

NEW HÆMOPROTEIDS OF SOME INDIAN BIRDS.

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IN this short note I will record the new species of Hæmoproteids of Indian birds found in the course of my studies.

1. *Gallinula chloropus* L. Shot in the lake of Carambolim, identified by Prof. Narayan Rao from Bangalore. *Hæmoproteus gallinulæ* sp. n. Sexual dimorphism. ♀ with vacuolated protoplasm, deep blue at Leishmann's stain, nucleus pale rose, pigment brownish black in granules of different sizes scattered all over the body, rarely collected on poles, often grouped in clusters. ♂ light blue, rather colourless, roundish or oval, almost never haltheride like, pigment in irregular clusters collected on the poles. Red cell hypertrophied, its nucleus displaced. Phagocytosis of the parasite in the mononuclears. No schizogonic forms observed in lung smears (studied in collaboration with my pupil Emidio Affonso).

2. *Astur badius dussumieri*. Shot at Corlim, Ilhas, identified by Dr. Baini Prasad from Calcutta. *Hæmoproteus asturis dussumieri*, sp.n. Sexual dimorphism. ♀ protoplasm light blue, alveolar, nucleus pale rose. ♂ colourless, nucleus more conspicuous. Pigment granules dark brown of different sizes irregularly scattered on both ♀ and ♂. The nucleus sometimes sub-central. General morphology oval specially on ♂, rare haltherid stages seen on ♀.

The trinominal designation has been given to avoid confusion with the unnamed *H.* of *Astur palumbarius* recorded by Wasielewsky in Germany in 1908.

3. *Oriolus oriolus kundoo* Sykes. Shot at Nova Gôa, identified by Mr. Prater from Bombay. *Hæmoproteus orioli* sp. n. ? (= *H.* of *Oriolus galbula* recorded by Cardamatis in Greece in 1919; ? = *H.* of *O. sagittarius* recorded by Cleland and Johnston in Australia in 1912).

Sexual dimorphism. ♀ light blue, nucleus central or sub-central, constituted by a more or less compact chromatic dot. ♂ whitish, nucleus central or sub-central constituted by an irregular spireme. Pigment light brown, the granules of different sizes irregularly distributed, having sometimes a polar location on both sexes (in collaboration with my pupil J. Filipe do Rego).

4. *Strix ocellata* Lesson. Shot at Praganã and identified by Mr. Prater. *Hæmoproteus* showing the peculiarity of lysing almost completely the infected cell. ♀ light prussian blue, nucleus pale rose. ♂ light bluish grey or colourless, nucleus a little larger than in ♀. Pigment coffee colour in granules, seldom in rods, independent or in clusters.

Hæmoproteids have already been recorded in *Strix flammea* by A. & M. Léger in Niger (1914), by Plimmer in South Africa (1912), by Balfour in Sudan (1906), by Sergent brothers in Algeria (1907); in *Strix flammea trimaculata* by Kerandel in French Congo (1909) and (1913); in *S. Otus* by Wasielewsky in Germany (1908); in *S. perlata* by Iturbe and Gonzalez in Venezuela (1916).

5. *Pastor roseus* Lin. Shot at Praganã, identified by Mr. Prater. *Hæmoproteus pastoris* sp. n. Sexual dimorphism. ♀ blue with a small, ovoid nucleus, central or sub-central, pale rose. Haltheridic or ovoid and, in this case, the nucleus of the host cell is completely displaced. Pigment scattered all over the body. ♂ colourless or very slightly blue, haltheridic, ovoid or irregularly deformed. Nucleus indistinct at Leishmann, constituted by chromatic masses disposed as the spokes of a wheel or in a starlike, or irregularly weaved threads. Pigment polar on haltheridic forms, scattered over the body on ovoid or deformed gametocytes. Red cell hypertrophied, its nucleus displaced.

6. *Thereiceryx z. inornatus* Walden. Shot at Corlim, identified by Mr. Prater. *Hæmoproteus thereicerycis* sp. n. showing a marked tendency to lyse the infected cell and become free, taking in this free stage aberrant forms remembering deformed haltherides or spheres. ♀ haltheride like, ovoid or spheric, blue protoplasm, finely vacuolated. Nucleus hardly distinguishable at Leishmann, well stained at May Grunwald-Giemsa, spherical, central or sub-central, lodged in a definite vacuole. Pigment granules of different sizes scattered over the body. ♂ colourless at Leishmann, rose at May Grunwald-Giemsa, nucleus very small, comma-shaped. Pigment with polar granules a little larger than those scattered on the body. Form always spheric. Red cell hypertrophied, nucleus displaced (in collaboration with my pupil Raia Sirvoicar).

7. *Thereiceryx Zeylonica* Gmelin. Shot at Malim (Bardés), identified by Mr. Prater. *Hæmoproteus* having the following characters. ♀ dark blue, vacuolated protoplasm. Nucleus circular, seldom elongated, central or sub-central. Pigment granules scattered, minute, often in clusters. ♂ colourless, large nucleus and without definite outline, always central and constituted by chromatic masses with irregular disposition. Pigment granules very minute situated on poles. Red cell hypertrophied, nucleus displaced.

This *H.* differs from the *H.* of *Thereiceryx z. inornatus* as far as concerns the ♂ gametocytes. The tendency for lysing the host cell is not seen here.

On pure morphological grounds we consider this *H.* a variety of the former and will name it *Hæmoproteus thereicerycis* Var. *Zeylonica* (in collaboration with my pupil Fernando Lopes).

8. *Aegithina tiphia* Lin. Shot at Nagoa (Salcete) and identified by Mr. Cann from Bombay. *Hæmoproteus aegithinae* sp. n. Sexual dimorphism. ♀ light blue, nucleus ovoid, central or sub-central, pigment in minute granules, scattered over the body. ♂ colourless, pigment in thin granules, often dust-like, collected mostly on poles. Nucleus oval, sub-central or central. Red cell hypertrophied, nucleus displaced.

9. *Centropus parroti* Stresemann. Shot at Diu, identified by Mr. Prater. *Hæmoproteus centropi* sp. n. Sexual dimorphism. ♀ light blue, alveolar. Pigment yellow brown, in large or minute dust-like granules, situated either on poles or irregularly scattered over the body. Nucleus central, pale rose. ♂ colourless or with a slightly pale blue tone in the periphery or in the poles. Nucleus central, much larger than on ♀, and constituted by minute, distinct chromatic dots or by an irregular spirematic thread. Pigment very irregularly distributed, but showing a tendency for a polar location. Red cell hypertrophied, nucleus displaced.

Hæmoproteids (unnamed) have been recorded in *Centropus monachus* by A. & M. Léger in Niger (1914), in *C. Sinensis* by Donovan in India and by Mathis and Léger in Tonkin (1911), in *C. Superciliosus* by Minchin in Uganda (1910) and in Belgian Congo by Rhodain and co-workers (1913).

10. *Platalea leucorodia major* Temm. Shot at Diu, identified by Mr. Prater. *Hæmoproteus plataleæ* n. sp. Pigment coffee olive tone showing a tendency to suffer a kind of dissolution and diffuse through the protoplasm. ♀ alveolar, deep blue with a greenish tone. Nucleus central. Pigment scattered over the body. ♂ colourless or very slightly greyish blue, the borders of the poles being often the only stained part of the parasite. Pigment in minute granules, often in clusters, generally with polar location. Red cell hypertrophied, nucleus displaced.

11. *Antigone virgo* Linn. Shot in Junagad, identified by Mr. Prater. *Hæmoproteus antigenis* n. sp. ? (? = *H.* of *Antigone antigone* studied by Wenyon and Dr. Scott in 1925). Sexual dimorphism. ♀ alveolar, blue, nucleus slightly sub-central, compact, oval, rose, lodged in a vacuole. ♂ pale violet, nucleus central, granular. Pigment coffee brown, scattered over the body; in ♀ often in clusters or in two large masses united by a bâtonnet.

12. *Upupa e. orientalis* Stuart Baker. Shot at Daman, identified by Mr. Prater. *Hæmoproteus upupæ* sp. n. ? [?=H. of *Upupa epops* recorded by Danilewsky in South Russia (1889)]. Sexual dimorphism. ♀ bluish, not staining uniformly. Nucleus compact, spheric, ovoid or ribbon-like, sub-central, deep rose. Pigment in granules or clusters, irregularly distributed. ♂ colourless with the borders with a very slight bluish tone. Nucleus pale rose or violet rose, large, granular, pseudospirematic, the threads being irregularly interwoven or disposed in parallel lines oblique to the great axis of the parasite. Pigment granules small, often dust-like and never fused together, scattered over the body or with polar location. Very few compared with those which fill the ♀ (in collaboration with my pupil Emidio da C. Affonso).

13. *Cerchneis t. objurgatus* Stuart Baker. Shot at Praganã and identified by Mr. Prater. *Hæmoproteus*. Sexual dimorphism. Pigment coffee brown with olive tone. ♀ haltheridic, blue greyish, alveolar. Nucleus slightly sub-central, light red, lodged in a vacuole and situated on the convex border of the parasite, generally circular and compact but often quadrangular and constituted by a central compact mass from which appendage-like expansions start all around. Granules or clusters of pigment irregularly distributed. ♂ oval or circular and making a sort of hernia on the periphery of the red cell. Protoplasm colourless or light violet. Nucleus pale rose, sub-central or central, small, elliptic or irregular and constituted by one chromatic dot fairly visible, surrounded by or continuing with the remainder of the chromatic substance hardly visible. Pigment with a rather polar location.

Hæmoproteids have been recorded in *Centropus alopex* by A. and M. Léger (Niger, 1914), *C. naumannii* by Plimmer (South Europe, 1914), *C. Sparveria* by Léger (Guiana, 1918), *C. tinnunculus* by Ziemann (Heligoland and Italy, 1898), by Boing (Germany, 1925). Wasielewsky and Wulker recorded as *Hæmoproteus danilewskyi* var. *tinnunculus* the parasite of this bird (Europe, 1918).

Having not read this paper we are obliged to limit our statements to a mere record of this *Hæmoproteus* as a parasite of the Indian *Cerchneis t. objurgatus*.

14. *Elanus c. vociferus* Latham. Shot at Daman, identified by Mr. Prater. *Hæmoproteus elani* sp.n. Sexual dimorphism. ♀ uniformly blue, nucleus sub-central, small, ovoid, rarely triangular, reddish, compact. ♂ colourless, large granular nucleus without a definite outline. Pigment of sepia colour, identically disposed both on males or females in a very peculiar way: collected on poles, under the form of large mulberry-like masses, leaving sometimes the colouring matter spread in the surrounding cytoplasm. Red

cell hypertrophied, nucleus displaced (in collaboration with my pupil Emidio da C. Affonso).

15. *Dicrurus m. macrocercus* Vieill. Shot at Praganā, identified by Mr. Prater. *Hæmoproteus dicruri* sp. n. Sexual dimorphism. ♀ bluish not uniformly stained, the poles and the convex border remaining uncoloured. Nucleus sub-central, small, pale rose. Pigment yellow brown in granular or rods, collected on poles. ♂ ovoid, colourless, nucleus sub-central, sometimes indistinct, pale rose, rod-like. Pigment or scattered in large granules here and there or collected in clusters with a polar location. Red cell hypertrophied, nucleus displaced.

16. *Tephrodornis p. pondiceriana* Gmelin. Shot at Praganā, identified by Mr. Prater. *Hæmoproteus tephrodornis* sp. n. Sexual dimorphism. ♀ haltheride or ovoid, blue not uniformly as many places are completely unstained. Nucleus oval, central or sub-central. ♂ oval, light greyish, small indistinct nucleus. Pigment black sepia colour, in granules or rods often disposed in lines or clusters along the concave border. Red cell hypertrophied, nucleus displaced.

17. *Otocompsa emeria* Cabanis. Shot at Malim (Bædez), identified by Mr. C. M. Cann from Bombay. *Hæmoproteus otocompsæ* sp. n. Sexual dimorphism. ♀ pale blue at Leishmann, and rose at May Grunwald-Giemsa, seldom vacuolated. Nucleus spherical, sub-central, seldom elongated, situated on the convex border of the parasite. Pigment scattered over the body. ♂ colourless at Leishmann, pale rose at May Grunwald-Giemsa. Nucleus very large, granular without definite outline, sub-central. Pigment located on poles. Red cell hypertrophied, nucleus displaced (in collaboration with my pupil Fernando Lopes).

N.B.:—This *H.* is perhaps similar to the unnamed *H.* of *Picnonotus barbatus* recorded by A. and M. Léger in Senegal.

18. *Glaucidium radiatum* Tickell. Shot at Canacona and identified by Mr. Cann. *Hæmoproteus glaucidii* sp. n. ? Var. nov. ? [? = *H.* of *Glaucidium perlatum* recorded by A. and M. Léger (Niger 1914); ? Var of. *H. noctuæ* Celli and S. Felice (1891)]. Sexual dimorphism. ♀ deep blue, vacuolated. Nucleus rose, spheric, central or elongated and situated on the convex border. Pigment scattered. ♂ almost colourless, nucleus large without definite borders, constituted by irregular chromatic masses, sub-central in haltheride forms, central in the roundish ones. Red cell hypertrophied; nucleus keeps the normal position when the parasite is female, and is displaced by the male forms (in collaboration with my pupil Fernando Lopes).

19. *Sturnus malabarica* Gmelin. Shot at Ponda, identified by Mr. Cann. *Hæmoproteus sturni* sp. n. [? = *H.* of *Sturnus vulgaris* recorded by

Coles (1914) in England, by Celli and S. Felice (1891) in Italy, by Wasielewsky (1896) in Germany, by Labb  (1894) in France]. Sexual dimorphism. ♀ Light blue, vacuolated. Nucleus ovoid, central or sub-central. Pigment lacking or irregularly scattered. ♂ almost colourless, nucleus conspicuous, compact, central or sub-central. Haltheride-like or oval. Pigment with polar location (in collaboration with my pupils Atchuta Rivoncar and Chandracanta Camotim).

20. *Anthus r. rufulus* Vieillot. Shot at Nagoa (Salcete), identified by Mr. Cann. *H moproteus anchi* sp. n. (perhaps similar to the unnamed *H.* of *Anthus pratensis* Nieseckul 1921, 1922 Heligoland, of *A. japonicus* Ogawa 1911, Japan, of *A. trivialis* Galli Valerio 1902, Europe). Sexual dimorphism. ♀ light blue, irregularly stained. Nucleus compact, central or sub-central, deep rose. Pigment brown coffee irregularly scattered, seldom located on poles. ♂ colourless, nucleus oval or triangular, central. Pigment *idem* as above. Red cell hypertrophied, nucleus displaced (in collaboration with my pupil Ant nio Reveredo).

21. *Halcyon Smyrnensis* Lin. Shot at Canaona, identified by Mr. Cann. *H moproteus halcyonis* n. sp. Sexual dimorphism. ♀ haltheridic, oval, cordiform, vacuolated or not, deep blue. Pigment on poles, sometimes on the centre or near the borders. Nucleus oval, central or sub-central. ♂ colourless, nucleus indistinct, oval or comma-shaped, central or sub-central. Pigment scattered over the body, often denser at the periphery. Red cell slightly hypertrophied. Sometimes not at all; nucleus displaced (in collaboration with my pupil Vamona V. Quenim).

22. *Gymnorhis Xanthocollis* Burton. Shot at Pragan , identified by Mr. Prater. *H moproteus gymnorhidis* (? similar to the *H.* of the Indian *Gymnorhis flavigollis* Plimmer, 1913). Sexual dimorphism. ♀ haltheridic, very slender, poles a little larger than the body and more deeply stained. Deep blue, alveolar. Nucleus central or sub-central, rod-like, oval or diplo-zomic. Pigment in clusters of large granules situated in the centre and on the poles, where, sometimes collected as a fine dust, renders more intense the natural dark staining of the protoplasm at this level. The pigment substance spreads a little around the granules diffusing in the protoplasm. ♂ colourless or slightly blue. Pigment granules very minute, situated rather on the poles. Nucleus *idem* as above. General morphology haltheridic or oval, red cell hypertrophied, rarely oval (in collaboration with my pupil J. Filipe do Rego).

23. *Athene brama* Temm. Shot at Nagoa (Salcete), identified by Mr. Cann. *H moproteus bramae* sp. n. (recorded already by Donovan, 1904). Sexual dimorphism. ♀ haltheridic, slender, more or less irregular showing

some degree of constriction in the middle. Rare oval forms. Protoplasm homogeneous, blue, the staining being more pronounced in the poles. Nucleus oval, pale rose, central or sub-central. Pigment granules isolated or in clusters, irregularly scattered. ♂ haltheridic, comma-shaped, oval. Nucleus without definite outline, often scarcely visible. Pigment granules thinner than in ♀, generally having a polar location but often covering the whole body. Red cell unaltered or slightly hypertrophied; nucleus displaced.

Conclusions.

In this note the following *Hæmoproteids* of Indian birds are recorded.

A.—*Hæmoproteus* recorded for the first time in the genus of these birds and to which the specific name has been given according to the same ornithological genus: *Gallinula chloropus*, *Pastor roseus*, *Thereiceryx z. inornatus*, *Aegithina tiphia*, *Platalea leucorodia major*, *Elanus c. vociferus*, *Dicrurus m. macrocercus*, *Tephrodornis p. pondiceriana*, *Halcyon smyrnensis*. Hence the 9 following new species: *Hæmoproteus gallinulæ*, *H. pastoris*, *H. thereicerycis*, *H. ægithinæ*, *H. plataleæ*, *H. elani*, *H. dicruri*, *H. tephrodornis*, *H. halcyonis*.

B.—*Hæmoproteus* recorded for the first time in the respective species of Indian birds, a similar protozoon having however been registered by other authors in birds belonging to the same genus. When such *Hæmoproteids* have not been named by other authors, we have given to our parasite the specific name according to the ornithological genus, excepting for *H. bramae*, par. of *Athene brama*. But often, having not sufficient information on the researches of the authors, we have only registered the parasite without naming it, or have employed a trinominal designation.

Hence:

Hæmoproteus asturis dussumieri, par. of *Astur badius dussumieri*.

H. orioli, par. of *Oriolus orilus kundoo*.

H. centropi, par. of *Centropus parroti*.

H. antigonis, par. of *Antigone virgo*.

H. upupæ, par. of *Upupa e orientalis*.

H. otocompsæ, par. of *Otocompsa emeria*.

H. glaucidi, par. of *Glaucidium radiatum* (? sp. ? var.).

H. sturni, par. of *Sturnus malabarica*.

H. anhi, par. of *Anthus r. rufulus*.

H. gymnorhidis, par. of *Gymnorhis xanthocollis*.

H. bramae, par. of *Athene brama*.

C.—The *H.* of *Thereiceryx zeylonicus* has been registered only as a var. of *H. thereicerycis* (*H. thereicerycis* var. *zeylonica*).

The *H.* of *Strix ocellata* has only been recorded without name.