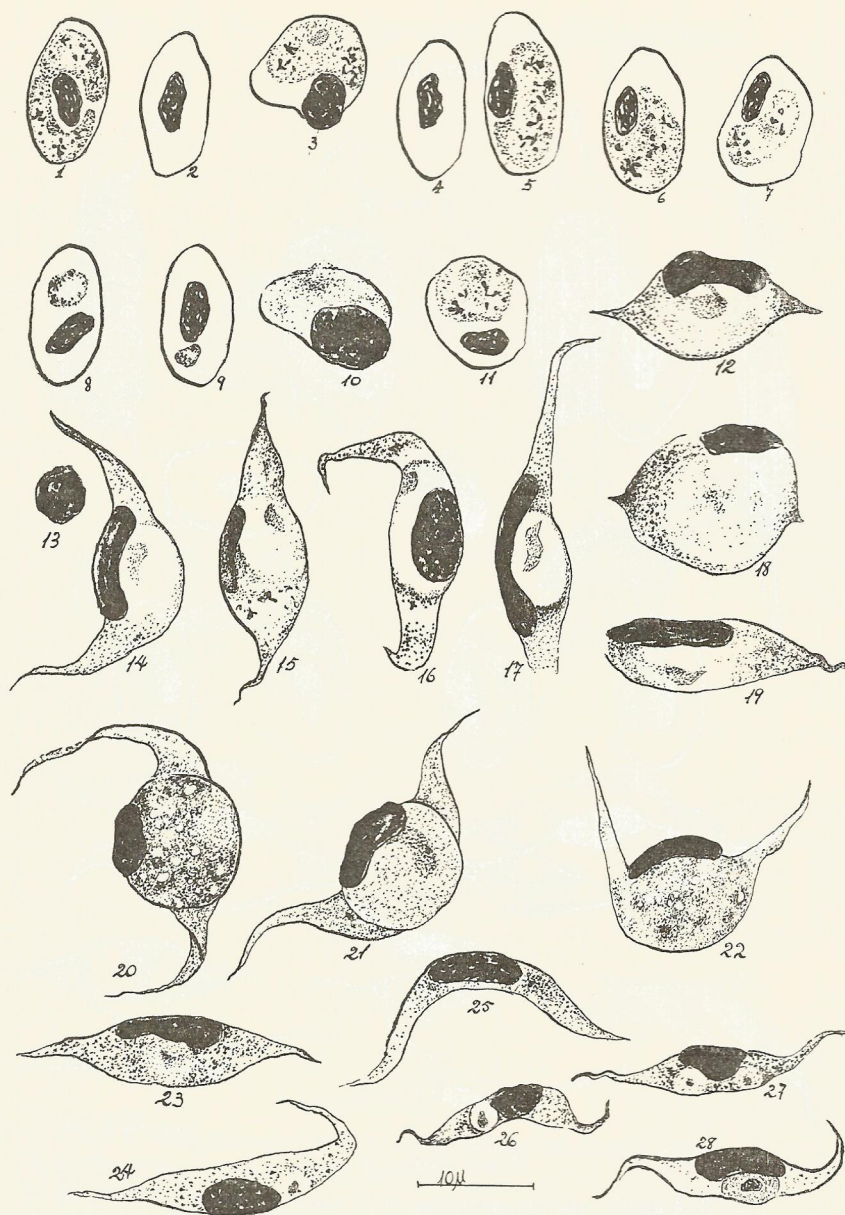
PLATE III



BLOOD SMEAR N° 6

- 1, 3, 4 and 5, macrogametocytes of *L. neavei*.
- 2 and 7, erythrocytes of *Numida mitrata*, normal.
- 6, lymphocyte, normal.
- 8 and 9, macrogametocytes of *H. silvai* n. sp.
- 10, immatured *H. silvai* n. sp.
- 11, microgametocyte of *H. silvai* n. sp.
- 12 and 13, microgametocytes of *L. neavei*.
- 14, probably two gametocytes of *L. neavei* in the same host-cell.
- 15, 16 and 17, immatured gametocytes of *L. neavei* in host-cells.

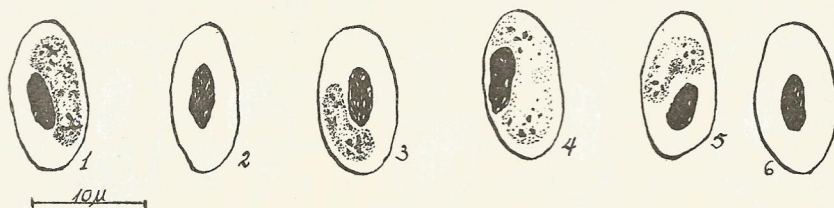
PLATE IV



BLCOD SMEAR N° 7

- 1, two gametocytes of *H. santosdiasi* n. sp. in the same host-cell.
- 2 and 4, erythrocytes of *Gallus domesticus*, normal.
- 3, 5 and 6, macrogametocytes of *H. santosdiasi* n. sp.
- 7 and 11, microgametocytes of *H. santosdiasi* n. sp.
- 8 and 9, immatured *H. santosdiasi* n. sp.
- 10 and 13, lymphocytes, normal.
- 12, 14, 15, 16, 17, 18 and 19, microgametocytes of *Leucocytozoon* sp.
- 20, 21 and 22, macrogametocytes of *Leucocytozoon* sp.
- 23, 24, 25, 26 and 28, immatured *Leucocytozoon* sp.
- 27, two immatured gametocytes of *Leucocytozoon* sp. in the same host-cell.

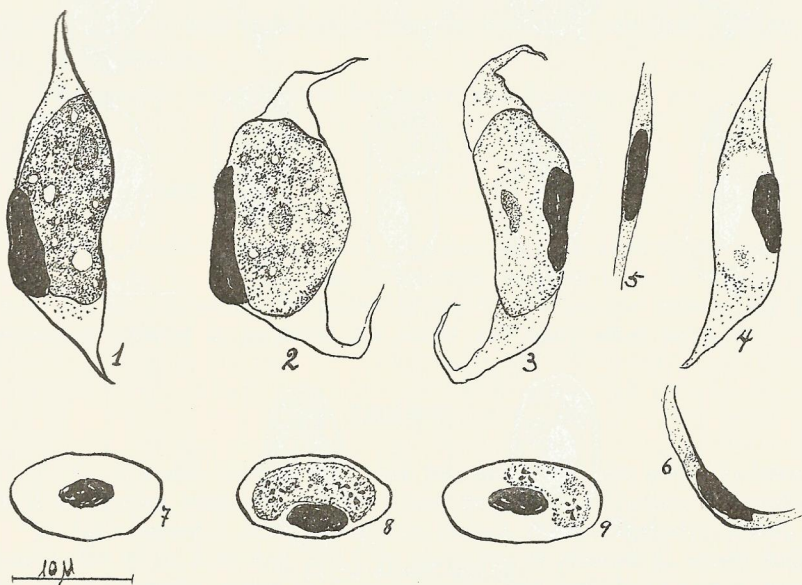
PLATE V



BLOOD SMEAR N° 9

- 1 and 3, macrogametocytes of *H. silvai* n. sp.
 2 and 6, erythrocytes of *Numida mitrata* normal.
 4 and 5, microgametocytes of *H. silvai* n. sp.

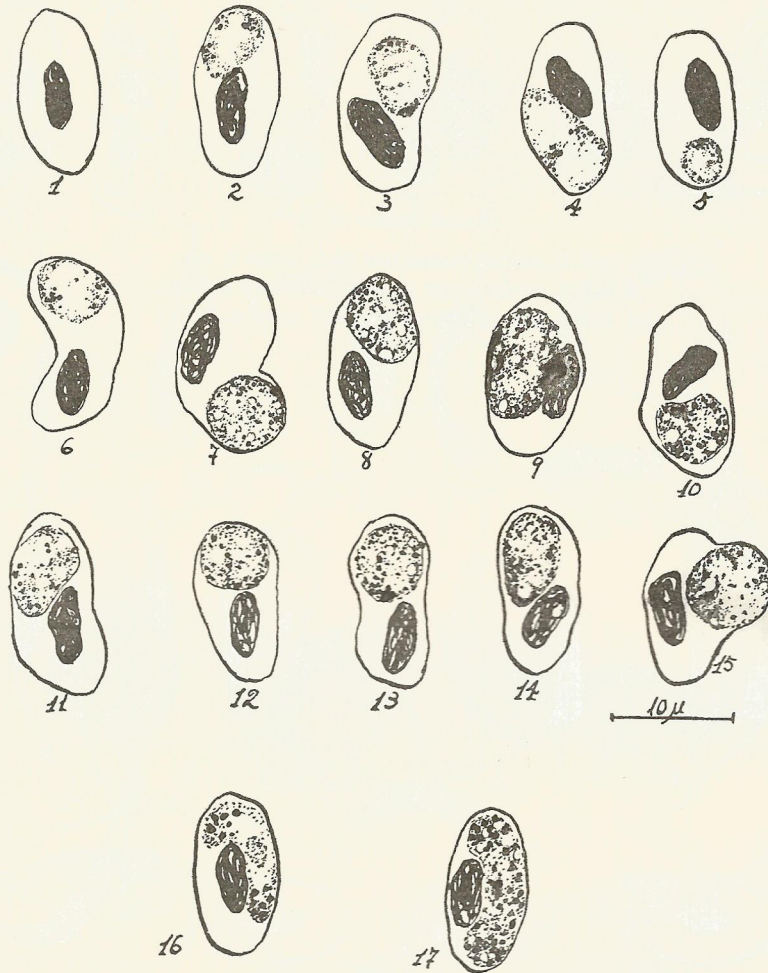
PLATE VI



BLOOD SMEAR N° 11

- 1, 2 and 3, macrogametocytes of *L. neavei*.
 4, microgametocyte of *L. neavei*.
 5 and 6, immature gametocytes of *L. neavei*.
 7, erythrocyte of *Numida mitrata*, normal.
 8, macrogametocyte of *H. silvai* n. sp.
 9, microgametocyte of *H. silvai* n. sp.

PLATE VII



BLOOD SMEAR N° 12

- 1, erythrocyte of *Columba livia*, normal.
- 2, 3, 4 and 6, microgametocytes of *H. piresi* n. sp.
- 5, young gametocyte of *H. piresi* n. sp.
- 7, 8, 9, 10, 11, 12, 13, 14 and 15, macrogametocytes of *H. piresi* n. sp.
- 16, microgametocyte of *H. columbae*.
- 17, macrogametocyte of *H. columbae*.

from the chicken (*Gallus domesticus*), and this *Haemoproteus* in blood smear n° 7 might be the first one ever discovered from such host. The writer proposes this new species to be named *Haemoproteus santosdiasi* n. sp., in honour of Dr. J. A. Travasos Santos Dias, director of the researching laboratory of M. C. T. (Missão de Combate às Tripanossomíases), Lourenço Marques, for his remarkable work of veterinary entomology and protozoology in Africa.

The two spp. found in blood smear n° 12, blood of pigeon (*Columba livia* Gmel), one was *H. columbae* Celli and Sanfelice, 1891, and the other was a new species; there has no other *Haemoproteus* sp. been recorded in domestic pigeon other than *H. columbae*. The writer names this new species *Haemoproteus piresi* n. sp., dedicating to Dr. Francisco Pires, veterinary surgeon of M. C. T., Lourenço Marques.

All blood smears were obtained from sick or dead birds but unfortunately it was impossible for the writer to conduct studies on their pathogenicity.

The proper intermediate hosts are not known.

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RÉSUMÉ

1. On a étudié les frottis de sang des pintades et des poules malades du district de Govuro, ainsi que du pigeon mort de Lourenço Marques, Moçambique.

2. On a trouvé 5 frottis de sang de pintade (*Numida mitrata*) infectés par parasites (les n°s 4, 5, 6, 9 et 11): 3 de ces frottis on présenté *L. neavei* Balfour, 1906, et une nouvelle espèce de *Haemoproteus*, pour laquelle l'auteur a proposé le nom *H. silvai* n. sp. Le frottis n° 5 avait seulement le *L. neavei* et le n° 9 seulement le *H. silvai* n. sp.

3. Le frottis n° 7, de sang de poule (*Gallus domesticus*), a présenté une infection par une nouvelle espèce de *Haemoproteus*, pour laquelle l'auteur a proposé le nom *H. santosdiasi* n. sp., et une espèce de *Leucocytozoon*, pour laquelle l'auteur n'a pas pu avoir la certitude d'être en présence d'une nouvelle espèce de *Leucocytozoon andrewsi* Atchley, 1951.

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4. Le frottis n° 12, de sang de pigeon mort (*Columba livia* Gmel.), a présenté une infection par *H. columbae* Celli et Sanfelice, 1891, et une nouvelle espèce de *Haemoproteus* à laquelle l'auteur a donné le nom de *H. piresi* n. sp.

5. On a pas trouvé la pathogénicité ni l'hôte intermédiaire des parasites rencontrés.

SUMMARY

1. Blood smears from sick guinea-fowls and domestic chicken, of the Govuro district and from dead domestic pigeon, of Lourenço Marques, Moçambique, were studied.

2. Five guinea-fowl (*Numida mitrata*) blood smears (n° 4, 5, 6, 9 and 11) were found infected with parasites: three of the smears (n° 4, 6 and 11) showed both *L. neavei* Balfour, 1906, and a new species of *Haemoproteus* which was proposed to be named *H. silvai* n. sp. by the writer. Blood smear n° 5 contained only *L. neavei* and blood smear n° 9 only *H. silvai* n. sp.

3. Blood smear n° 7, from blood of domestic chicken (*Gallus domesticus*), showed infection of a new species of *Haemoproteus* which was proposed to be named *H. santosdiasi* n. sp. by the writer; and a species of *Leucocytozoon* which the writer could not ascertain that whether it is a new species or *Leucocytozoon andrewsi* Atchley, 1951.

4. Blood smear n° 12, blood of dead pigeon (*Columba livia* Gmel.), showed an infection of *H. columbae* Celli and Sanfelice, 1891, and a new sp. of *Haemoproteus*, which was named *H. piresi* n. sp. by the writer.

5. Pathogenicity and intermediate host for the parasites found are not detected.

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