Description of Two New Species of Avian Haemoproteidae -9, *Haemoproteus zhobensis* Sp. Nov. and *Haemoproteus balochiorum* Sp. Nov from Cranes (Gruidae) in Pakistan

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**Abstract:** Two new species of Haemoproteids, *Haemoproteus zhobensis* (*H. zhobensis*) sp. Nov and *Haemoproteus balochiorum* (*H. balochiorum*) sp. Nov are described from the cranes *Anthropoides virgo* (L) and *Grus grus lilfordii* (Sharpe) with the incidence of 0.86% and 1.56% respectively, collected from Balochistan and the tribal areas of North West Frontier Province (N.W.F.P).

**Key word:** Birds - Haematology - Protozoan - Parasite - Host Species

**INTRODUCTION**

Although an extensive literature is available on the haematozoan of birds [1], however relatively very little sporadic work has been done on haematozoa from birds, furthermore least studies are available in Asia [2]. There is no specific survey work has been planned to study these parasites in birds and particularly from Balochistan, Pakistan. Nothing has so far been reported on Haematozoa, an area which is fanatically interesting because of its geographic resemblance to Palaeartic Region and concurrent possession of some unique migrant avifauna [2-5].

Relatively few haemoproteids are reported from the avian family Gruidae. The only record from Gruidae is *Haemoproteus antigenis* (*H. antigenis*) de Mello, 1935 from Anthropoidis virgo from India Bhatia [6]. Pierce [7] described *Haemoproteus balaericae*(*H. balaericae*) from the crowned crane, *Balearica pavonina* in West Africa. Many unidentified and incomplete described haemoproteids have been reported by various authors in or from Africa [8] nothing has been reported from the rest of the world including Pakistan. Haemoproteids are family specific and on the basis of few recognizable morphological characters the species can be identified up to species level, [9]. Key to the identification of Haemoproteids species in Gruidae [10, 11] is also revised

**MATERIALS AND METHODS**

A total of 180 cranes, 116 *Anthropoides virgo* (L) and 84 *Grus grus lilfordii* were examined during the trapping/hunting season of cranes in Balochistan and the tribal areas of North West Frontier Province (N.W.F.P) [2-5] Blood smears were prepared, air dried, fixed in 100% ethyl/methyl alcohol and Giemsa’s Stain was used. Microscopic examination and screening of blood slides were done using 100X lens. Dimension of the parasites (Macro; and micro gametocytes) were measured as +S.D. Micro photographs were taken with NIKON-HFX-11 Photomicroscope with the magnification of 100 objective X 10 eye piece X 5 instrument=5000X. All measurements are in microns. “N” represents number of specimens examined. NDR= nuclear displacement ratio. Permanent slides and photographs are with the senior author, Parasitology section, Zoology Department, Baluchistan University, Quetta. Pakistan.

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RESULTS

Family: Haemoproteidae Doflien, 1961
Genus: Haemoproteus Kruse, 1890.
Type species: Haemoproteus zhobensis sp. nov
Type locality: Zhob, Balochistan
Type Host: Anthropopoides virgo Linnaeus, 1758
(Demoiselle Crane)

Description: Acrogametocyte (Fig.1and Table 1, 3) N=7
Matured gametocytes sausage–shaped; not extending
ever host cell nucleus. Outline entire not amoeboid. Host
Cell nucleus markedly replaced laterally; parasite attached
with nucleus; cytoplasm finely granular deep blue with
Giemsa’s stain; pigment granules prominent scattered
randomly throughout cytoplasm usually fused with one
another. parasite not reaching ends of host cell. Pigment
granules ranging from12-16 per parasite and averaging
14.00(0.00) parasite measured 10.6 (0.43) in length and 3.8
(0.2) in width and 40.90 (1 .23) in area. Nucleus diffused
and not seen. Hypertrophy not marked. The host cell
nucleus markedly dislodged laterally; NDR = 0.30 (0 .01).

Microgametocyte: (Fig. 2) Sausage-shaped, cytoplasm
pale blue with Giemsa’s stain NDR = 0.40; other characters
as for macrogametocytes.

Incidence of Infection: Out of 116 Cranes only once crane
harboured this parasite it. It was present with mixed
infection of Puasmodium elongatum and Puasmodium
relictum. The incidence was 0.86%.

Intensity of infection: Only few matured gametocytes
were observed. The intensity was 1/20000 RBC.

Remarks: It is the only sausage-shape haemoproteid
described so from Gruidae. H. antigenis is slightly
halteridial but larger in size occupying about 80% of the
host cell, while this species is smaller in size sausage-
shape and occupies about less than 50% of the host cell
with altering the host cell.

It was also compared with newly described species
H. balochiorm (Fig 3).The difference were noted in
shape and size of granules, covered area, number of
pigment granules and NDR. One the basis of above
remarks it was considered as new species and the name
Haemoproteus zhobensis was proposed for it on the basis
of locality from where the host of this new species was
collected (Table 1).
Table 1: Dimensions of the *Haemoproteus zhobensis* sp. n. All measurements based on 7 parasites and normal erythrocytes from one host of the same species. Figures in parenthesis are standard deviation. All measurements are in microns.

<table>
<thead>
<tr>
<th>Erythrocyte</th>
<th>Parasite</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Length</td>
</tr>
<tr>
<td>Parasitized</td>
<td>18.8</td>
</tr>
<tr>
<td></td>
<td>(0.28)</td>
</tr>
<tr>
<td>Non-parasitized</td>
<td>13.8</td>
</tr>
<tr>
<td></td>
<td>(0.18)</td>
</tr>
</tbody>
</table>

Table 2: Showing morphometric measurements of *Haemoproteus balochiorum* sp.n. All measurement based on 10 parasites and normal and parasitized erythrocytes from 5 hosts of the same species. Figures in parenthesis are standard deviation. All measurements are in microns.

<table>
<thead>
<tr>
<th>Measurements</th>
<th>Normal RBC</th>
<th>Parasitized BRC</th>
<th>Parasite</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Length</td>
<td>Width</td>
<td>Area</td>
</tr>
<tr>
<td>Parasitized</td>
<td>13.9 (0.19)</td>
<td>15.2 (0.07)</td>
<td>15.13 (0.08)</td>
</tr>
<tr>
<td>Non-parasitized</td>
<td>7.55</td>
<td>8.56 (0.13)</td>
<td>8.63 (0.05)</td>
</tr>
<tr>
<td></td>
<td>105.04 (0.65)</td>
<td>131.68 (0.55)</td>
<td>130.29 (1.26)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nucleus</th>
<th>Length</th>
<th>Width</th>
<th>Area</th>
<th>NDR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parasitized</td>
<td>5.78 (0.21)</td>
<td>5.05 (0.02)</td>
<td>5.38 (0.04)</td>
<td>3.35 (0.03)</td>
</tr>
<tr>
<td>Non-parasitized</td>
<td>2.01 (0.002)</td>
<td>1.86 (0.04)</td>
<td>1.93 (0.03)</td>
<td>2.55 (0.11)</td>
</tr>
<tr>
<td></td>
<td>11.60 (0.15)</td>
<td>9.47 (0.24)</td>
<td>10.37 (0.11)</td>
<td>8.72 (0.59)</td>
</tr>
<tr>
<td>No. of granules</td>
<td>-</td>
<td>12.2 (0.13)</td>
<td>12.00 (0.00)</td>
<td>12.2 (0.03)</td>
</tr>
<tr>
<td>N</td>
<td>40</td>
<td>0.45</td>
<td>0.62</td>
<td>0.45</td>
</tr>
<tr>
<td>% hypotrophy in</td>
<td>-</td>
<td>9.15</td>
<td>8.84</td>
<td>-</td>
</tr>
<tr>
<td>Length</td>
<td>-</td>
<td>13.37</td>
<td>14.30</td>
<td>-</td>
</tr>
<tr>
<td>Width</td>
<td>-</td>
<td>25.36</td>
<td>24.04</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 3: Dimensions of sausage shaped haemoproteids in Gruidae

<table>
<thead>
<tr>
<th>Erythrocyte</th>
<th>Parasite</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Length</td>
</tr>
<tr>
<td>Parasitized</td>
<td>13.5 (0.00)</td>
</tr>
<tr>
<td>Non-parasitized</td>
<td>13.8 (0.28)</td>
</tr>
<tr>
<td>Host. <em>Anthropodis virgo</em></td>
<td>13.8 (0.28)</td>
</tr>
<tr>
<td>Parasitized</td>
<td>15.2 (0.07)</td>
</tr>
<tr>
<td>Non-parasitized</td>
<td>13.8 (0.28)</td>
</tr>
<tr>
<td>Host. <em>A. virgo</em></td>
<td>13.8 (0.28)</td>
</tr>
<tr>
<td>Parasitized</td>
<td>15.2 (0.07)</td>
</tr>
<tr>
<td>Non-parasitized</td>
<td>13.9 (0.19)</td>
</tr>
</tbody>
</table>

**Microgametocyte:** (Fig. 3, 4, 5 Table-2,3) N=10 Matured gametocytes sausage-shaped; cytoplasm pale pink in colour with Giemsa’s stain; parasite nucleus exceptionally diffused and not observed; NDR=0.62. Other characters as for macrogametocytes.

**Incidence of Infection:** Out of 64 cranes (*G.g. lilfordii*) Examined, only one crane harbored this parasite. Both micro- and macrogametocyte was observed. The incidence was 1.56%.

**Microgametocyte:** (Fig. 3, 4, 5 Table-2,3) N=10 Matured gametocytes sausage-shaped; cytoplasm pale pink in colour with Giemsa’s stain; parasite nucleus exceptionally diffused and not observed; NDR=0.62. Other characters as for macrogametocytes.

**Intensity of Infection:** Moderate infection was observed both Macrogametocyte and microgametocyte were present with the ratio of 1:3 respectively. The intensity was 1-2/2000 RBC.

**Remarks:** Very few haemoproteid have been reported from family Gruidae. This is due to less number of canes examined in the world. During the present study 180 cranes were examined for observation of haematozoa; comprising 64 *Grus grus lilfordii* and 116 were
Fig. 4: Macrogametocyte of H.balochiorum sp.nov.

Fig. 5: Microgametocyte of H.balochiorum sp.nov.

**Anthropoides virgo.** Uptill now it is the highest record of cranes examined for haematozoa in the world. The only sausage-shaped haemoproteid recorded from Gruidae is *Haemoproteus antigonis* which is very slightly halteridial constituting about more than 80% of the host cell. The species under-study is smaller in size constituting about 40-50% of the host parasite complex with very little NDR value and also possesses prominent rod shaped granules in the cytoplasm. It also differ from the newly described sausage shaped *Haemoproteus zhobensis* species in morphometric measurements, shape and size of granules, in NDR and with new host record (Table 2,3). On the basis of above specific characters it is considered as distinct species and the name *Haemoproteus balochiorum* is proposed for it on the basis of first record from Balochistan, Pakistan.

Key to the identification of Haemoproteus species from the family Gruidae (cranes modified after Bennett, 1975)

- Parasite highly amoeboid in outline ..........2
- Parasite not amoeboid in outline but entire ........3

Outline usually broken slightly amoeboid.

- Parasite constitute more than 50% of the host cell-parasite complex with 18-24 (average 20-4) number of granules..................*H. laeikii* sp.nov.

Outline highly amoeboid, parasite constitute less than 50% of the host cell-parasite complex with number of granules 7.6 (average ..................*H.balaericae*.

- Parasite sausage-shaped ..............4
- Parasite halteridial .....................5
- Parasite broadly sausage shaped, constitute more than 80% of the host cell parasite complex with 18-20 number of rounded granules, host cell nucleus markedly displaced towards periphery..................*H. antigonis*.
- Parasite sausage-shaped, smaller in size, constitute less than 50% of the host cell parasite complex with 12-16 number of granules ...............*H. zhobensis* sp.nov.
- Sausage-shaped, constituting more than 50% of the host cell, granules rod-shaped ranging from 10-14 in number......................*H. balochiorum* sp. nov.
- Mature parasites normally totally encircle host cell nucleus, ends of parasites appearing to fuse; host cell nucleus not displaced .........................*H. telfordii*.
- Mature parasite not encircling the host cell nucleus, ends of parasite never fuse, host cell nucleus very little displaced ....................*H.anthropoidii* sp. nov.

**REFERENCES**


