STUDIES ON TWO NEW SPECIES OF THE GENUS
MONOCERCOMONAS GRASSI, 1879, FROM THE
INDIAN BIRDS

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Received March 9, 1971

(Communicated by Prof. P. N. Ganapathi, F.A.Sc.)

ABSTRACT

Two new species of the genus Monocercomonas Grassi 1879 are described from the Indian birds. A complete morphological description and a detailed discussion regarding the specific identity of the species described is given.

INTRODUCTION

DURING the systematic survey of the flagellate parasites of birds and mammals two new species of the genus Monocercomonas were found in the domestic birds of India. At present this genus has four species in birds, namely; M. gallinarum Martin and Robertson (1911) from Gallus gallus, M. cruzi Da Cunha and Muniz (1925) from Crotophaga ani, M. globosus Da Cunha and Muniz (1925) from Chauna cristata and Trogon variegatus, M. gracilis Da Cunha and Muniz (1925) from Nyctibius sp., Monas sp., Podager sp. and Belnopterus sp. Two new species of Monocercomonas are reported for the first time from Indian birds in the present paper.

MATERIAL AND METHODS

For the study of intestinal flagellates, birds belonging to the genera Anas and Gallus were examined. In Anas sp. the infection was found in three of the fifteen ducks and in Gallus gallus domesticus out of twenty only four were infected with parasites belonging to this genus. Permanent stained preparations were made either with Giemsa’s stain after fixation in methanol or with Heidenhain’s iron haematoxylin following fixation in Schaudinn’s fluid. All the drawings were made with the aid of a camera lucida, at a magnification of about 2,000 ×.
Morphology

Monocercomonas anasae n. sp.—In stained preparations the shape of the body is spherical (Figs. 1, 4 and 5) or pyriform (Figs. 2 and 6), and measures 4·5 μ to 10·0 μ with an average of 7·45 μ in length and 2·5 μ to 7·5 μ in breadth with an average of 4·5 μ. The nucleus is situated at the anterior part of the body below the blepharoplast. It is generally spherical in shape (Figs. 1, 4 and 6) and the diameter ranges from 1·0 μ to 4·0 μ with an average of 2·3 μ. It has no definite endosome but contains a thin layer of chromatin just below the nuclear membrane with a clear space in the centre (Figs. 4–6).

The blepharoplast, a small darkly stained granule, is situated at the extreme anterior end of the body (Figs. 2, 4 and 5). It gives origin to three anterior flagella and a trailing flagellum. The three anterior flagella are unequal in length and their basal portions are so closely associated that they appear to arise as a bundle. All of them are uniform in thickness. The trailing flagellum is always longer than the three anterior flagella and also is longer than the body. It runs posteriorly along the body surface (Figs. 1, 2 and 4) but in some individuals it extends anteriorly.

The axostyle is a tubular structure, originating from the blepharoplast and passing backwards beneath (Figs. 1 and 2) or by the side of the nucleus (Figs. 4–6). It has three distinct regions, the capitulum, the trunk and the tip. The capitulum is bulbous, the trunk is uniform in diameter while the tip is pointed. The axostyle has a typical bend in the middle (Figs. 1–6) and never projects outside the body. It has no chromatic ring at the posterior region. Pelta and cytostome are not observed. The cytoplasm is finely granulated. Cyst-like forms are also noticed with two sets of mastigont elements (Fig. 3). As Martin and Robertson (1911) pointed out in Monocercomonas gallinarum this form may possibly be a stage in conjugation. But in their form the flagella were lacking while in the present Monocercomonas the flagella are seen like two darkly stained thick bands.

Monocercomonas qadrii n. sp.—In stained preparations the body is usually elongated (Figs. 1, 4 and 6) with a snout-like anterior end but pear-shaped (Fig. 7) and spherical (Fig. 8) forms are also seen. The length and breadth of the body range from (3·5 μ to 9·5 μ) with an average of 6·66 μ × (3·0 μ to 9·0 μ) with an average of 4·72 μ. The nucleus is situated at the anterior part of the body. It is oval (Figs. 1, 3, 7 and 8) or elongated (Figs. 2, 4–6) and has a small endosome in the centre (Figs. 7 and 8). The length of the nucleus ranges from 1·5 μ to 4·0 μ with an average of 2·3 μ and the breadth ranges from 1·0 μ to 3·0 μ with an average of 1·4 μ.
Genus Manocercomonas Grassi, 1879

Monocercomonas amasae n.sp.

FIGS. 1-6. Fig. 1. Spherical form showing a spherical nucleus, large blepharoplast, four long flagella directed backwards and a curved axostyle with a bulbous capitulum. Fig. 2. Pyriform showing a transversely elongated nucleus. Fig. 3. Cyst-like form showing two elongated nuclei, two band-like flagella and two axostyles. Figs. 4-6. Showing a thin layer of chromatin just below the nuclear membrane with a clear space in the centre.

(Figs. 1–3 from smears exposed to 4% osmic acid vapours, fixed in methyl alcohol and stained with Giemsa’s stain. Figs. 4–6 from smears fixed in Schaudinn’s fluid and stained with Heidenhain’s iron haematoxylin).

The blepharoplast is situated either at the extreme anterior end of the body (Figs. 2–8) or a little distance away from the anterior end. It is a large darkly stained granule which gives origin to the flagella and the axostyle. The three anterior flagella are usually directed backwards (Figs. 1–6) in the form of a bundle. In a few forms they are directed anteriorly. The length of
the anterior flagella are $10.0 \mu$ to $18.5 \mu$, $10.0 \mu$ to $21.0 \mu$, $9.0 \mu$ to $18.5 \mu$. The trailing flagellum always remains independent, and the length of it ranges from $10.5 \mu$ to $24.5 \mu$. All the flagella are longer than the length of the body.

The axostyle is tubular, slender and almost of uniform diameter throughout its length. The length of the axostyle ranges from $4.5 \mu$ to $11.0 \mu$. The anterior part of the axostyle is slightly expanded (Figs. 4 and 8) but there is no definite capitulum. The posterior end is sharply tapering and projects outside the body to a length of $4.0 \mu$. Axostylar ring is absent. The cytoplasm is finely granular with few darkly stained granules scattered in it.

Resting forms are also observed. In the typical form such as figured in Fig. 5 there is a well-marked blepharoplast and the flagella are fused forming a darkly stained band. The nucleus has the same shape which is already mentioned in the active form. An axostyle is also present.

**DISCUSSION**

From the above description it is evident that the present species of *Monoecercamonas* differ from all the other species of *Monocercomonas* so far reported from birds. Table I summarises the dimensions of all previously reported species along with the present species.

**TABLE I**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the species</th>
<th>Range of length in microns</th>
<th>Range of width in microns</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><em>M. gallinarum</em></td>
<td>$5.0$</td>
<td>$3.0$</td>
</tr>
<tr>
<td>2.</td>
<td><em>M. cruzi</em></td>
<td>$7.0$ to $8.0$</td>
<td>$3.0$ to $4.0$</td>
</tr>
<tr>
<td>3.</td>
<td><em>M. globosus</em></td>
<td>$4.0$ to $6.0$</td>
<td>$3.0$ to $4.0$</td>
</tr>
<tr>
<td>4.</td>
<td><em>M. gracillus</em></td>
<td>$6.0$ to $7.0$</td>
<td>$2.5$ to $3.5$</td>
</tr>
<tr>
<td>5.</td>
<td><em>M. anasae n.sp.</em></td>
<td>$4.5$ to $10.0$</td>
<td>$2.5$ to $7.5$</td>
</tr>
<tr>
<td>6.</td>
<td><em>M. quadrii n.sp.</em></td>
<td>$3.5$ to $9.5$</td>
<td>$3.0$ to $9.0$</td>
</tr>
</tbody>
</table>

Table I shows that the present species differ in dimensions. Apart from the dimensions the two new species show some distinct characters.
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Fig. 1. Elongated form with a snout-like anterior end showing the general structure. Fig. 2. Showing an elongated nucleus and a large blepharoplast. Figs. 3, 4, and 6. Showing three flagella in the form of a bundle running posteriorly an independent fourth flagellum and a projecting axostyle. Fig. 5. Resting form showing all the mastigont elements. Figs. 7 and 8. Showing an endosome in the nucleus.

(Figs. 1-6 from smears exposed to 4% osmic acid vapours, fixed in methyl alcohol and stained with Giemsa's stain. Figs. 7 and 8 from smears fixed in Schaudinn's fluid and stained with Heidenhain's iron haematoxylin.)
In *M. gallinarum* the nucleus contains chromatin granules scattered throughout it. In *M. cruzi* the nucleus has an endosome in the centre with chromatin all round. The nucleus of *M. globosus* is rich in chromatin. But in *M. anasae* n. sp. the nucleus contains only a thin layer of chromatin just beneath the nuclear membrane and in *M. qadrii* n.sp the nucleus has a small endosome.

The blepharoplast of *M. gallinarum* has four granules while in both the new species the blepharoplast is a single granule. In *M. cruzi* and *M. globosus* the anterior flagella are equal in length and the posterior flagellum of *M. cruzi* and *M. gracillus* is thicker than the anterior flagella. But in *M. anasae* n.sp. and *M. dadrii* n.sp. the anterior flagella are unequal in length and the trailing flagellum is as thick as the anterior flagella. Unlike all other species the flagella of *M. qadrii* n.sp. are longer than the body length.

The axostyle of *M. gallinarum* has two axostylar rings but in the two new species the axostylar rings are absent. In all the previously reported species the axostyle projects beyond the body as in *M. qadrii* n.sp. but in *M. anasae* n.sp. the axostyle never projects out.

In *M. cruzi* and *M. globosus* siderophilic granules are present in contrast to the present two new species where they are absent. In *M. globosus* and *M. gracillus* the cytostome is present but in *M. anasae* n.sp. and *M. qadrii* n.sp. the cytostome is absent.

In view of these differences, the parasites from the birds *Anas* sp. and *Gallus gallus domesticus* are considered new to science and are designated as *M. anasae* n.sp. after the generic name of the host and *M. qadrii* n.sp. after Prof. S. S. Qadri respectively.

**Acknowledgements**

The author wishes to express her sincere gratitude to Prof. S. S. Qadri under whose guidance the entire research work was carried out. She is indebted to him for his continuous guidance and encouragement. She is grateful to Prof. S. N. Singh, Head of the Zoology Department, Osmania University, for the laboratory facilities provided in the department. She is thankful to the CSIR for the award of a Research Fellowship during the tenure of her research work.

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