DESCRIPTION, RESULT AND DISCUSSION:
SYSTEMATIC LIST OF DESCRIBED FORMS
Family: Allocreadiidae Stossich, 1903
Family: Allocreadiidae Stossich, 1903

*Allocreadium madhaviae* sp. nov.
(Plate-1-2, Fig. 1-3)

**Description**

Body elongated, aspinose, 1.38 to 2.25 mm long, 0.48 to 0.58 mm wide with depressed or rounded anterior and bluntly pointed posterior ends. Oral sucker terminal, subspherical, 0.16 to 0.18 mm long, 0.14 to 0.22 mm wide. Prepharynx absent. Pharynx globular, 0.06 to 0.08 mm long, 0.06 to 0.08 mm wide. Oesophagus short, 0.02 to 0.03 mm long. Intestinal caeca simple, extending to a little anterior to hind end of body. Ventral sucker subspherical, pre-equatorial, 0.12 to 0.20 mm long, 0.15 to 0.18 mm wide, at 0.44 to 0.67 mm from anterior extremity.

Excretory bladder tubular; excretory pore terminal, at hind end of body.

Genital pore median, intercaecal, posterior to caecal bifurcation, 0.34 to 0.39 mm from anterior extremity.

Testes entire, rounded, subequal, tandem, intercaecal, lying in middle region of body. Anterior testis post ovarian, 0.14 to 0.30 mm long, 0.16 to 0.26 mm wide, at 0.66 to 1.18 from anterior extremity. Posterior testis close to anterior testis, 0.14 to 0.35 mm long, 0.14 to 0.26 mm wide, at 0.43 to 1.05 mm from hind end of body. Cirrus sac flask shaped, extending posteriorly up to anterior margin of ventral sucker, 0.13 to 0.33 mm long, 0.06 to 0.15 mm wide, at 0.35 to 0.41 mm from anterior extremity. Vesicula seminalis bipartite, lying in the basal part of cirrus sac; proximal part oval, 0.04 to 0.09 mm long, 0.03 to 0.08 mm wide; distal part 0.04 to 0.09 mm long, 0.02 to 0.08 mm wide. Pars prostatica tubular, surrounded by a large number of prostate gland cells.

Ovary entire, oval, pre-equatorial, lying in between ventral sucker and testis, 0.08 to 0.15 mm long, 0.10 to 0.14 mm wide, at 0.54 to 0.92 mm from
Plate 1: *Allocreadium madhaviae* sp. nov.
Entire ventral view
Plate 1: Allocreadium madhaviae sp. nov.
Entire ventral view
Plate 2: *Allocreadium madhaviae* sp. nov.
1. Entire ventral view
2. Eggs
3. Portion showing differences in shape of anterior extremity.
anterior extremity. An oviduct arises from anterior end of ovary to open at ootype. Receptaculum seminis sac like, posterior to ovary, slightly overlapping its posterior part, 0.09 to 0.12 mm long, 0.11 to 0.12 mm wide. Vitellaria follicular, lateral in position, confluent in post testicular region, extending from anterior third level of ovary upto a little anterior to hind end of body. Uterus lying between anterior testis and genital pore. Eggs oval, operculate, 0.10 to 0.12 mm long, 0.06 to 0.07 mm wide.

Host - *Catla catla* (Ham.)

Location - Intestine

Locality - Chaukaghat fish market, Varanasi

Discussion


The present form differs from all the known valid Indian species of the genus, *Allocreadium* Looss, 1900 except *A. handiai*, *A. hetropneustusius*, *A. fasciatusi*, *A. catlai*, *A. mrighali* and *A. manteri* in the commencement of vitellaria from anterior third level of ovary upto a little anterior to hind end of the body. It differs from *A. fasciatusi* in having oral sucker larger than ventral
sucker, and from *A. hetropneustusius* in having receptaculum seminis posterior to ovary instead of anterior to it, and in the extension of vitellaria not from hind end of ventral sucker. The new form again differs from *A. catlai* and *A. manteri* in shape and position of receptaculum seminis, sucker ratio and commencement of vitellaria not from mid level of pharynx. Accordingly, it is regarded as a new species with the specific name, *Allocreadium madhaviae* sp. nov.

The new species is named in honour of Dr. R. Madhavi, Prof. Emeritus, Andhra University, Vishakhapatnam.

**Seasonal variation in the incidence and intensity of infection of *Allocreadium madhaviae* sp.nov. in fresh water fish, *Catla catla* (Ham.)**

For the study of seasonal variation, 381 specimens of *Catla catla* (Ham.) were examined in which 76 fishes were found infected and 181 mature worms of *Allocreadium madhaviae* sp. nov. were obtained. The overall percentage of infection was 19.95% and intensity 2.38 per infected fish.

**Table No. 1: Data showing incidence and intensity of infection of *Allocreadium madhaviae* sp. nov.**

<table>
<thead>
<tr>
<th>Months</th>
<th>Fish examined</th>
<th>Fish infected</th>
<th>No. of parasites</th>
<th>% of infection</th>
<th>Mean no. of parasites/infected fish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mar. 04</td>
<td>40</td>
<td>5</td>
<td>12</td>
<td>12.50</td>
<td>2.40</td>
</tr>
<tr>
<td>Apr.</td>
<td>35</td>
<td>8</td>
<td>19</td>
<td>22.86</td>
<td>2.38</td>
</tr>
<tr>
<td>May.</td>
<td>28</td>
<td>7</td>
<td>16</td>
<td>25.00</td>
<td>2.29</td>
</tr>
<tr>
<td>Jun.</td>
<td>22</td>
<td>4</td>
<td>9</td>
<td>18.18</td>
<td>2.25</td>
</tr>
<tr>
<td>Jul.</td>
<td>34</td>
<td>7</td>
<td>15</td>
<td>20.59</td>
<td>2.14</td>
</tr>
<tr>
<td>Aug.</td>
<td>23</td>
<td>5</td>
<td>11</td>
<td>21.74</td>
<td>2.20</td>
</tr>
<tr>
<td>Sep.</td>
<td>25</td>
<td>10</td>
<td>28</td>
<td>40.00</td>
<td>2.80</td>
</tr>
<tr>
<td>Oct.</td>
<td>42</td>
<td>13</td>
<td>32</td>
<td>30.95</td>
<td>2.46</td>
</tr>
<tr>
<td>Nov.</td>
<td>36</td>
<td>5</td>
<td>12</td>
<td>13.89</td>
<td>2.40</td>
</tr>
<tr>
<td>Dec.</td>
<td>29</td>
<td>3</td>
<td>6</td>
<td>10.34</td>
<td>2.00</td>
</tr>
<tr>
<td>Jan. 05</td>
<td>39</td>
<td>6</td>
<td>14</td>
<td>15.38</td>
<td>2.33</td>
</tr>
<tr>
<td>Feb.</td>
<td>28</td>
<td>3</td>
<td>7</td>
<td>10.71</td>
<td>2.33</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>381</strong></td>
<td><strong>76</strong></td>
<td><strong>181</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The percentage of infection and mean number of parasites per infected fish were recorded between March, 2004 to February, 2005 and are shown in Table 1. The number of fishes examined and parasites obtained during this period are also given in Table 1. During 12 months the fluke occurred in different intensities. Throughout the year, percentage fluctuated between 10.34% to 40.00%. The highest infection occurred in September, 2004 when 40.00% of the fishes were infected with parasites. The lowest infection occurred in December, 2004 when 10.34% of the fishes were infected with parasites. In rest of the months the infection varied between 10.71% to 30.95%.

The mean number of parasites per infected fish during the same time duration showed almost similar trend. The maximum intensity (an average of 2.80 worms per infected fish) was recorded in September, 2004 when percentage of infection was also at maximum level. The minimum intensity (2.0 fluke per infected host) was recorded during December, 2004. In rest of the months the infection varied between 2.14 and 2.46.
Family: Bucephalidae Poche, 1907
Family: Bucephalidae Poche, 1907

*Bucephalopsis dhari* sp. nov.

(Plate: 3-4, Fig. 1-2)

**Description**

Body elongated, slender, aspinose with bluntly rounded anterior and posterior end, 1.01 to 1.62 mm long, 0.41 to 0.45 mm wide. Anterior sucker subterminal, subspherical, 0.13 to 0.15 mm long, 0.14 to 0.17 mm wide. Mouth ventral, equatorial, at 0.51 to 0.83 mm from anterior extremity. Pharynx subglobular, 0.04 to 0.08 mm long, 0.04 to 0.09 mm wide. Oesophagus small, tubular, 0.03 to 0.04 mm long. Intestine saccular, 0.17 to 0.18 mm long, 0.08 to 0.16 mm wide, extending posteriorly up to a little behind the posterior margin of anterior testis.

Excretory bladder tubular; excretory pore terminal, at hind end of the body.

Genital pore subterminal, at hind end of body.

Testes entire, subspherical, tandem, close together, lying in middle third of body. Anterior testis 0.15 to 0.19 mm long, 0.15 to 0.16 mm wide, at 0.46 to 0.84 mm from anterior extremity. Posterior testis 0.12 to 0.16 mm long, 0.13 to 0.14 mm wide, at 0.34 to 0.45 mm from hind end of body. Cirrus sac elongated, curved, 0.53 to 0.54 mm long, 0.08 to 0.09 mm wide, in posterior half region of body, extending anteriorly up to a little anterior to posterior level of intestine, at 0.50 to 1.03 mm from anterior extremity, enclosing 0.10 to 0.11 mm long, 0.07 to 0.08 mm wide, ovoid, vesicula seminalis; 0.27 to 0.35 mm long, slender, pars prostatica surrounded by large number of prostate gland cells and 0.07 to 0.10 mm long, tubular, ejaculatory duct terminating into genital atrium opening through genital pore.
Plate 3: *Bucephalopsis dhari* sp. nov.
Entire ventral view
Plate 3: *Bucephalopsis dhari* sp. nov.
Entire ventral view
Plate 4: *Bucephalopsis dhari* sp. nov.
1. Entire ventral view
2. Eggs
Ovary subspherical, pre-equatorial, lateral, pretesticular, preintestinal, 0.13 to 0.19 mm long, 0.13 to 0.16 mm wide, at 0.26 to 0.47 mm from anterior extremity. Oviduct arises from posterior end of ovary, opening into ootype surrounded by a large number of Mehlis' glands cells. Vitellaria follicular, rounded in two lateral rows, 8 on right side, 9 in left side, extending posteriorly up to a little posterior to anterior level of ovary. Vitelline ducts from either side meet posterior to intestine forming yolk reservoir, opening at ootype. Uterus coiled, lying between posterior level of anterior sucker and genital atrium. Egg small, oval, nonoperculate, 0.018 mm to 0.019 mm long, 0.009 to 0.010 mm wide.

Host - Clupisoma garua (Ham.)

Location - Intestine

Locality - River Ganga, Varanasi

Discussion

The new form is referred to the genus, Bucephalopsis (Diesing, 1855), Nicoll, 1914 and differs from all the known species included under the genus except B. callicotyle, Nicoll, 1915; B. exilis Nicoll, 1915; B. pleuronectis Layman, 1930; B. fusiformis Verma, 1936; B. scombropsis Yamaguti, 1938; B. microcirrus, Chauhan, 1943; B. tenuis, Yamaguti, 1952; B. philipinoporum, Velasquez, 1959; B. scomberomorus Corkum, 1968; B. ghanensis Fischtal and Tomas, 1968; B. chorinemi Gupta and Ahmad, 1976; B. pritchardae Govind, 1985 and B. vachai Govind, Sabhyata and Gundevia, 2004 in having elongated body. It differs from B. callicotyle, B. exilis, B. scombropsis, B. microcirrus, B. scomberomorus, B. ghanensis, B. chorinemi, B. pritchardae and B. vachai in having uterus beyond the ovary and from B. fusiformis, B. pleuronectis, B. tenuis, B. philipinoporum and B. pritchardae in having testes close instead separated by uterine coil. It further differs from B. fusiformis and B. microcirrus in the anterior extension of cirrus sac up to mid level of anterior testis instead of behind posterior testis, from B. callicotyle and B. chorinemi in
having smooth body, from *B. pritchardae* in having cirrus sac elongated instead of curved and in the position of ovary anterior to the intestine and from *B. vachai* in the anterior extension of cirrus sac beyond posterior testis and extension of uterus anteriorly beyond the posterior level of anterior sucker. Accordingly, it is regarded as a new species with the specific name, *Bucephalopsis dhari* sp. nov.

The new species is named in honour of Dr. R.L. Dhar, retired Professor, Kashmir University, Srinagar for his contribution in the field of Helminthology.

**Seasonal variation in the incidence and intensity of infection of *Bucephalopsis dhari* sp. nov. in fresh water fish *Clupisoma garua* (Ham.)**

The 426 specimens of *Clupisoma garua* (Ham.) examined included 90 infected fish from which 163 mature *Bucephalopsis dhari* sp.nov. were collected. This represented an overall percentage of infection of 21.13% and intensity of 1.81 per infected fish.

**Table No. 2: Data showing incidence and intensity of infection of *Bucephalopsis dhari* sp. nov.**

<table>
<thead>
<tr>
<th>Months</th>
<th>Fish examined</th>
<th>Fish infected</th>
<th>No. of parasites</th>
<th>% of infection</th>
<th>Mean no. of parasites/infected fish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feb. 06</td>
<td>32</td>
<td>5</td>
<td>6</td>
<td>15.63</td>
<td>1.20</td>
</tr>
<tr>
<td>Mar.</td>
<td>43</td>
<td>16</td>
<td>35</td>
<td>37.21</td>
<td>2.19</td>
</tr>
<tr>
<td>Apr.</td>
<td>38</td>
<td>9</td>
<td>15</td>
<td>23.68</td>
<td>1.67</td>
</tr>
<tr>
<td>May</td>
<td>40</td>
<td>7</td>
<td>10</td>
<td>17.50</td>
<td>1.43</td>
</tr>
<tr>
<td>Jun.</td>
<td>42</td>
<td>5</td>
<td>8</td>
<td>11.90</td>
<td>1.60</td>
</tr>
<tr>
<td>Jul.</td>
<td>37</td>
<td>4</td>
<td>6</td>
<td>10.81</td>
<td>1.50</td>
</tr>
<tr>
<td>Aug.</td>
<td>36</td>
<td>5</td>
<td>9</td>
<td>13.89</td>
<td>1.80</td>
</tr>
<tr>
<td>Sep.</td>
<td>48</td>
<td>11</td>
<td>17</td>
<td>22.92</td>
<td>1.55</td>
</tr>
<tr>
<td>Oct.</td>
<td>25</td>
<td>9</td>
<td>19</td>
<td>36.00</td>
<td>2.11</td>
</tr>
<tr>
<td>Nov.</td>
<td>31</td>
<td>11</td>
<td>24</td>
<td>35.48</td>
<td>2.18</td>
</tr>
<tr>
<td>Dec.</td>
<td>28</td>
<td>5</td>
<td>9</td>
<td>17.86</td>
<td>1.80</td>
</tr>
<tr>
<td>Jan. 07</td>
<td>26</td>
<td>3</td>
<td>5</td>
<td>11.54</td>
<td>1.67</td>
</tr>
<tr>
<td>Total</td>
<td>426</td>
<td>90</td>
<td>163</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The incidence and intensity of infection were recorded during period from February, 2006 to January, 2007 and are shown in Table No. 2. The data regarding the number of fishes examined and their parasite burden during the period of infection are given in Table No. 2. The fluke occurred throughout the year but in varying intensities. Over the period of 12 months the percentage of infection varied from 10.81% and 37.21%. The maximum infection recorded in March, 2006 when 37.21% of the fishes were found infected with flukes. The infection was minimum during July, 2006 when only 10.81% of the fish examined were infected. In remaining months the infection fluctuated between 11.54% to 36.00%.

The intensity of infection during the same period showed different trend. The maximum intensity (an average of 2.19 flukes per infected host) was recorded in March, 2006. The minimum intensity (1.20 fluke per infected host) was recorded during February, 06 when percentage of infection was 15.63%. In the remaining months the intensity varied between 1.43 and 2.18.

Graph No. 2: Showing incidence and intensity of infection of *Bucephalopsis dhari* sp. nov.
Bucephalopsis magnum Verma, 1936  
(Plate - 5-6, Fig. 1-2)

Description

Body elongated, aspinose, 4.23 to 5.24 mm long, 2.21 and 2.32 mm wide, with rounded extremities. Anterior sucker subterminal, subspherical, 0.48 to 0.55 mm long, 0.52 to 0.54 mm wide. Mouth ventral, pre-equatorial, at 1.70 to 2.22 mm from anterior extremity. Pharynx subglobular, 0.32 to 0.34 mm long, 0.38 to 0.40 mm wide. Oesophagus small, 0.46 to 0.47 mm long. Intestine saccular, 1.12 to 1.13 mm long, 0.53 to 0.56 mm wide, extending posteriorly up to the level of left testis.

Excretory bladder tubular; excretory pore terminal, at hind end of the body.

Genital pore subterminal, at hind end of the body.

Testes notched, subequal, symmetrical, separated by vitelline duct in posterior half of body. Left testis 0.46 to 0.49 mm long, 0.48 to 0.62 mm wide, at 2.23 to 3.03 mm from anterior extremity. Right testis 0.33 to 0.56 mm long, 0.52 to 0.53 mm wide, at 1.09 to 1.78 mm from hind end of the body. Cirrus sac elongate, slender, 1.02 to 1.13 mm long, 0.31 to 0.32 mm wide, in posterior fourth of body, extending anteriorly much behind the testes, enclosing 0.14 to 0.15 mm long, 0.10 to 0.12 mm wide, oval, vesicula seminalis; 0.58 to 0.61 mm long, tubular, pars prostatica, surrounded by large number of prostate gland cells and 0.27 to 0.28 mm long, tubular, ejaculatory duct terminating into genital atrium opening through genital pore.

Ovary subspherical, lateral, postequatorial, postintestinal, 0.41 to 0.50 mm long, 0.40 to 0.41 mm wide, besides testes, at 2.12 to 3.10 mm from anterior extremity. Vitellaria follicular, in two lateral rows, 18-20 on right side and 17-18 on left side, extending posteriorly up to the level just posterior to
Plate 5: *Bucephalopsis magnum* Verma, 1936

Entire ventral view
Plate 6: *Bucephalopsis magnum* Verma, 1936
1. Entire ventral view
2. Eggs
anterior margin of intestine. Vitelline ducts from either side meet anterolateral to ovary forming yolk reservoir, opening at ootype, surrounded by Mehlis’ gland cells. Uterus coiled, extending anteriorly behind the level of pharynx. Egg numerous, small, oval, 0.70 to 0.96 long, 0.05 to 0.06 mm wide.

Host - *Eutropiichthys vacha* (Ham.)

Location - Intestine

Locality - Chaukaghat fish market, Varanasi

**Discussion**

The present form belongs to *Bucephalopsis magnum* Verma, 1936 but differs from it, in the number and extension of vitelline follicles, shape and size of cirrus sac, ovary and relative size of various organ. These differences are considered as intra-specific variations.

**Seasonal variation in the incidence and intensity of infection of Bucephalopsis magnum Verma, 1936 in fresh water fish, Eutropiichthys vacha (Ham.)**

During extensive survey, 385 specimens of *Eutropiichthys vacha* (Ham.) were examined, in which 233 fishes were found infected with *Bucephalopsis magnum* Verma, 1936 and 582 adults flukes were collected. The overall infection was 60.52% and intensity 2.50 parasites per infected fish.

The incidence and intensity of infection were recorded during the period January, 2005 to December, 2005. The data shows the percentage of infection varying between 48.72% to 82.76%. The highest infection was recorded in March, 2005 when 82.76% of the fishes were found infected. The lowest infection was in July, 2005 when only 48.72% of the fish examined were found infected. In rest of the months the percentage of infection varied between 50.00% to 73.33%.
### Table No. 3: Data showing incidence and intensity of infection of *Bucephalopsis magnum* Verma, 1936.

<table>
<thead>
<tr>
<th>Months</th>
<th>Fish examined</th>
<th>Fish infected</th>
<th>No. of parasites</th>
<th>% of infection</th>
<th>Mean no. of parasites / infected fish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. 05</td>
<td>34</td>
<td>18</td>
<td>50</td>
<td>52.94</td>
<td>2.78</td>
</tr>
<tr>
<td>Feb.</td>
<td>39</td>
<td>20</td>
<td>54</td>
<td>51.28</td>
<td>2.70</td>
</tr>
<tr>
<td>Mar.</td>
<td>29</td>
<td>24</td>
<td>73</td>
<td>82.76</td>
<td>3.04</td>
</tr>
<tr>
<td>Apr.</td>
<td>30</td>
<td>22</td>
<td>62</td>
<td>73.33</td>
<td>2.82</td>
</tr>
<tr>
<td>May.</td>
<td>41</td>
<td>27</td>
<td>58</td>
<td>65.85</td>
<td>2.15</td>
</tr>
<tr>
<td>Jun.</td>
<td>25</td>
<td>14</td>
<td>29</td>
<td>56.00</td>
<td>2.07</td>
</tr>
<tr>
<td>Jul.</td>
<td>39</td>
<td>19</td>
<td>31</td>
<td>48.72</td>
<td>1.63</td>
</tr>
<tr>
<td>Aug.</td>
<td>27</td>
<td>15</td>
<td>35</td>
<td>55.56</td>
<td>2.33</td>
</tr>
<tr>
<td>Sep.</td>
<td>29</td>
<td>18</td>
<td>41</td>
<td>62.07</td>
<td>2.28</td>
</tr>
<tr>
<td>Oct.</td>
<td>35</td>
<td>25</td>
<td>75</td>
<td>71.43</td>
<td>3.00</td>
</tr>
<tr>
<td>Nov.</td>
<td>33</td>
<td>19</td>
<td>45</td>
<td>57.58</td>
<td>2.37</td>
</tr>
<tr>
<td>Dec. 05</td>
<td>24</td>
<td>12</td>
<td>29</td>
<td>50.00</td>
<td>2.42</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>385</strong></td>
<td><strong>233</strong></td>
<td><strong>582</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Graph No. 3: Showing incidence and intensity of infection of *Bucephalopsis magnum* Verma, 1936.
The mean number of parasites per infected fish showed similar trend. The maximum intensity (3.04 worms per infected host) was observed in March, 2005 when the percentage of infection was also at the highest level. The minimum intensity (1.63 worms per infected host) was observed in July, 2005 when the percentage of infection was the lowest. In rest of the months, the intensity varied between 2.07 and 3.00.
*Bucephalus jadhavi* sp. nov.
(Plate No. 7-8, Fig. 1-2)

**Description**

Body elongate, spinose, with bluntly rounded anterior and posterior extremities, 1.41 to 1.49 mm long, 0.29 to 0.32 mm wide. Anterior sucker oval, subterminal, broader anteriorly with crown of five tentecles, 0.17 to 0.18 mm long, 0.12 to 0.13 mm wide.

Mouth ventral, postequatorial, 0.80 to 1.02 mm from anterior extremity. Pharynx subglobular, 0.05 to 0.09 mm long, 0.05 to 0.08 mm wide. Oesophagus small, 0.02 to 0.03 mm long. Intestine saccular, 0.15 to 0.16 mm long, 0.08 to 0.13 mm wide, extending anteriorly up to a little anterior to anterior level of ovary.

Excretory bladder tubular; excretory pore terminal, at hind end of the body.

Genital pore subterminal, at hind end of the body.

Testes entire, oval, subequal, lateral, tandem separated by each other by uterine coils, lying in the posterior third region of the body. Anterior testis 0.15 to 0.16 mm long, 0.13 to 0.14 mm wide, at 0.87 to 0.91 mm from anterior extremity. Posterior testis 0.17 to 0.18 mm long, 0.10 to 0.11 wide, at 0.12 to 0.18 mm from hind end of body. Cirrus sac elongated, curved, 0.44 to 0.45 mm long, 0.10 to 0.11 mm wide, extending anteriorly up to the midlevel of anterior testis, enclosing 0.06 to 0.07 mm long, 0.05 to 0.06 mm wide, ovoid, vesicula seminalis; 0.25 to 0.30 mm long, tubular pars prostatica, surrounded by a large number of prostate gland cells and 0.06 to 0.08 mm long, tubular ejaculatory duct, terminating into genital atrium, opening through genital pore.

Ovary subspherical, lateral, postequatorial, partly overlapping anterior testis and intestine, 0.11 to 0.14 mm long, 0.12 to 0.13 mm wide, at 0.77 to
Plate 7: *Bucephalus jadhavi* sp. nov.
Entire dorsal view
Plate 7: *Bucephalus jadhavi* sp. nov.
Entire dorsal view
Plate 8: *Bucephalus jadhavi* sp. nov.
1. Entire dorsal view
2. Eggs
0.93 mm from anterior extremity. Vitellaria follicular, rounded, in two lateral rows, 18 on right side, 12 on left side, extending posteriorly overlapping the ovary. Vitelline duct from either side meet between testis and cirrus sac forming yolk reservoir, opening at ootype surrounded by Mehlis' gland cells. Uterus coiled, lying between anterior sucker and genital atrium. Egg small, oval, 0.022 to 0.032 mm long, 0.014 to 0.018 mm wide.

Host - Bagarius bagarius (Ham.)
Location - Intestine
Locality - Dashashwamedh Ghat, Varanasi

Discussion


The present species differs from all these species except B. allahabadensis, B. purshottami, B. barina, B. yamaguti, B. aori and B. varanasiensis in having five tentacles. It differs from B. allahabadensis, B. purshottami, B. barina, B. aori and B. varanasiensis in having tentacles smooth instead of spiny. It further differs from B. allahabadensis, B. yamaguti, B.
varanasiensis in having lateral ovary, overlapping the intestine and anterior testis. It again differs from B. yamaguti and B. varanasiensis in the anterior extension of cirrus sac up to mid level of anterior testis instead of anterior level of it. Accordingly, it is regarded as a new species with the specific name, Bucephalus jadhavi sp. nov.

The new species in named in honour of Dr. Baba V. Jadhav, Professor in Zoology, Dr. B.A.M. University, Aurangabad (M.S.) and a renowned Helminthologist of India.

Seasonal variation in the incidence and intensity of infection of Bucephalus jadhavi sp. nov. in fresh water fish Bagarius bagarius (Ham.)

400 specimens of Bagarius bagarius (Ham.) examined included 59 infected fish from which 113 mature Bucephalus jadhavi sp. nov. were collected. This represented an overall percentage of infection of 14.75% and intensity of 1.92 per infected fish.

**Table No. 4: Data showing incidence and intensity of infection of Bucephalus jadhavi sp. nov.**

<table>
<thead>
<tr>
<th>Months</th>
<th>Fish examined</th>
<th>Fish infected</th>
<th>No. of parasites</th>
<th>% of infection</th>
<th>Mean no. of parasites/infected fish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apr. 05</td>
<td>33</td>
<td>5</td>
<td>8</td>
<td>15.15</td>
<td>1.60</td>
</tr>
<tr>
<td>May.</td>
<td>24</td>
<td>2</td>
<td>3</td>
<td>8.33</td>
<td>1.50</td>
</tr>
<tr>
<td>Jun.</td>
<td>36</td>
<td>4</td>
<td>6</td>
<td>11.11</td>
<td>1.50</td>
</tr>
<tr>
<td>Jul.</td>
<td>29</td>
<td>3</td>
<td>5</td>
<td>10.34</td>
<td>1.67</td>
</tr>
<tr>
<td>Aug.</td>
<td>39</td>
<td>5</td>
<td>8</td>
<td>12.82</td>
<td>1.60</td>
</tr>
<tr>
<td>Sept.</td>
<td>28</td>
<td>3</td>
<td>6</td>
<td>10.71</td>
<td>2.00</td>
</tr>
<tr>
<td>Oct.</td>
<td>27</td>
<td>4</td>
<td>8</td>
<td>14.81</td>
<td>2.00</td>
</tr>
<tr>
<td>Nov.</td>
<td>32</td>
<td>10</td>
<td>28</td>
<td>31.25</td>
<td>2.80</td>
</tr>
<tr>
<td>Dec.</td>
<td>35</td>
<td>6</td>
<td>13</td>
<td>17.14</td>
<td>2.17</td>
</tr>
<tr>
<td>Jan. 06</td>
<td>42</td>
<td>7</td>
<td>12</td>
<td>16.67</td>
<td>1.71</td>
</tr>
<tr>
<td>Feb.</td>
<td>38</td>
<td>6</td>
<td>9</td>
<td>15.79</td>
<td>1.50</td>
</tr>
<tr>
<td>Mar.</td>
<td>37</td>
<td>4</td>
<td>7</td>
<td>10.81</td>
<td>1.75</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>400</strong></td>
<td><strong>59</strong></td>
<td><strong>113</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The percentage of infection and mean number of parasites per infected fish were recorded between April, 2005 to March, 2006 and are shown in Table 4. The number of fishes examined and parasites obtained during this period are also given in Table 4. During 12 months the fluke occurred in different intensities. Throughout the year, percentage fluctuated between 8.33% to 31.25%. The highest infection occurred in November, 2005 when 31.25% of the fishes were infected with parasites. The lowest infection occurred in May, 2005 when 8.33% of the fishes were infected with parasites. In rest of the months the infection varied between 10.34% to 17.14%.

The mean number of parasites per infected fish during the same time duration showed almost similar trend. The maximum intensity (an average of 2.80 worms per infected fish) was recorded in November, 2005 when percentage of infection was also at maximum level. The lowest intensity (1.5 fluke per infected host) was reported during May, June 2005 and February 2006. In rest of the months the infection varied between 1.60 to 2.17.
Ripidocotyle quadriculata Kohn, 1961
(Plate No. 9-10, Fig. 1-2)

Description

Body elongate; cylindrical, spinose with broader anterior and posterior extremities, 1.14 to 1.22 mm long, 0.30 to 0.33 mm wide. Anterior sucker oval, subterminal, cap like tetragonal hood, 0.16 mm to 0.18 mm long, 0.14 to 0.16 mm wide, with one median, one pair of anterolateral right and single, broad, left bifid papillae. Mouth ventral, postequatorial, at 0.05 to 0.06 mm from anterior extremity. Pharynx subglobular, 0.04 to 0.06 mm, long 0.04 to 0.05 mm wide. Oesophagus small, 0.026 to 0.028 mm long. Intestine saccular, 0.08 to 0.12 mm long, 0.09 to 0.013 mm wide, extending anteriorly up to the level of ovary.

Excretory bladder tubular; excretory pore terminal, at hind end of body.

Genital pore subterminal, at hind end of the body.

Testes entire, oval, subequal, tandem, separated from each other by uterine coils, lying in posterior half of the body. Anterior testis 0.13 to 0.14 mm long, 0.07 to 0.10 mm wide, at 0.54 to 0.58 mm from anterior extremity. Posterior testis 0.13 to 0.18 mm long, 0.07 to 0.10 mm wide, at 0.20 to 0.22 mm from hind end of the body. Cirrus sac elongate, slender, 0.33 to 0.45 mm long, 0.08 to 0.10 mm wide, extending anteriorly up to the posterior level of pharynx, enclosing 0.03 to 0.08 mm long, 0.03 to 0.07 mm wide, ovoid, vesicula seminalis, 0.14 to 0.26 mm long, tubular, pars prostatica surrounded by large number of prostate gland cells and 0.10 to 0.13 mm long, tubular, ejaculatory duct, terminating into genital atrium opening through genital pore.

Ovary subspherical, lateral, pre-equatorial, slightly overlapping anterior testis and intestine, 0.12 to 0.13 mm long, 0.08 to 0.11 mm wide, at 0.43 to
Plate 9: *Ripidocotyle quadriculata* Kohn, 1961
Entire dorsal view
Plate 9: *Ripidocotyle quadriculata* Kohn, 1961
Entire dorsal view
Plate 10: *Ripidocotyle quadriculata* Kohn, 1961
1. Entire dorsal view
2. Eggs
0.48 mm from anterior extremity. Vitellaria follicular, rounded in two lateral groups, extending posteriorly up to the anterior level of ovary. Vitelline duct from either side meet near posterior end of ovary forming yolk reservoir opening at öotype surrounded by Mehlis' gland cells. Uterus coiled, lying between anterior sucker and genital atrium. Eggs small, oval, 0.027 to 0.030 mm long, 0.016 to 0.020 mm wide.

Host - *Mystus aor* (Ham.)
Location - Intestine
Locality - Dashashwamedh Ghat, Varanasi

**Discussion**

The present species belongs to *Rhipidocotyle quadriculata* Kohn, 1961 for having quadrangular anterior sucker but, however, differs from the original specimens in the shape and size of intestine, ovary and testes, and position of mouth and number of vitelline follicles. These differences are considered as intraspecific variations.

**Seasonal variation in the incidence and intensity of infection of *Ripidocotyle quadriculata* Kohn, 1961 in fresh water fish *Mystus aor* (Ham.)**

388 specimens of *Mystus aor* (Ham.) examined included 69 infected fish from which 121 mature *Ripidocotyle quadriculata* Kohn, 1961 were collected. This represented an overall percentage of infection of 17.78% and intensity of 1.75 per infected fish.
Table No. 5: Data showing incidence and intensity of infection of *Ripidocotyle quadriculata* Kohn, 1961

<table>
<thead>
<tr>
<th>Months</th>
<th>Fish examined</th>
<th>Fish infected</th>
<th>No. of parasites</th>
<th>% of infection</th>
<th>Mean no. of parasite/infected fish</th>
</tr>
</thead>
<tbody>
<tr>
<td>May. 05</td>
<td>36</td>
<td>5</td>
<td>8</td>
<td>13.89</td>
<td>1.60</td>
</tr>
<tr>
<td>Jun.</td>
<td>37</td>
<td>6</td>
<td>10</td>
<td>16.22</td>
<td>1.67</td>
</tr>
<tr>
<td>Jul.</td>
<td>30</td>
<td>4</td>
<td>6</td>
<td>13.33</td>
<td>1.50</td>
</tr>
<tr>
<td>Aug.</td>
<td>32</td>
<td>5</td>
<td>7</td>
<td>15.63</td>
<td>1.40</td>
</tr>
<tr>
<td>Sep.</td>
<td>34</td>
<td>4</td>
<td>6</td>
<td>11.76</td>
<td>1.50</td>
</tr>
<tr>
<td>Oct.</td>
<td>29</td>
<td>6</td>
<td>9</td>
<td>20.69</td>
<td>1.50</td>
</tr>
<tr>
<td>Nov.</td>
<td>34</td>
<td>12</td>
<td>28</td>
<td>35.29</td>
<td>2.33</td>
</tr>
<tr>
<td>Dec.</td>
<td>35</td>
<td>9</td>
<td>19</td>
<td>25.71</td>
<td>2.11</td>
</tr>
<tr>
<td>Jan. 06</td>
<td>29</td>
<td>5</td>
<td>7</td>
<td>17.24</td>
<td>1.40</td>
</tr>
<tr>
<td>Feb.</td>
<td>39</td>
<td>6</td>
<td>9</td>
<td>15.38</td>
<td>1.50</td>
</tr>
<tr>
<td>Mar.</td>
<td>22</td>
<td>3</td>
<td>5</td>
<td>13.64</td>
<td>1.67</td>
</tr>
<tr>
<td>Apr.</td>
<td>31</td>
<td>4</td>
<td>7</td>
<td>12.90</td>
<td>1.75</td>
</tr>
<tr>
<td>Total</td>
<td>388</td>
<td>69</td>
<td>121</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Graph No. 5: Showing incidence and intensity of infection of *Ripidocotyle quadriculata* Kohn, 1961
The incidence and intensity of infection were recorded during the period May, 2005 to April, 2006 and are shown in Table No. 5. The data regarding the number of fishes examined and their parasite burden during the period of infection are given in Table No. 5. The fluke occurred throughout the year but in varying intensities. Over the period of 12 months the percentage of infection varied from 11.76% to 35.29%. The highest infection recorded in November, 2005 when 35.29% of the fishes were found infected with flukes. The infection was lowest during September, 2005 when only 11.76% of the fish examined were infected. In remaining months the infection fluctuated between 12.90% to 25.71%.

The intensity of infection during the same period showed different trend. The maximum intensity (an average of 2.33 worms per infected fish) was recorded in November, 2005 when percentage of infection also at maximum level. The lowest intensity (1.40 fluke per infected host) was recorded during August, 2005 and January, 2006. In remaining months the intensity varied between 1.50 and 2.11.
Family: Heterophyidae Odhner, 1914
Family: Heterophyidae Odhner, 1914

*Haplorchoides guptai* sp. nov.
(Plate: 11-12; Fig. 1-2)

Description

Body small, oval, spinose, 0.73 to 1.02 mm long, 0.34 to 0.39 mm wide, with narrow anterior and broader posterior extremities. Oral sucker subspherical, subterminal, 0.06 to 0.10 mm long, 0.07 to 0.11 mm wide. Prepharynx long, tubular, 0.07 to 0.16 mm long. Pharynx sub globular, 0.04 to 0.05 mm long, 0.05 to 0.06 mm wide. Oesophagus tubular, smaller than prepharynx, 0.05 to 0.08 mm long. Intestinal caeca simple, ending blindly up to the posterior level of testis. Ventral sucker absent. Ventrogenital sac spherical, submedian, behind caecal bifurcation, enclosing circllet of minute spines, 0.04 to 0.05 mm in diameter, lying below the right intestinal caecum, at 0.25 to 0.39 mm, from anterior extremity.

Excretory bladder Y-shaped, excretory pore terminal, at hind end of the body.

Testis single, subspherical, median, intercaecal, postequatorial, 0.12 to 0.23 mm long, 0.15 to 0.17 mm wide, at 0.47 to 0.56 mm from anterior extremity. Cirrus sac absent. Vesicula seminalis bipartite, free in parenchyma, extending obliquely upto mid level of ovary; proximal part 0.05 to 0.07 mm long, 0.06 to 0.07 mm wide; distal part 0.08 to 0.10 mm long, 0.11 to 0.13 mm wide, ejaculatory duct tubular, 0.020 to 0.021 mm long, opening into ventrogenital sac jointly with metraterm.

Ovary subspherical, submedian, equatorial, pretesticular, 0.08 to 0.10 mm long, 0.12 to 0.13 mm wide, at 0.34 to 0.48 mm from anterior extremity. Receptaculum seminis subglobular, lateral, apart from ovary, 0.07 to 0.11 mm long, 0.05 to 0.11 mm wide. Vitellaria follicular, consisting of large follicles, extending from posterior third level of the ovary up to midregion of post
Plate 11: *Haplorchoides guptai* sp. nov.
Entire dorsal view
Plate 11: *Haplorchoides guptai* sp. nov.
Entire dorsal view
Plate 12: *Haplorchoides guptai* sp. nov.
1. Entire dorsal view
2. Eggs
testicular space. Uterus coiled, descending up to just anterior to hind end of the body and ascending up to ventrogenital sac. Eggs numerous, oval, operculate, 0.04 to 0.06 mm long, 0.02 to 0.03 mm wide.

Host - *Channa punctatus* (Bl.)
Location - Intestine
Locality - River Ganges, Varanasi

**Discussion**


The present form differs from all the known species of the genus, *Haplorchoides* Chen, 1949 except *H. cahirinus*, *H. gomtionensis* and *H. ritai* in having intercaecal ventrogenital sac. It differs from *H. cahirinus* and *H. ritai* in having caeca extending posteriorly up to the posterior level of testis instead of much behind it and in the commencement of vitteline follicle from posterior third level of ovary instead of posterior margin of it in *H. cahirinus* and from posterior to receptaculum seminis in *H. ritai* and from *H. gomtionensis* in having ovary in the level of receptaculum seminis instead of anterior to it.
Accordingly, it is regarded as a new species with the specific name, *Haplorchoides guptai* sp. nov..

The new species is named in the honour of Dr. P.C. Gupta, in recognition of his contribution to the field of trematology.

**Seasonal variation in the incidence and intensity of infection of *Haplorchoides guptai* sp.nov. in fresh water fish *Channa punctatus* (Bl.)**

During extensive survey, 442 specimens of *Channa punctatus* (Bl.) were examined, in which 193 fishes were found infected with *Haplorchoides guptai* sp. nov. and 480 adults flukes were collected. The overall infection was 43.67% and intensity 2.49 parasites per infected fish.

**Table No. 6: Data showing incidence and intensity of infection of *Haplorchoides guptai* sp.nov.**

<table>
<thead>
<tr>
<th>Months</th>
<th>Fish examined</th>
<th>Fish infected</th>
<th>No. of parasites</th>
<th>% of infection</th>
<th>Mean no. of parasites / infected fish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apr. 05</td>
<td>40</td>
<td>19</td>
<td>41</td>
<td>47.50</td>
<td>2.16</td>
</tr>
<tr>
<td>May</td>
<td>34</td>
<td>12</td>
<td>33</td>
<td>35.29</td>
<td>2.75</td>
</tr>
<tr>
<td>Jun.</td>
<td>30</td>
<td>9</td>
<td>16</td>
<td>30.00</td>
<td>1.78</td>
</tr>
<tr>
<td>Jul.</td>
<td>38</td>
<td>15</td>
<td>32</td>
<td>39.47</td>
<td>2.13</td>
</tr>
<tr>
<td>Aug.</td>
<td>42</td>
<td>24</td>
<td>51</td>
<td>57.14</td>
<td>2.13</td>
</tr>
<tr>
<td>Sep.</td>
<td>38</td>
<td>27</td>
<td>88</td>
<td>71.05</td>
<td>3.26</td>
</tr>
<tr>
<td>Oct.</td>
<td>36</td>
<td>19</td>
<td>54</td>
<td>52.78</td>
<td>2.84</td>
</tr>
<tr>
<td>Nov.</td>
<td>40</td>
<td>17</td>
<td>36</td>
<td>42.50</td>
<td>2.12</td>
</tr>
<tr>
<td>Dec.</td>
<td>46</td>
<td>14</td>
<td>31</td>
<td>30.43</td>
<td>2.21</td>
</tr>
<tr>
<td>Jan. 06</td>
<td>17</td>
<td>5</td>
<td>14</td>
<td>29.41</td>
<td>2.80</td>
</tr>
<tr>
<td>Feb.</td>
<td>45</td>
<td>17</td>
<td>37</td>
<td>37.78</td>
<td>2.18</td>
</tr>
<tr>
<td>Mar.</td>
<td>36</td>
<td>15</td>
<td>47</td>
<td>41.67</td>
<td>3.13</td>
</tr>
<tr>
<td>Total</td>
<td>442</td>
<td>193</td>
<td>480</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The incidence and intensity of infection were recorded during period from April, 2005 to March, 2006 and are shown in Table No. 6. The data regarding the number of fishes examined and their parasite burden during the period of infection are given in Table No. 6. The fluke occurred throughout the year but in varying intensities. Over the period of one year the percentage of infection varied from 29.41% and 71.05%. The highest infection was in September, 2005 when 71.05% of the fishes were found infected with fluke. The infection was minimum during January, 2006 when only 29.41% of the fish examined were infected. In remaining months the infection fluctuated between 30.00% to 57.14%.

The intensity of infection during the same period showed different trend. The maximum intensity (an average of 3.26 worms per infected host) was recorded in September, 2005 when the percentage of infection was also at maximum level. The lowest intensity (1.78 fluke per infected host) was recorded during June, 05. In the remaining months the intensity varied between 2.12 to 3.13.
Haplorchoides tengrai sp. nov.
(Plate: 13-14; Fig. 1-2)

Description

Body small, oval, spinose, 0.69 to 0.83 mm long, 0.32 to 0.34 mm wide, with bluntly pointed extremities. Oral sucker subspherical, subterminal 0.06 to 0.09 mm long, 0.07 to 0.08 mm wide. Prepharynx long, tubular, 0.04 to 0.07 mm long. Pharynx subglobular, 0.03 to 0.04 mm long, 0.03 to 0.05 mm wide. Oesophagus tubular, smaller than prepharynx. Intestinal caeca simple, ending blindly just behind the posterior level of testis. Ventral sucker absent. Ventrogenital sac spherical, enclosing circlet of minute spines, 0.03 in diameter, lying at right intestinal caecum, at 0.21 to 0.22 mm from anterior extremity.

Excretory bladder Y shaped; excretory pore terminal, at hind end of the body.

Testis single, subspherical, submedian, intercaecal, equatorial, 0.15 mm to 0.19 mm long, 0.17 to 0.23 mm wide, at 0.34 to 0.35 mm from anterior extremity. Cirrus sac absent. Vesicula seminalis bipartite, free in parenchyma, extending obliquely anterior to ovary. Proximal part 0.08 to 0.09 mm long, 0.05 to 0.06 mm wide; distal part 0.02 to 0.05 mm long, 0.03 to 0.04 mm wide. Ejaculatory duct tubular, 0.01 to 0.02 mm long, opening into ventrogenital sac jointly with metraterm.

Ovary subspherical, submedian, pre-equatorial, pretesticular, 0.08 to 0.10 mm long, 0.12 to 0.13 mm wide, at 0.26 to 0.27 mm from anterior extremity. Receptaculum seminis spherical, 0.08 to 0.09 mm long, 0.09 to 0.12 mm wide, lateral to ovary partially overlapping it. Vitellaria follicular, consisting of large follicles, extending anteriorly up to posterior third level of ovary. Uterus coiled ascending up to ventrogenital sac and descending near
Plate 13: *Haplorchoides tengrai* sp. nov.
Entire ventral view
Plate 13: *Haplorchoides tengrai* sp. nov.
Entire ventral view
Plate 14: *Haplorchoides tengrai* sp. nov.
1. Entire ventral view
2. Eggs
hind end of body. Eggs numerous, large, oval, operculated, 0.036 to 0.038 mm long, 0.025 to 0.032 mm wide.

Host -  *Mystus tengra* (Ham.)
Location - Intestine
Locality - Dashaswamedh fish market, Varanasi

**Discussion**

Present species resembles *H. seenghali, H. mehrai, H. kherai, H. srivastavai, H. hardayali, H. mystusi* and *H. dayali* in having ventrogenital sac at intestinal caecum. It differs from *H. seenghali, H. mehrai, H. kherai, H. srivastavai, H. hardayali* and *H. mystusi* in having ventrogenital sac at right caecum instead of left caecum, from *H. dayali* in having receptaculum seminis in level of ovary instead of testis. It further differs from *H. srivastavai* in the extension of caeca up to posterior level of testis instead of post testicular region, commencement of vitelline follicle from anterior level of ovary up to the level of intestinal caeca instead of from posterior level of ovary up to post testicular region. It again differs from *H. hardayali* in having vesicula seminalis extending up to anterior end of ovary instead of posterior end of it and *H. kherai* in the position of ovary and extension of vesicula seminalis.

Accordingly, it is regarded as a new species with the specific name *Haplorchoides tengrai* sp. nov.

The new species is named after its host *Mystus tengra* from which the parasite was procured.

**Seasonal variation in the incidence and intensity of infection of Haplorchoides tengrai* sp.nov. in fresh water fish Mystus tengra* (Ham.)

For the study of seasonal variation, 452 specimens of *Mysus tengra* (Ham.) were examined in which 195 fishes were found infected from 464
mature *Haplorchoides tengrai* sp. nov. The overall percentage of infection was 43.14% and intensity 2.37 per infected fish.

**Table No. 7: Data showing incidence and intensity of infection of *Haplorchoides tengrai* sp.nov.**

<table>
<thead>
<tr>
<th>Months</th>
<th>Fish examined</th>
<th>Fish infected</th>
<th>No. of parasites</th>
<th>% of infection</th>
<th>Mean no. of parasites / infected fish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jun. 05</td>
<td>37</td>
<td>15</td>
<td>31</td>
<td>40.54</td>
<td>2.07</td>
</tr>
<tr>
<td>Jul.</td>
<td>43</td>
<td>17</td>
<td>37</td>
<td>39.53</td>
<td>2.18</td>
</tr>
<tr>
<td>Aug.</td>
<td>25</td>
<td>11</td>
<td>25</td>
<td>44.00</td>
<td>2.27</td>
</tr>
<tr>
<td>Sep.</td>
<td>58</td>
<td>27</td>
<td>68</td>
<td>46.55</td>
<td>2.52</td>
</tr>
<tr>
<td>Oct.</td>
<td>21</td>
<td>9</td>
<td>20</td>
<td>42.86</td>
<td>2.22</td>
</tr>
<tr>
<td>Nov.</td>
<td>31</td>
<td>12</td>
<td>28</td>
<td>38.71</td>
<td>2.33</td>
</tr>
<tr>
<td>Dec.</td>
<td>25</td>
<td>7</td>
<td>16</td>
<td>28.00</td>
<td>2.29</td>
</tr>
<tr>
<td>Jan. 06</td>
<td>30</td>
<td>6</td>
<td>14</td>
<td>20.00</td>
<td>2.33</td>
</tr>
<tr>
<td>Feb.</td>
<td>48</td>
<td>12</td>
<td>29</td>
<td>25.00</td>
<td>2.42</td>
</tr>
<tr>
<td>Mar.</td>
<td>45</td>
<td>24</td>
<td>50</td>
<td>53.33</td>
<td>2.08</td>
</tr>
<tr>
<td>Apr.</td>
<td>47</td>
<td>32</td>
<td>98</td>
<td>68.09</td>
<td>3.06</td>
</tr>
<tr>
<td>May</td>
<td>42</td>
<td>23</td>
<td>48</td>
<td>54.76</td>
<td>2.09</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>452</strong></td>
<td><strong>195</strong></td>
<td><strong>464</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Graph No. 7: Showing incidence and intensity of infection of *Haplorchoides tengrai* sp.nov.**
The percentage of infection and mean number of parasites per infected fish were recorded between June, 2005 to May, 2006 and are shown in Table 7. The number of fishes examined and parasites obtained during this period are also given in Table 7. During 12 months the flukes occurred in different intensities. Throughout the year, percentage fluctuated between 20.00% to 68.09%. The highest infection occurred in April, 2006 when 68.09% of the fishes were infected with parasites. The lowest infection occurred in January, 2006 when 20.00% of the fishes were infected with parasites. In rest of the months the infection varied between 25.00% to 54.76%.

The mean number of parasites per infected fish during the same time duration showed different trend. The maximum intensity (an average of 3.06 worms per infected fish) was recorded in April, 2006 when percentage of infection was also at maximum level. The lowest intensity (2.07 fluke per infected host) was recorded during June, 2005. In rest of the months the infection varied between 2.08 and 2.52.

Ventrogenital sac outside the intestinal caecum ........ (1)

- Ventrogenital sac inside or at the intestinal caecum ........ (2)
  - Ventrogenital sac in front of caecal bifurcation
    - *H. pearsoni*, Pandey and Shukla, 1976
  - Ventrogenital sac outside the caecum ........ (3)

(3) Receptaculum seminis posterio lateral to ovary

- Receptaculum seminis in between the ovary and testis
  - *H. brahamputraensis* Gupta, 1955

(2) Intestinal caeca up to hinder end of body

- Intestinal caeca up to anterior to posterior level of testis or some distance behind it
- Intestinal caeca up to middle of post testicular region

(4) Vitelline follicle do not meet behind testis

- Vitelline follicle meet behind testis
  - *H. srivastavai* Gupta and Govind, 1985

(5) Receptaculum seminis anterior to ovary

- Receptaculum seminis posterior or in level of ovary
  - *H. gomtionensis* Gupta, 1955

(6) Receptaculum seminis lying in right side of testis

- Receptaculum seminis lying in right side of ovary
- Receptaculum seminis lying in left side of ovary

(7) Vesicula seminalis extend upto anterior level of ovary

- Vesicula seminalis extend upto mid level of ovary
- Vesicula seminalis lying in between pharynx and ovary
  - *H. guptai* sp. nov.
(8) Ventrogenital sac on left caecum
   Ventrogenital sac on right caecum
(9) Ovary pre-equatorial ......
    Ovary equatorial ......
(10) Vitelline follicles up to little anterior to hind end of body
     Vitelline follicles much anterior to the hind end of body

H. mehra\textit{i} Pande & Shukla, 1976
H. tengrai sp.\textit{nov.}
H. kherai Gupta and Govind, 1985
H. ritai Gupta, 1955
H. seenghali Gupta, 1955
Family: Hemiuridae Lühe, 1901
Family: Hemiuridae Lühe, 1901
Genarchopsis varunai sp. nov.
(Plate : 15-16, Fig. 1-2).

Description

Body elongated, fusiformis, dorsoventrally flattened and aspinose with rounded extremities, 2.61 to 2.68 mm long, 0.98 to 0.99 mm wide. Oral sucker subspherical, subterminal, 0.29 to 0.33 mm long, 0.31 to 0.39 mm wide. Prepharynx absent. Pharynx oval, 0.12 to 0.15 mm long, 0.15 to 0.16 mm wide. Oesophagus absent; Oesophageal pouch arises from the junction of pharynx and intestinal bifurcation. Intestinal caeca extending up to hind end of body and unite to form a continuous tube. Ventral sucker circular, highly muscular, equatorial, longer than oral sucker, 0.73 to 0.90 mm long, 0.82 to 0.94 mm wide, at 0.85 to 1.05 mm from anterior extremity.

Excretory bladder Y shaped; excretory pore terminal, at the hind end of body

Genital pore preacetabular, median, 0.44 to 0.48 mm from anterior extremity.

Testes oval, symmetrical, postequatorial, posterior to ventral sucker. Right testis 0.35 to 0.44 mm long, 0.18 to 0.45 mm wide, at 1.63 to 1.85 mm from anterior extremity. Left testis is smaller than right testis, 0.34 to 0.35 mm long, 1.52 to 1.75 mm wide, at 0.39 to 0.55 mm from anterior extremity. Cirrus sac absent, vesicula seminalis well developed, "S" shaped, tubular, lying free in parenchyma; 0.28 to 0.38 mm long, 0.07 to 0.13 mm wide. Pars prostatica oval, surrounded by large number of prostate gland cells, 0.08 to 0.22 mm long, 0.02 to 0.03 mm wide, opening into muscular metraterm through a short tube, forming a hermaphroditic duct, 0.04 to 0.09 mm long, 0.03 to 0.04 mm wide which opens by a common genital pore.
Plate 15: *Genarchopsis varunai* sp. nov.
Entire dorsal view
Plate 15: Genarchopsis varunai sp. nov.
Entire dorsal view
Plate 16: *Genarchopsis varunai* sp. nov.
1. Entire dorsal view
2. Eggs
Ovary entire, spherical or oval, post-testicular, postacetabular, smaller than testis, 0.18 to 0.26 mm long, 0.23 to 0.24 mm wide, lying in the right posterior third region, at 2.08 to 2.17 mm from anterior extremity. Receptaculum seminis absent, Mehli's gland cells absent. Vitellaria two, large, lobed, lying symmetrically posterior to caecal union, at hind end of body. Uterus transversely coiled, compact and ascending up to genital pore through muscular hermaphrodite duct.

Egg oval, filamented and golden yellow in colour, 0.03 to 0.04 mm long, 0.02 to 0.03 mm wide.

Host \textit{Amphipnous cuchia} (Ham.)

Location Intestine

Locality River Varuna, Varanasi

Discussion

The present form is referred to the genus \textit{Genarchopsis} Ozaki, 1925 of which following species \textit{viz.}, \textit{G. ovocaudatum} (Srivastava, 1933) Manter, 1938; \textit{G. piscicola} (Srivastava, 1933) Manter, 1938; \textit{G. singularis} (Srivastava, 1933) Yamaguti, 1954; \textit{G. lobatum} (Srivastava, 1933) Yamaguti, 1954; \textit{G. faruquis} (Gupta, 1951) Yamaguti, 1958; \textit{G. dasus} (Gupta, 1951) Yamaguti, 1958; \textit{G. indicus} (Gupta, 1951) Yamaguti 1958; \textit{G. punctatii} Agarwal, 1966; \textit{G. cuchiai} Kakaji, 1969 and \textit{G. cameroni} Kakaji, 1969 have been described so far from fresh water fishes of India. This form differs from all these species except \textit{G. singularis}, \textit{G. lobatum}, \textit{G. faruquis}, \textit{G. punctatii} and \textit{G. cuchiai} in the presence of an oesophageal pouch arising from the junction of intestinal bifurcation. It differs from \textit{G. singularis} in having lobed vitellaria from \textit{G. lobatum} in the extension of uterine coil near vitellaria, from \textit{G. faruquis} and \textit{G. cuchiai} in the absence of Mehils' glands and from \textit{G. punctatii} in the absence of receptaculum seminis. It further differs from \textit{G. cuchiai} in having well differentiated more
developed vesicula seminalis, larger sucker ratio (1:5:45 instead of 1:3:17) large testes in relation to ovary, and smaller postacetabular space. According, it is regarded as a new species with the specific name, *Genarchopsis varunai* sp. nov.

**Seasonal variation in the incidence and intensity of infection of *Genarchopsis varunai* sp.nov. in fresh water fish *Amphipnous cuchia* (Ham.)**

The 401 specimens of *Amphipnous cuchia* (Ham.) examined included 79 infected fish from which 136 mature *Genarchopsis varunai* sp.nov. were collected. This represented an overall percentage of infection of 19.70% and 1.72 worms per infected fish.

**Table No. 8: Data showing incidence and intensity of infection of *Genarchopsis varunai* sp. nov.**

<table>
<thead>
<tr>
<th>Months</th>
<th>Fish examined</th>
<th>Fish infected</th>
<th>No. of parasites</th>
<th>% of infection</th>
<th>Mean no. of parasites / infected fish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mar. 04</td>
<td>35</td>
<td>14</td>
<td>34</td>
<td>40.00</td>
<td>2.43</td>
</tr>
<tr>
<td>Apr.</td>
<td>40</td>
<td>7</td>
<td>13</td>
<td>17.50</td>
<td>1.86</td>
</tr>
<tr>
<td>May</td>
<td>37</td>
<td>6</td>
<td>10</td>
<td>16.22</td>
<td>1.67</td>
</tr>
<tr>
<td>Jun.</td>
<td>34</td>
<td>4</td>
<td>6</td>
<td>11.76</td>
<td>1.50</td>
</tr>
<tr>
<td>Jul.</td>
<td>27</td>
<td>5</td>
<td>7</td>
<td>18.52</td>
<td>1.40</td>
</tr>
<tr>
<td>Aug.</td>
<td>25</td>
<td>4</td>
<td>5</td>
<td>16.00</td>
<td>1.25</td>
</tr>
<tr>
<td>Sep.</td>
<td>34</td>
<td>7</td>
<td>12</td>
<td>20.59</td>
<td>1.71</td>
</tr>
<tr>
<td>Oct.</td>
<td>42</td>
<td>6</td>
<td>9</td>
<td>14.29</td>
<td>1.50</td>
</tr>
<tr>
<td>Nov.</td>
<td>38</td>
<td>7</td>
<td>10</td>
<td>18.42</td>
<td>1.43</td>
</tr>
<tr>
<td>Dec.</td>
<td>31</td>
<td>6</td>
<td>11</td>
<td>19.35</td>
<td>1.83</td>
</tr>
<tr>
<td>Jan. 05</td>
<td>28</td>
<td>5</td>
<td>7</td>
<td>17.86</td>
<td>1.40</td>
</tr>
<tr>
<td>Feb.</td>
<td>30</td>
<td>8</td>
<td>12</td>
<td>26.67</td>
<td>1.50</td>
</tr>
</tbody>
</table>

**Total** | **401** | **79** | **136** |
The incidence and intensity of infection were recorded during period from March, 2004 to February, 2005 and are shown in Table No. 8. The data regarding the number of fishes examined and their parasite burden during the period of infection are given in Table No. 8. The fluke occurred throughout the year but in varying intensities. Over the period of 12 months the percentage of infection varied from 11.76% and 40.0%. The highest infection recorded in March, 2004 when 40.0% of the fishes were found infected with fluke. The infection was minimum during June, 2004 when 11.76% of the fish examined were infected. In remaining months the infection fluctuated between 14.29% to 26.67%.

The intensity of infection during the same period showed different trend. The maximum intensity (an average of 2.43 worms per infected host) was recorded in March, 2004 when the percentage of infection was also at maximum level. The lowest intensity (1.25 fluke per infected host) was recorded during August, 2004 when percentage of infection was 16%. In the remaining months the intensity varied between 1.40 and 1.86.
Key to the species of the genus *Genarchopsis* Ozaki, 1925

(1) Oesophageal pouch present  ...  (2)
Oesophageal pouch absent  ...  (7)

(2) Receptaculum seminis present  *G. punctaii* Agarwal, 1966
Receptaculum seminis absent  ...  (3)

(3) Mehlis gland present  ...  (4)
Mehlis gland absent  ...  (5)

(4) Genital pore far behind intestinal bifurcation  *G. cuchiai* Kakaji, 1969
Genital pore on ventral side of the left intestinal bifurcation  *G. farugius* (Gupta, 1951) Yamaguti, 1958

(5) Vittelaria in the form of two unlobed masses  *G. singularis* (Srivastava, 1933) Yamaguti, 1954
Vittelaria in the form of two lobed masses  ...  (6)

(6) Uterus far from vitellaria  *G. labatum* (Srivastava, 1933) Yamaguti, 1954
Uterus near to the vitellaria  *G. varunai sp. nov.*

(7) Uterine coil intercaecal  *G. dasus* (Gupta, 1951) Yamaguti, 1958
Uterus coil extracaecal  ...  (8)

(8) Genital pore in the level of pharynx  ...  (9)
Genital pore not in the level of pharynx  ...  (10)

(9) Testes intercaecal  *G. cameroni* Kakaji, 1969
Testes extracaecal  *G. piscicola* (Srivastava, 1933) Manter, 1938

(10) Extension of uterine coil posteriorly upto vitelline region  *G. ovocaudatum* (Srivastava, 1933) Manter, 1938
Extension of uterine coil anterior to caecal union posteriorly  *G. indicus* (Gupta, 1951) Yamaguti, 1958
Family: Maseniidae Gupta, 1953
Family: Maseniidae (Chatterji, 1933) Gupta, 1953

*Masenia hanumanthai* sp. nov.

(Plate : 17-18, Fig. 1-2).

**Description**

Body elongate, oval, spinose posteriorly up to the middle third of the body, 0.73 to 0.77 mm long, 0.42 to 0.43 mm wide, spine closely set anteriorly, sparse posteriorly. Oral sucker terminal, funnel shaped, 0.08 mm to 0.09 mm long, 0.09 to 0.13 mm wide. Prepharynx absent, Pharynx oval, 0.03 to 0.04 mm long, 0.04 to 0.05 mm wide. Oesophagus short, 0.01 to 0.02 mm long; Caeca simple, extending posteriorly up to posterior level of ovary. Ventral sucker subspherical, pre-equatorial 0.11 to 0.14 mm long, 0.12 to 0.13 mm wide, at 0.17 to 0.22 mm from the anterior extremity.

Excretory bladder tubular; excretory pore terminal, at hind end of the body.

Genital pore submedian, on dorsal side of oral sucker, at anterior extremity.

Testes oval, tandem, unequal in the middle third of the body. Anterior testis 0.09 to 0.13 mm long, 0.15 to 0.24 mm wide, at 0.32 to 0.36 mm from anterior extremity. Posterior testis 0.09 to 0.13 mm long, 0.20 to 0.23 mm wide, at 0.18 to 0.21 mm from hind end of body. Cirrus sac elongated, tubular, divided into two distinct part, 0.27 to 0.81 mm long, 0.06 to 0.08 mm wide, extending posteriorly up to the level just anterior to hind end of ventral sucker; Posterior portion broader and cylindrical while anterior portion in narrow and tubular, running dorsal to oral sucker, to open at genital pore. Seminal vesicle, bipartite; proximal part 0.07 to 0.11 mm long, 0.04 to 0.05 mm wide; distal part 0.06 to 0.08 mm long, 0.04 to 0.07 mm wide. Pars prostatica 0.06 to 0.09 mm long, surrounded by large number of prostate gland cells. Ejaculatory duct long,
Plate 17: *Masenia hanumanthai* sp. nov.
Entire dorsal view
Plate 17: *Msenia hanumanthai* sp. nov.
Entire dorsal view
Plate 18: *Masenia hanumanthai* sp. nov.

1. Entire dorsal view
2. Eggs
narrow, tubular, 0.06 to 0.08 mm long, opening dorsally on dorsal side of oral sucker through genital pore.

Ovary entire, sickle shaped, pretesticular, pre-equatorial, 0.06 to 0.19 mm long, 0.14 to 0.18 mm wide, lying just dorsolateral side of ventral sucker, at 0.27 to 0.31 mm from anterior extremity. Receptaculum seminis saccular, 0.07 to 0.08 mm long, 0.08 to 0.09 mm wide, Vitellaria follicular, lateral, extending from anterior level of ventral sucker up to hind end of anterior testis, uterus coiled, extending behind ovary, occupying whole of the posterior region of body, opening terminally at genital pore by metraterm. Eggs small, numerous, operculate, 0.20 to 0.23 mm long, 0.013 to 0.022 mm wide.

**Host** - *Rita rita* (Ham.)

**Location** - Intestine

**Locality** - River Ganga, Varanasi

**Discussion**

The present form is referred to the genus, *Masenia* Chatterji, 1933 of which following species viz., *M.collata* Chatterji, 1933; *M. dayali*, Gupta, 1953; *M. fossilisi*, Gupta, 1953; *M. vittatusia* Agarwal, 1963; *M. gomtia* Agarwal, 1963; *M. ritai* Sircar and Sinha, 1970; *M. upeneusi* Gupta and Puri, 1984; *M. chauhani* Maurya, Agarwal and Singh, 1989 have been described so far from Indian fresh water fishes.

The present species differs from all the known species of genus, *Masenia* Chatterji, 1933 except *M. collata* Chatterji, 1933; *M. gomtia* Agarwal, 1963; *M. ritai* Sircar and Sinha, 1970; *M. chauhani* Maurya, Agarwal and Singh, 1989 in the absence of spines in posterior third region of body. It differs from above mentioned species in the commencement of vitteline follicles from anterior level of ventral sucker up to hind end of anterior testis and having sickle shaped
ovary. It further differs from *M. chauhani* and *M. collata* in the position of ovary separated from ventral sucker instead of overlapping it and from *M. gomtia* in having ovary smaller than testes. Accordingly, it is regarded as a new species with the specific name *Masenia hanumanthai* sp. nov.

The new species is named in honour of Prof. K. Hanumantha Rao Retired Head, Department of Zoology, Andhra University, Vishakhapatnam for his contribution in the field of Parasitology.

**Seasonal variation in incidence and intensity of infection of *Masenia hanumanthai* sp. nov. in fresh water fish *Rita rita* (Ham.)**

The 387 specimens of *Rita rita* examined included 68 infected fish from which 151 mature *Masenia hanumanthai* were collected. This represented an overall percentage of infection of 17.58% and intensity of 2.22 worms per infected fish.

**Table No. 9: Data showing incidence and intensity of infection of *Masenia hanumanthai* sp. nov.**

<table>
<thead>
<tr>
<th>Months</th>
<th>Fish examined</th>
<th>Fish infected</th>
<th>No. of parasites</th>
<th>% of infection</th>
<th>Mean no. of parasites / infected fish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mar. 04</td>
<td>40</td>
<td>16</td>
<td>36</td>
<td>40.00</td>
<td>2.25</td>
</tr>
<tr>
<td>Apr.</td>
<td>20</td>
<td>6</td>
<td>22</td>
<td>30.00</td>
<td>3.67</td>
</tr>
<tr>
<td>May</td>
<td>30</td>
<td>4</td>
<td>10</td>
<td>13.33</td>
<td>2.50</td>
</tr>
<tr>
<td>Jun.</td>
<td>32</td>
<td>2</td>
<td>2</td>
<td>6.25</td>
<td>1.00</td>
</tr>
<tr>
<td>Jul.</td>
<td>20</td>
<td>2</td>
<td>4</td>
<td>10.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Aug.</td>
<td>22</td>
<td>4</td>
<td>12</td>
<td>18.18</td>
<td>3.00</td>
</tr>
<tr>
<td>Sep.</td>
<td>36</td>
<td>8</td>
<td>16</td>
<td>22.22</td>
<td>2.00</td>
</tr>
<tr>
<td>Oct.</td>
<td>40</td>
<td>6</td>
<td>10</td>
<td>15.00</td>
<td>1.67</td>
</tr>
<tr>
<td>Nov.</td>
<td>45</td>
<td>5</td>
<td>8</td>
<td>11.11</td>
<td>1.60</td>
</tr>
<tr>
<td>Dec.</td>
<td>36</td>
<td>3</td>
<td>5</td>
<td>8.33</td>
<td>1.67</td>
</tr>
<tr>
<td>Jan. 05</td>
<td>22</td>
<td>4</td>
<td>8</td>
<td>18.18</td>
<td>2.00</td>
</tr>
<tr>
<td>Feb.</td>
<td>44</td>
<td>8</td>
<td>18</td>
<td>18.18</td>
<td>2.25</td>
</tr>
<tr>
<td>Total</td>
<td><strong>387</strong></td>
<td><strong>68</strong></td>
<td><strong>151</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The incidence and intensity of infection were recorded during the period from March, 2004 to February, 2005 and are shown in Table No. 9. The Data regarding the number of fishes examined and their parasite burden during the period of infection are given in Table No. 9. The fluke occurred throughout the year but in varying intensities. Over the period of 12 months the percentage of infection varied from 6.25 to 40%. The highest infection was in March, 2004 when 40% of the fishes were found infected with the fluke. The infection was minimum during June, 04 when only 6.25% of the fish examined were infected. In remaining months the infection fluctuated between 8.33 to 30%.

The intensity of infection during the same period showed different trend. The maximum intensity (an average of 3.67 worms per infected host) was recorded in April, 04. The lowest intensity (1 fluke per infected host) was recorded during June, 04 when percentage of infection was also at the minimum level. In the remaining months the intensity varied between 1.60 and 3.00.
Masenia mauryai Sabhyata, 2006
(Plate : 19-20, Fig. 1-2)

Description

Body elongate, spinose, posteriorly up to middle third of the body, 0.84 to 1.17 mm long, 0.24 to 0.34 mm wide. Spines closely set anteriorly sparse posteriorly. Oral sucker terminal, funnel shaped, 0.08 to 0.13 mm long, 0.09 to 0.13 mm wide. Prepharynx absent, Pharynx oval, 0.040 to 0.045 mm long, 0.040 to 0.041 mm wide. Oesophagus tubular, short, 0.01 to 0.02 mm long; caeca simple extending posteriorly up to posterior level of ovary. Ventral sucker subspherical, pre-equatorial, 0.14 to 0.17 mm long, 0.11 to 0.19 mm wide, at 0.19 to 0.28 mm from anterior extremity.

Excretory bladder tubular; excretory pore terminal, at hind end of the body.

Genital pore submedian; on dorsal side of oral sucker, near anterior extremity.

Testes two, oval, tandem, unequal, in middle third of the body. Anterior testis, 0.11 to 0.12 mm long, 0.16 to 0.24 mm wide, at 0.38 to 0.53 mm from anterior extremity. Posterior testis larger than anterior testis, 0.09 to 0.14 mm long, 0.20 to 0.21 mm wide, at 0.34 to 0.40 mm from hind end of body. Cirrus sac elongated, tubular, slightly overlapping the ventral sucker, divided into two distinct parts, 0.22 to 0.45 mm long, 0.06 to 0.08 mm wide, extending posteriorly up to midlevel of ventral sucker; posterior portion broader and cylindrical while anterior portion narrow and tubular, running dorsally to oral sucker to open at genital pore. Seminal vesicle bipartite; proximal part 0.08 to 0.18 mm long, 0.04 to 0.08 mm wide; distal part 0.11 to 0.12 mm long, 0.04 to 0.05 mm wide. Pars prostatica narrow, tubular, 0.03 to 0.08 mm long, surrounded by a large number of prostate gland cells. Ejaculatory duct long.
Plate 19: *Masia mauryai* Sabhyata, 2006
Entire ventral view
Plate 19: *Masename mauryai* Sabhyata, 2006
Entire ventral view
Plate 20: *Masenia mauryai* Sabhyata, 2006

1. Entire ventral view
2. Eggs
narrow, tubular, 0.04 to 0.05 mm long, opening dorsally on oral sucker through genital pore.

Ovary entire, oval, pretesticular, pre-equatorial, 0.09 to 0.12 mm long, 0.14 to 0.18 mm wide, lying just beneath the ventral sucker, at 0.40 to 0.43 mm from anterior extremity. Receptaculum seminis saccular, 0.05 to 0.08 mm long, 0.07 to 0.08 mm wide behind cirrus sac. Vitellaria follicular, lateral, partly overlapping the ovary on right side, extending from the anterior level of ventral sucker up to the anterior third level of anterior testis. Uterus coiled, extending behind ovary occupying whole of the posterior region of body, opening anteriorly at genital pore by metraterm.

Eggs small, oval, numerous, operculate, 0.025 to 0.030 mm long, 0.018 to 0.023 mm wide.

Host  
*Mystus cavasius* (Ham.)

Location  
Intestine

Locality  
River Varuna, Varanasi

**Discussion**

The present form belongs to *Masenia mauryai* Sabhyata, 2006 in the position of testes and cirrus sac, extension of vitellaria and shape of ovary but, however, differs from it slightly in the shape of testes, position of ovary and posterior extension of intestinal caeca. These differences are considered as individual variations.

**Seasonal variation in incidence and intensity of infection of *Masenia mauryai* sp. nov. in fresh water fish *Mystus cavasius* (Ham.)**

During extensive survey, 379 specimens of *Mystus cavasius* (Ham.) were examined, in which 126 fishes were found infected with *Masenia mauryai*
sp. nov. and 320 adults flukes were collected. The overall infection was 33.25% and intensity 2.54 parasites per infected fish.

Table No. 10: Data showing incidence and intensity of infection of *Messenia mauryai* sp.nov.

<table>
<thead>
<tr>
<th>Months</th>
<th>Fish examined</th>
<th>Fish infected</th>
<th>No. of parasites</th>
<th>% of infection</th>
<th>Mean no. of parasites / infected fish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct. 05</td>
<td>45</td>
<td>13</td>
<td>29</td>
<td>28.89</td>
<td>2.23</td>
</tr>
<tr>
<td>Nov.</td>
<td>43</td>
<td>8</td>
<td>16</td>
<td>18.60</td>
<td>2.00</td>
</tr>
<tr>
<td>Dec.</td>
<td>33</td>
<td>4</td>
<td>7</td>
<td>12.12</td>
<td>1.75</td>
</tr>
<tr>
<td>Jan. 06</td>
<td>20</td>
<td>6</td>
<td>12</td>
<td>30.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Feb.</td>
<td>36</td>
<td>14</td>
<td>32</td>
<td>38.89</td>
<td>2.29</td>
</tr>
<tr>
<td>Mar.</td>
<td>35</td>
<td>24</td>
<td>76</td>
<td>68.57</td>
<td>3.17</td>
</tr>
<tr>
<td>Apr.</td>
<td>25</td>
<td>15</td>
<td>46</td>
<td>60.00</td>
<td>3.07</td>
</tr>
<tr>
<td>May</td>
<td>32</td>
<td>10</td>
<td>24</td>
<td>31.25</td>
<td>2.40</td>
</tr>
<tr>
<td>Jun.</td>
<td>30</td>
<td>5</td>
<td>11</td>
<td>16.67</td>
<td>2.20</td>
</tr>
<tr>
<td>Jul.</td>
<td>24</td>
<td>6</td>
<td>15</td>
<td>25.00</td>
<td>2.50</td>
</tr>
<tr>
<td>Aug.</td>
<td>24</td>
<td>10</td>
<td>28</td>
<td>41.67</td>
<td>2.80</td>
</tr>
<tr>
<td>Sep.</td>
<td>32</td>
<td>11</td>
<td>24</td>
<td>34.38</td>
<td>2.18</td>
</tr>
<tr>
<td>Total</td>
<td>379</td>
<td>126</td>
<td>320</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Graph No. 10: Showing incidence and intensity of infection of *Messenia mauryai* sp.nov.
The incidence and intensity of infection were recorded during the period from October, 2005 to September, 2006 and are shown in Table No. 10. The data regarding the number of fishes examined and their parasite burden during the period of infection are given in Table No. 10. The fluke occurred throughout the year but in varying intensities. Over the period of one year the percentage of infection varied from 12.12% and 68.57%. The highest infection was in March, 2006 when 68.57% of the fishes were found infected with flukes. The infection was minimum during December, 2005 when only 12.12% of the fish examined were infected. In remaining months, the infection fluctuated between 16.67% to 60.00%.

The intensity of infection during the same period showed almost similar trend. The maximum intensity (an average of 3.17 worms per infected host) was recorded in March, 2006 when the percentage of infection was also at maximum level. The lowest intensity (1.75 flukes per infected host) was recorded during December, 2005. In the remaining months, the intensity varied between 2.00 to 3.07.
Masenia agarwali sp.nov.
(Plate : 21-22, Fig. 1-2)

Description

Body elongate, oval, 0.61 to 1.06 mm long, 0.35 to 0.45 mm wide, spinose, up to middle third of the body. Spines closely set anteriorly, sparse posteriorly. Oral sucker terminal, funnel shaped, 0.08 to 0.15 mm long, 0.09 to 0.012 mm wide. Prepharynx absent. Pharynx spherical, 0.02 to 0.03 mm in diameter. Oesophagus tubular, short, 0.01 to 0.2 mm long; caeca simple, extending posteriorly up to the posterior level of ovary. Ventral sucker subspherical, pre-equatorial, 0.10 to 0.16 mm long, 0.11 to 0.20 mm wide, at 0.04 to 0.07 mm from the anterior extremity.

Excretory bladder tubular; excretory pore terminal, at hind end of the body.

Genital pore submedian, on dorsal side of oral sucker near anterior extremity.

Testes entire, two, tandem, subequal, in the middle third of the body. Anterior testis 0.04 to 0.15 mm long, 0.10 to 0.17 mm wide, at 0.30 to 0.41 mm from anterior extremity. Posterior testis larger than anterior testis, 0.04 to 0.14 mm long, 0.075 to 0.22 mm wide, at 0.21 to 0.37 mm from hind end of the body. Cirrus sac elongated, tubular, divided into two distinct part, 0.31 to 0.33 mm long, 0.05 to 0.09 mm wide, extending posteriorly up to the level just anterior to posterior end of ventral sucker; posterior portion broad and cylindrical while anterior portion narrow and tubular, running dorsal to oral sucker to open at genital pore. Seminal vesicle bipartite; proximal part 0.09 to 0.12 mm long; 0.05 to 0.08 mm wide; distal part 0.09 to 0.10 mm long, 0.04 to 0.07 mm wide. Pars prostatica tubular, 0.05 to 0.06 mm long, surrounded by a large number of prostate gland cells. Ejaculatory duct tubular, narrow, 0.06 to 0.09 mm long, opening on dorsal side of oral sucker through genital pore.
Plate 21: *Masenia agarwali* sp.nov.
Entire dorsal view
Plate 21: *Masename agarwali* sp.nov.
Entire dorsal view
Plate 22: *Masename agarwali* sp. nov.
1. Entire dorsal view
2. Eggs
Ovary entire, ovoid, pretesticular, pre-equatorial, 0.075 to 0.14 mm long, 0.09 to 0.16 mm wide, lying posterodorsal to ventral sucker, partly overlapping it, at 0.22 to 0.31 mm from anterior extremity. Receptaculum seminis saccular, 0.07 to 0.10 mm long, 0.06 to 0.16 mm wide, between ovary and anterior testis. Vitellaria follicular, lateral, extending from midlevel of ventral sucker up to midlevel of anterior testis. Uterus coiled, extending behind ovary occupying whole of the posterior region of body, opening anteriorly at genital pore by metraterm. Eggs small, numerous, operculate, 0.020 to 0.025 mm long, 0.011 to 0.021 mm wide.

Host        *Clarias batrachus* (Linn.)
Location    Intestine
Locality    River Ganga at Varanasi

**Discussion**

The present species differs from all the known species of genus *Masenia* Chatterji, 1933 except *M. collata* Chatterji, 1933; *M. gomtia* Agarwal, 1963; *M. ritai* Sircar and Sinha, 1970; and *M. chauhani* Maurya, Agarwal and Singh, 1989; *M. mauryai* Sabhyata, 2006; in the absence of spines in posterior third region of body. It differs from above mentioned species in the commencement of vitellaria from mid level of ventral sucker up to mid level of anterior testis. It further differs from *M. chauhani*, *M. collata* and *M. mauryai* in the position of ovary posterodorsal to ventral sucker and from *M. ritai* in having smooth ovary and position of receptaculum seminis. It again differs from *M. collata* and *M. gomtia* in having ovary smaller than testis. Accordingly, it is regarded as a new species with the specific name *Masenia agarwali* sp. nov.

The new species is named in honour of Professor G.P. Agarwal, Retired Head, Deptt. of Zoology, Banaras Hindu University, Varanasi for his contribution in the field of Helminthology.
Seasonal variation in incidence and intensity of infection of *Masettia agarwali* sp. nov. in fresh water fish *Clarias batrachus* (Linn.)

The 204 specimens of *Clarias batrachus* (Linn.) examined included 71 infected fish from which 166 mature *Masettia agarwali* sp.nov. were collected. This represented an overall percentage of infection of 34.80% and intensity of 2.34 worms per infected fish.

**Table No. 11: Data showing incidence and intensity of infection of *Masettia agarwali* sp. nov.**

<table>
<thead>
<tr>
<th>Months</th>
<th>Fish examined</th>
<th>Fish infected</th>
<th>No. of parasites</th>
<th>% of infection</th>
<th>Mean no. of parasites / infected fish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov. 04</td>
<td>30</td>
<td>8</td>
<td>12</td>
<td>26.67</td>
<td>1.50</td>
</tr>
<tr>
<td>Dec.</td>
<td>18</td>
<td>5</td>
<td>10</td>
<td>27.78</td>
<td>2.00</td>
</tr>
<tr>
<td>Jan. 05</td>
<td>11</td>
<td>4</td>
<td>9</td>
<td>36.36</td>
<td>2.25</td>
</tr>
<tr>
<td>Feb.</td>
<td>19</td>
<td>8</td>
<td>20</td>
<td>42.11</td>
<td>2.50</td>
</tr>
<tr>
<td>Mar.</td>
<td>20</td>
<td>14</td>
<td>44</td>
<td>70.00</td>
<td>3.14</td>
</tr>
<tr>
<td>Apr.</td>
<td>15</td>
<td>8</td>
<td>22</td>
<td>53.33</td>
<td>2.75</td>
</tr>
<tr>
<td>May</td>
<td>15</td>
<td>4</td>
<td>10</td>
<td>26.67</td>
<td>2.50</td>
</tr>
<tr>
<td>Jun.</td>
<td>16</td>
<td>2</td>
<td>4</td>
<td>12.50</td>
<td>2.00</td>
</tr>
<tr>
<td>Jul.</td>
<td>10</td>
<td>2</td>
<td>3</td>
<td>20.00</td>
<td>1.50</td>
</tr>
<tr>
<td>Aug.</td>
<td>12</td>
<td>4</td>
<td>10</td>
<td>33.33</td>
<td>2.50</td>
</tr>
<tr>
<td>Sep.</td>
<td>18</td>
<td>8</td>
<td>16</td>
<td>44.44</td>
<td>2.00</td>
</tr>
<tr>
<td>Oct.</td>
<td>20</td>
<td>4</td>
<td>6</td>
<td>20.00</td>
<td>1.50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>204</strong></td>
<td><strong>71</strong></td>
<td><strong>166</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The incidence and intensity of infection were recorded during the period from November, 2004 to October, 2005 and are shown in Table No. 11. The data regarding the number of fishes examined and their parasite burden during the period of infection are given in Table No. 11. The fluke occurred throughout the year but in varying intensities. Over the period of one year the percentage of infection varied from 12.50% and 70.0%. The highest infection was in March, 2005 when 70.0% of the fishes were found infected with fluke. The infection was minimum during June, 2005 when only 12.5% of the fish...
examined were infected. In remaining months the infection fluctuated between 20.0% to 53.33%.

Graph No. 11: Showing incidence and intensity of infection of *Masenia agarwali* sp.nov.

The intensity of infection during the same period showed different trend. The maximum intensity (an average of 3.14 worms per infected host) was recorded in March, 2005 when the percentage of infection was also at its maximum level. The lowest intensity (1.5 flukes per infected host) was recorded during November, 04, July, 05 and October, 05. In the remaining months the intensity varied between 2.00 to 2.75 worms per infected host.
Key to the species of the genus *Masenia*, Chatterji, 1933.

1. Genital pore anteriorly in the region of oral sucker  
   Genital pore anteriorly behind oral sucker  

2. Body partly spinose  
   Body completely spinose  
   .... ... 3  
   .... ... 4

3. Vitellaria commence from posterior level of oesophagus up to posterior region of anterior testis  
   Vitellaria commence from behind caecal bifurcation up to mid level of posterior testis  
   *M. chauhani* Maurya, Agarwal and Singh, 1989
   Vitellaria commence from anterior region of ventral sucker up to midlevel of posterior testis  
   *M. mauryai* Sabhyata, 2006
   Vitellaria commence from anterior level of ventral sucker up to hind end of anterior testis  
   *M. hanumanthai* sp. nov.
   Vitellaria commence from mid region of ventral sucker up to hind end of posterior testis  
   *M. gomtia* Agarwal, 1963
   Vitellaria commence from mid region of ventral sucker up to mid level of anterior testis  
   *M. agarwali* sp. nov.
   Vitellaria commence from mid level of ventral sucker up to hind region of anterior testis  
   *M. ritai* Sircar and Sinha, 1970

4. Vitellaria commence from anterior end of ventral sucker up to mid level of anterior testis  
   *M. fossilisi* Gupta, 1953
   Vitellaria commence from middle region of ventral sucker up to hind end of anterior testis  
   .... ... 5

5. Ovary larger than ventral sucker  
   *M. dayali* Gupta, 1953
   Ovary smaller than ventral sucker  
   *M. upeneusi* Gupta and Puri, 1984
Family: Opisthorchiidae Braun, 1901
Family: Opisthorchiidae Braun, 1901
*Opisthorchis ritai* sp.nov.
(Plate: 23-24, Fig. 1-3)

Description

Body slender, elongated, spinose with narrow extremities, bluntly pointed anterior and posterior extremities, 3.59 to 4.65 mm long, 0.72 to 0.75 mm wide. Oral sucker terminal, subspherical, 0.20 to 0.21 mm long, 0.20 to 0.22 mm wide. Prepharynx short, pharynx subglobular, 0.10 to 0.19 mm long, 0.09 to 0.12 mm wide. Oesophagus short, smaller than pharynx, 0.05 to 0.15 mm long. Intestinal bifurcation nearer to oral sucker than ventral sucker, caeca simple, ending blindly nearer hind end of the body. Ventral sucker subspherical, larger than oral sucker, 0.25 to 0.26 mm long, 0.26 to 0.30 mm wide, at 1.40 to 1.42 mm from anterior extremity.

Excretory bladder sigmoid, passes between testes as observed in living form; excretory pore terminal, at hind end of the body.

Genital pore median, intercaecal, post bifurcal, just above the ventral sucker, at 1.34 to 1.38 mm from anterior extremity.

Testes tandem, highly lobed, close together, intercaecal, post equatorial near hind end of the body. Anterior testis 0.21 to 0.25 mm long, 0.24 mm to 0.37 mm wide, at 3.05 to 3.99 mm from anterior extremity. The posterior testis is longer than anterior testis, 0.27 to 0.32 mm long, 0.22 to 0.23 mm wide, at 0.08 to 0.10 mm from hind end of the body. Cirrus sac absent, vesicula seminalis long, tubular, coiled, free in parenchyma, 0.65 to 0.72 mm long, extending posteriorly either anterior to middle of body.

Ovary entire, subspherical, submedian, post-equatorial, pretesticular, 0.18 to 0.20 mm long, 0.25 to 0.27 mm wide, at 2.91 to 3.82 mm from anterior extremity. Receptaculum seminis prominent, transversely elongated 0.09 to
Plate 23: *Opisthorchis ritai* sp.nov.
Entire dorsal view
Plate 23: *Opisthorchis ritai* sp.nov.
Entire dorsal view
Plate 24: *Opisthorchis ritai* sp. nov.
1. Entire dorsal view
2. Posterior portion showing differences in shape of testes
3. Eggs
0.18 mm long, 0.19 to 0.43 mm wide, lying between anterior testis and ovary. Vitellaria follicular, extending along caeca from the level just posterior to hind end of the ventral sucker up to the level of anterior margin of ovary. Œotype present, anterolateral to receptaculum seminis, surrounded by a large number of Mehlis' gland cells. Uterus coiled, intercaecal, lying between ovary and ventral sucker, opening terminally into genital pore. Eggs small, numerous, oval, 0.03 to 0.04 mm long and 0.02 to 0.03 mm wide.

Host - *Rita rita* (Ham.)
Location - Intestine
Locality - Chaukaghat, Varanasi

**Discussion**

New species referred to the genus, *Ophisthorchis* Blanchard, 1895 of which following species *viz.*, *O. pedicellata* Verma, 1927; *O. gorakhpurensis* Rai, 1971; *O. gwaliorensis*. Bhadauria and Dondotia, 1979; *O. cadulspinatum* Bhadauria and Dondotia, 1979; *O. attui* Pandey, Pandey and Govind, 2004 reported so far valid from Indian fishes. It differs from *O. pedicellata*, *O. gorakhpurensis*, and *O. gwaliorensis* in having transversely elongated receptaculum seminis, oesophagus smaller than pharynx and in having smaller size of eggs, and from *O. cadulspinatum* in having distinctly pre-equatorial ventral sucker, in the presence of prepharynx and in the absence of crown of spines around the excretory pore. It further differs from *O. pedicellata* in smaller sucker ratio and continuous nature of vitellaria from *O. gorakhpurensis* in the presence of prepharynx and in having lobed testes and from *O. gwaliorensis* in having pre-equatorial ventral sucker and genital pore. It differs from *O. attui* in having entire ovary. Accordingly, it is regarded as a new species with the specific name *Opisthorchis ritai* sp. nov.

The new species is named after its host *Rita rita* (Ham.).
Seasonal variation in the incidence and intensity of infection of *Opisthorchis ritai* sp.nov. in fresh water fish, *Rita rita* (Ham.)

For the study of seasonal variation, 243 specimens of *Rita rita* (Ham.) were examined in which 51 fishes were found infected and 81 mature worms of *Opisthorchis ritai* sp.nov. were obtained. The overall percentage of infection was 20.99% and intensity 1.59 per infected fish.

Table No. 12: Date showing incidence and intensity of infection of *Opisthorchis ritai* sp. nov.

<table>
<thead>
<tr>
<th>Months</th>
<th>Fish examined</th>
<th>Fish infected</th>
<th>No. of parasites</th>
<th>% of infection</th>
<th>Mean no. of parasites / infected fish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. 04</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>10.0</td>
<td>1.00</td>
</tr>
<tr>
<td>Feb.</td>
<td>23</td>
<td>6</td>
<td>8</td>
<td>26.09</td>
<td>1.33</td>
</tr>
<tr>
<td>Mar.</td>
<td>27</td>
<td>8</td>
<td>20</td>
<td>29.63</td>
<td>2.50</td>
</tr>
<tr>
<td>Apr.</td>
<td>21</td>
<td>5</td>
<td>7</td>
<td>23.81</td>
<td>1.40</td>
</tr>
<tr>
<td>May</td>
<td>24</td>
<td>2</td>
<td>3</td>
<td>8.33</td>
<td>1.50</td>
</tr>
<tr>
<td>Jun.</td>
<td>17</td>
<td>1</td>
<td>1</td>
<td>5.88</td>
<td>1.00</td>
</tr>
<tr>
<td>Jul.</td>
<td>13</td>
<td>1</td>
<td>1</td>
<td>7.69</td>
<td>1.00</td>
</tr>
<tr>
<td>Aug.</td>
<td>14</td>
<td>2</td>
<td>4</td>
<td>14.29</td>
<td>2.00</td>
</tr>
<tr>
<td>Sep.</td>
<td>34</td>
<td>9</td>
<td>12</td>
<td>26.47</td>
<td>1.33</td>
</tr>
<tr>
<td>Oct.</td>
<td>21</td>
<td>6</td>
<td>8</td>
<td>28.57</td>
<td>1.33</td>
</tr>
<tr>
<td>Nov.</td>
<td>19</td>
<td>6</td>
<td>10</td>
<td>31.58</td>
<td>1.67</td>
</tr>
<tr>
<td>Dec.</td>
<td>20</td>
<td>4</td>
<td>6</td>
<td>20.00</td>
<td>1.50</td>
</tr>
<tr>
<td>Total</td>
<td>243</td>
<td>51</td>
<td>81</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The percentage of infection and mean number of parasites per infected fish were recorded between January, 2004 to December, 2004 and are shown in Table 12. The number of fishes examined and parasites obtained during this period are also given in Table 12. During 12 months the flukes occurred in different intensities. Throughout the year, percentage fluctuated between 5.88% to 31.58%. The highest infection occurred in November, 2004 when 31.58% of the fishes were infected with parasites. The lowest infection occurred in June,
2004 when 5.88% of the fishes were infected with parasites. In rest of the months the infection varied between 7.69% to 29.63%.

**Graph No. 12: Showing incidence and intensity of infection of *Opisthorchis ritai* sp. nov.**

The mean number of parasites per infected fish during the same time duration showed different trends. The maximum intensity (an average of 2.50 worms per infected fish) was recorded in March, 2004 when percentage of infection was 29.63%. The lowest intensity (1.0 fluke per infected host) was recorded during January, June and July, 2004. In rest of the months the infection varied between 1.33 and 2.00.
Key to the species of genus, *Opisthorchis* Blanchard, 1895

1. Ovary entire
   - Ovary notched
     - O. *attui* Pandey, Pandey and Govind, 2004

2. Crown of spines present around excretory pore
   - Crown of spines absent around excretory pore

3. Ventral sucker pre equatorial or equatorial
   - Ventral sucker distinctly post equatorial
     - O. *gwaliorensis* Bhadauria and Dondotia, 1977

4. Testes lobed
   - Testes unlobed
     - O. *gorakhpurensis* Rai, 1971

5. Oesophagus smaller than pharynx
   - Oesophagus larger than pharynx
     - O. *ritai* sp. nov.
     - O. *pedicellata* Verma, 1927
**Opisthorchis pedicellata Verma, 1927**
(Plate: 25-26, Fig. 1-3)

**Description**

Body slender, elongated, spinose with narrow bluntly pointed anterior and posterior extremities, 4.80 to 5.80 mm long, 0.88 to 1.44 mm wide. Oral sucker terminal, subspherical, 0.19 to 0.29 mm long, 0.18 to 0.30 mm wide. Prepharynx absent. Pharynx subglobular, 0.09 to 0.12 mm long, 0.5 to 0.12 mm wide. Oesophagus short, larger than pharynx, 0.09 to 0.28 mm long. Intestinal bifurcation nearer to oral sucker than ventral sucker; caeca simple ending blindly near hind end of body. Ventral sucker subspherical, equal to oral sucker, 0.19 to 0.34 mm long, 0.18 to 0.37 mm wide, at 1.2 to 1.72 mm from anterior extremity.

Excretory bladder sigmoid; passes between testes as observed in living form; excretory pore terminal at hind end of body.

Genital pore median, intercaecal, postbifurcal, just above the ventral sucker, at 1.14 to 1.57 mm from anterior extremity.

Testes two, tandem, slightly lobed, closed together, intercaecal, postequatorial, near hind end of body. Anterior testis 0.53 to 0.57 mm long, 0.43 to 0.56 mm wide, at 3.46 to 4.14 mm from anterior extremity. Posterior testis is longer than the anterior testis, 0.52 to 0.54 mm long, 0.46 to 0.48 mm, at 0.12 to 0.16 mm from hind end of body. Cirrus sac absent. Vesicula seminalis long, tubular, free in parenchyma, 0.28 to 0.75 mm long, extending posteriorly either anterior middle of the body.

Ovary entire, subspherical, submedian, postequatorial, pretesticular, 0.31 to 0.35 mm long, 0.24 to 0.52 mm wide, at 3.10 to 3.84 mm from anterior extremity. Receptaculum seminis, prominent, oblique, 0.23 to 0.58 mm long,
Plate 25: *Opisthorchis pedicellata* Verma, 1927
Entire dorsal view
Plate 25: *Opisthorchis pedicellata* Verma, 1927
Entire dorsal view
Plate 26: *Opisthorchis pedicellata* Verma, 1927
1. Entire dorsal view
2. Eggs
0.26 to 0.27 mm wide, lying between anterior testis and ovary; vitellaria follicular, extending along the caeca from the level just posterior to hind end of ventral sucker up to the level of anterior margin of ovary. Ootype present, anterolateral to receptaculum seminis, surrounded by large number of Mehlis' gland cells. Uterus coiled, intercaecal, lying between ovary and ventral sucker, opening terminally into genital pore. Eggs small, numerous, oval, 0.03 to 0.04 mm long, 0.020 to 0.023 mm wide.

Host        Rita rita (Ham.)
Location    Gall bladder
Locality    River Ganga, Varanasi

Discussion

The present specimen belongs to *Opisthorchis pedicellata* Verma, 1927 in having slightly lobed testes and oesophagus larger than pharynx but, however, differs from original description in the shape of ovary, receptaculum seminis and relative size of body and various organs. These differences are considered as specific variations.

Seasonal variation in the incidence and intensity of infection of *Opisthorchis pedicellata* Verma, 1927 in fresh water fish, *Rita rita* (Ham.)

202 specimens of *Rita rita* (Ham.) examined included 57 infected fish from which 111 mature *Opisthorchis pedicellata* were collected. This represented an overall percentage of infection of 28.22% and intensity 1.95 worms per infected fish.
Table No. 13: Showing incidence and intensity of infection of *Opisthorchis pedicellata* in *Rita rita* (Ham.).

<table>
<thead>
<tr>
<th>Months</th>
<th>Fish examined</th>
<th>Fish infected</th>
<th>No. of parasites</th>
<th>% of infection</th>
<th>Mean no. of parasites / infected fish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jul. 04</td>
<td>21</td>
<td>4</td>
<td>9</td>
<td>19.05</td>
<td>2.25</td>
</tr>
<tr>
<td>Aug.</td>
<td>14</td>
<td>6</td>
<td>14</td>
<td>42.86</td>
<td>2.33</td>
</tr>
<tr>
<td>Sep.</td>
<td>18</td>
<td>10</td>
<td>24</td>
<td>55.56</td>
<td>2.40</td>
</tr>
<tr>
<td>Oct.</td>
<td>22</td>
<td>9</td>
<td>12</td>
<td>40.91</td>
<td>1.33</td>
</tr>
<tr>
<td>Nov.</td>
<td>12</td>
<td>4</td>
<td>7</td>
<td>33.33</td>
<td>1.75</td>
</tr>
<tr>
<td>Dec.</td>
<td>14</td>
<td>3</td>
<td>5</td>
<td>21.43</td>
<td>1.67</td>
</tr>
<tr>
<td>Jan. 05</td>
<td>10</td>
<td>1</td>
<td>2</td>
<td>10.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Feb.</td>
<td>20</td>
<td>4</td>
<td>6</td>
<td>20.00</td>
<td>1.50</td>
</tr>
<tr>
<td>Mar.</td>
<td>22</td>
<td>7</td>
<td>15</td>
<td>31.82</td>
<td>2.14</td>
</tr>
<tr>
<td>Apr.</td>
<td>18</td>
<td>4</td>
<td>8</td>
<td>22.22</td>
<td>2.00</td>
</tr>
<tr>
<td>May</td>
<td>14</td>
<td>3</td>
<td>5</td>
<td>21.43</td>
<td>1.67</td>
</tr>
<tr>
<td>Jun.</td>
<td>17</td>
<td>2</td>
<td>4</td>
<td>11.76</td>
<td>2.00</td>
</tr>
<tr>
<td>Total</td>
<td>202</td>
<td>57</td>
<td>111</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Graph No. 13: Showing incidence and intensity of infection of *Opisthorchis pedicellata* Verma, 1927
The incidence and intensity of infection were recorded during the period from July, 2004 to August, 2005 and are shown in Table 13. The data regarding the number of fishes examined and their parasite burden during the period of infection are given in Table No. 13. The fluke occurred throughout the year but in varying intensities. Over the period of 12 months the percentage of infection varied from 10% and 55.56%. The highest infection was in September, 2004 when 55.56% of fishes were found infected with the fluke. The infection was minimum during January, 05 when only 10% of fish examined were infected. In remaining months the infection fluctuated between 11.76% and 42.86%.

The intensity of infection during the same period showed different trend. The maximum intensity (an average of 2.40 worms per infected host) was recorded in September, 04 when percentage of infection was also at maximum level. The lowest intensity (1.33 fluke per infected host) was recorded during October, 04 when percentage of infection was 40.91%. In the remaining months the intensity varied between 1.67 and 2.33.
Gomtia pandeyi sp.nov.
(Plate: 27-28, Fig. 1-2)

Description

Body slender, elongated, spinose, 2.83 to 2.93 mm long, 0.50 to 0.52 mm wide, with rounded anterior and posterior extremities. Oral sucker subterminal, subspherical, 0.12 to 0.14 mm long, 0.11 to 0.12 mm wide. Prepharynx tubular, 0.15 to 0.16 mm long, Pharynx subglobular, 0.9 to 0.10 mm long, 0.08 to 0.10 mm wide. Oesophagus short, smaller than prepharynx, 0.07 to 0.08 mm long. Caeca simple, ending blindly near hind end of the body. Ventral sucker subspherical, equal to oral sucker, 0.11 to 0.14 mm long, 0.11 to 0.18 mm wide, at 0.74 to 0.80 mm from anterior extremity.

Excretory bladder sigmoid; passes between testes, observed in living form; excretory pore terminal at hind end of body.

Genital pore median, intercaecal, post bifurcal, just above the ventral sucker, at 0.69 to 0.73 mm from anterior extremity.

Testes two, tandem, closed together, intercaecal, postequatorial, near hind end of the body. Anterior testis 0.24 to 0.28 mm long, 0.37 to 0.40 mm wide, at 2.26 to 2.50 mm from anterior extremity. The posterior testis is longer than anterior testis, 0.20 to 0.24 mm long, 0.29 to 0.30 mm wide, at 0.07 to 0.10 mm from hind end of body. Cirrus sac is absent. Vesicula seminalis is present, 0.25 to 0.29 mm long, divided into three parts, proximal part, middle part and distal part.

Proximal part 0.08 to 0.09 mm long, 0.09 to 0.10 mm wide, middle part, 0.08 to 0.09 mm long, and 0.09 to 0.11 mm wide, distal part 0.10 to 0.11 mm long, 0.07 to 0.10 mm wide, extending posteriorly anterior to middle of the body.
Plate 27: *Gomtia pandeyi* sp.nov.
Entire dorsal view
Plate 27: *Gomtia pandeyi* sp. nov.
Entire dorsal view
Plate 28: *Gomtia pandeyi* sp.nov.
1. Entire dorsal view
2. Eggs
Ovary entire, subspherical, submedian, postequatorial 0.17 to 0.19 mm long, 0.23 to 0.25 mm wide, at 2.07 to 2.10 mm from anterior extremity. Receptaculum seminis prominent, spherical in shape, 0.21 to 0.25 mm long, 0.25 to 0.28 mm wide, lying anterior to anterior testis beside ovary. Vitellaria discontinuous, extending along caeca from posterior level of cirrus sac up to the level of anterior testis. Uterus coiled, intercaecal, lying between ovary and ventral sucker, opening terminally into genital pore. Eggs small, numerous, oval, 0.03 to 0.04 mm long, 0.015 to 0.02 mm wide.

Host  
*Wallago attu* (Bl.)

Location  Intestine

Locality  Chaukaghat fish market, Varanasi

Discussion

The present species is referred to genus, *Gomtia* Thapar, 1930; with *G. piscicola* as its type species Mehra (1941) doubted the validity of *Gomtia* and synonymised it with *Opisthorchis* Blanchard, 1895. Yamaguti (1971) considered *Gomtia* and *Opisthorchis* as distinct genera on the basis of commencement nature and extension of vitelline follicles. While studying the present species, author agrees with the opinion of Yamaguti, 1971 and considers *Gomtia* and *Opisthorchis* as two distinct genera.

The genus *Gomtia* Thapar, 1930 includes following sp. viz., *G. piscicola*, Thapar, 1930; *G. gagata* Dayal, 1949; *G. lucknowia* Dayal, 1949; and *G. thapari* (Agarwal and Singh, 1978) new comb from Indian fresh water fishes. The present species differs from all the known species of genus, *Gomtia* in having bulbus, tripartite lower part of vesicula seminalis. It closely resembles *G. piscicola* and *G. thapari* in the position of testes, spinose body and posterior extension of vesicula seminis but, however, differs from them in having more compact testes and ovary, much longer, lateral, seminal receptacle, more
elongated prepharynx and more posterior extension of vitelline follicles. It further differs from *G. piscicola* in more posterior extension of intestinal caeca up to posterior end of posterior testis instead of midlevel of posterior testis and larger size of eggs, from *G. thapari* in having sub median ovary, smaller sucker ratio and intercaecal vesicula seminis. Accordingly, it is regarded as new species with specific name, *Gomtia pandeyi* sp. nov.

The new species is named in the honour of Prof. K.C. Pande Ex-Vice Chancellor and Ex-Head, Deptt. of Zoology, Lucknow University, Lucknow for his contribution in the field of trematodology.

**Seasonal variation in the incidence and intensity of infection of *Gomtia pandeyi* sp.nov. in fresh water fish *Wallago attu* (Bleeker)**

During extensive survey, 251 specimens of *Wallago attu* (Bleeker) were examined, in which 45 fishes were found infected with *Gomtia pandeyi* sp.nov. and 98 adults flukes were collected. The overall infection was 17.93% and intensity 2.18 parasites per infected fish.

<table>
<thead>
<tr>
<th>Months</th>
<th>Fish examined</th>
<th>Fish infected</th>
<th>No. of parasites</th>
<th>% of infection</th>
<th>Mean no. of parasites / infected fish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jul. 05</td>
<td>19</td>
<td>2</td>
<td>4</td>
<td>10.53</td>
<td>2.00</td>
</tr>
<tr>
<td>Aug.</td>
<td>16</td>
<td>2</td>
<td>5</td>
<td>12.50</td>
<td>2.50</td>
</tr>
<tr>
<td>Sep.</td>
<td>23</td>
<td>3</td>
<td>6</td>
<td>13.04</td>
<td>2.00</td>
</tr>
<tr>
<td>Oct.</td>
<td>19</td>
<td>5</td>
<td>12</td>
<td>26.32</td>
<td>2.40</td>
</tr>
<tr>
<td>Nov.</td>
<td>14</td>
<td>4</td>
<td>10</td>
<td>28.57</td>
<td>2.50</td>
</tr>
<tr>
<td>Dec.</td>
<td>17</td>
<td>6</td>
<td>16</td>
<td>35.29</td>
<td>2.67</td>
</tr>
<tr>
<td>Jan. 06</td>
<td>16</td>
<td>4</td>
<td>9</td>
<td>25.00</td>
<td>2.25</td>
</tr>
<tr>
<td>Feb.</td>
<td>22</td>
<td>5</td>
<td>11</td>
<td>22.73</td>
<td>2.20</td>
</tr>
<tr>
<td>Mar.</td>
<td>20</td>
<td>3</td>
<td>7</td>
<td>15.00</td>
<td>2.33</td>
</tr>
<tr>
<td>Apr.</td>
<td>35</td>
<td>5</td>
<td>9</td>
<td>14.29</td>
<td>1.80</td>
</tr>
<tr>
<td>May</td>
<td>22</td>
<td>3</td>
<td>5</td>
<td>13.64</td>
<td>1.67</td>
</tr>
<tr>
<td>Jun.</td>
<td>28</td>
<td>3</td>
<td>4</td>
<td>10.71</td>
<td>1.33</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>251</strong></td>
<td><strong>45</strong></td>
<td><strong>98</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The percentage of infection and mean number of parasites per infected fish were recorded between July, 2005 to June, 2006 and are shown in Table 14. The number of fishes examined and parasites obtained during this period are also given in Table 14. During 12 months the flukes occurred in different intensities. Throughout the year, percentage fluctuated between 10.53% to 35.29%. The highest infection occurred in December, 2005 when 35.29% of the fishes were infected with parasites. The lowest infection occurred in July, 2005 when 10.53% of the fishes were infected with parasites. In rest of the months the infection varied between 10.71% to 28.57%.

The mean number of parasites per infected fish during the same time duration showed different trend. The maximum intensity (an average of 2.67 worms per infected fish) was recorded in December, 2005 when percentage of infection was also at maximum level. The lowest intensity (1.33 fluke per infected host) was recorded during June, 2006. In rest of the months the infection varied between 1.67 and 2.50.
Description

Body slender, elongated, spinose, 1.32 to 1.96 mm long, 0.48 to 0.51 mm wide, with rounded anterior and posterior extremities. Oral sucker terminal, 0.08 to 0.11 mm long, 0.10 to 0.11 mm wide. Prepharynx present, 0.05 to 0.15 mm long, pharynx subglobular, 0.08 to 0.09 mm long, 0.05 to 0.06 mm wide. Oesophagus shorter than pharynx, 0.06 to 0.07 mm long. Intestinal bifurcation is in between oral and ventral sucker. Caeca simple, ending blindly near anterior end of posterior testis. Ventral sucker spherical and equal to the oral sucker, 0.11 to 0.12 mm long, 0.10 to 0.11 mm wide, at 0.45 to 0.70 mm from anterior extremity.

Excretory bladder sigmoid; passes between testes as observed in living form, excretory pore terminal, at hind end of the body.

Genital pore median, intercaecal, post bifurcal, just above the ventral sucker, at 0.39 to 0.58 mm from anterior extremity.

Testes tandem, close together, intercaecal, postequatorial, at the hind end of the body. Anterior testis 0.14 to 0.24 mm long, 0.35 to 0.36 mm wide, at 1.02 to 1.62 mm from anterior extremity. The posterior testis is longer than anterior testis, 0.15 to 0.22 mm long, 0.35 to 0.36 mm wide, at 0.01 to 0.02 mm from hind end of the body. Cirrus sac absent, vesicula seminalis comparatively short, tubular, free in parenchyma, 0.48 to 0.40 mm long, extending anteriorly to the body.

Ovary entire, subspherical, submedian, postequatorial pretesticular, 0.13 to 0.16 mm long, 0.18 to 0.23 mm wide, at 0.77 to 1.37 mm from anterior end of body. Receptaculum seminis prominent, transversely elongated, 0.10 to 0.33...
Plate 29: *Gomtia vittatusi* Sabhyata, 2006
Entire dorsal view
Plate 29: *Gomtia vittatusi* Sabhyata, 2006
Entire dorsal view
Plate 30: *Gomtia vittatus* Sabhyata, 2006
1. Entire dorsal view
2. Eggs
mm long, 0.15 to 0.20 mm wide, lying between ovary and anterior testis. Vitellaria discontinuous, extending along caeca from the level of posterior margin of vesicula seminalis up to the middle portion of anterior testis. Uterus intercaecal, lying between anterior testis and ventral sucker, opening terminally genital pore. Eggs small, numerous, oval, 0.025 to 0.033 mm long, 0.013 to 0.019 mm wide.

Host  
Wallago attu (Bl.)

Location  
Intestine

Locality  
Chaukaghat fish market, Varanasi

Discussion

The present form belongs to Gomtia vittatusi Sabhyata, 2006 in the nature and extension of vitellaria, seminal vesicle, position of testes, ovary and receptaculum seminis but, however, differs from it slightly in the extension of intestinal caeca, shape of vesicula seminalis size of receptaculum seminis and relative body size. These differences are considered as individual variations.

Seasonal variation in the incidence and intensity of infection of Gomtia vittatusi Sabhyata, 2006 in fresh water fish Wallago attu (Bleeker)

The 376 specimens of Wallago attu (Bl.) examined included 90 infected fish from which 278 mature Gomtia vittatusi Sabhyata, 2006 were collected. This represented an overall percentage of infection of 23.94% and intensity of 3.09 per infected fish.
Table No. 15: Data showing incidence and intensity of infection of *Gomtia vittatusi* Sabhyata, 2006

<table>
<thead>
<tr>
<th>Months</th>
<th>Fish examined</th>
<th>Fish infected</th>
<th>No. of parasites</th>
<th>% of infection</th>
<th>Mean no. of parasites / infected fish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep. 04</td>
<td>20</td>
<td>6</td>
<td>10</td>
<td>30.00</td>
<td>1.67</td>
</tr>
<tr>
<td>Oct.</td>
<td>24</td>
<td>8</td>
<td>18</td>
<td>33.33</td>
<td>2.25</td>
</tr>
<tr>
<td>Nov.</td>
<td>33</td>
<td>12</td>
<td>43</td>
<td>36.36</td>
<td>3.58</td>
</tr>
<tr>
<td>Dec.</td>
<td>42</td>
<td>22</td>
<td>81</td>
<td>52.38</td>
<td>3.68</td>
</tr>
<tr>
<td>Jan. 05</td>
<td>28</td>
<td>10</td>
<td>27</td>
<td>35.71</td>
<td>2.70</td>
</tr>
<tr>
<td>Feb.</td>
<td>30</td>
<td>4</td>
<td>14</td>
<td>13.33</td>
<td>3.50</td>
</tr>
<tr>
<td>Mar.</td>
<td>37</td>
<td>5</td>
<td>16</td>
<td>13.51</td>
<td>3.20</td>
</tr>
<tr>
<td>Apr.</td>
<td>31</td>
<td>4</td>
<td>13</td>
<td>12.90</td>
<td>3.25</td>
</tr>
<tr>
<td>May.</td>
<td>38</td>
<td>7</td>
<td>18</td>
<td>18.42</td>
<td>2.57</td>
</tr>
<tr>
<td>Jun.</td>
<td>40</td>
<td>6</td>
<td>19</td>
<td>15.00</td>
<td>3.17</td>
</tr>
<tr>
<td>Jul.</td>
<td>35</td>
<td>4</td>
<td>13</td>
<td>11.43</td>
<td>3.25</td>
</tr>
<tr>
<td>Aug.</td>
<td>18</td>
<td>2</td>
<td>6</td>
<td>11.11</td>
<td>3.00</td>
</tr>
<tr>
<td>Total</td>
<td>376</td>
<td>90</td>
<td>278</td>
<td></td>
<td></td>
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</tbody>
</table>

Graph No. 15: Showing incidence and intensity of infection of *Gomtia vittatusi* Sabhyata, 2006
The incidence and intensity of infection were recorded during the period from September, 2004 to August, 2005 and are shown in Table No. 15. The data regarding the no. of fishes examined and their parasite burden during the period of infection are given in Table No. 15. The flukes occurred throughout the year but in varying intensities. Over the period of 12 months the percentage of infection varied from 11.11% to 52.38%. The highest infection recorded in December, 2004 when 52.38% of the fishes were found infected with fluke. The infection was minimum during August, 2005 when only 11.11% of the fish examined were infected. In remaining months the infection fluctuated between 11.43% to 36.36%.

The intensity of infection during the same period showed different trend. The maximum intensity (an average of 3.68 worms per infected fish) was recorded in December, 04 when percentage of infection also at maximum level. The lowest intensity (1.67 fluke per infected host) was recorded during September, 04 when percentage of infection was 30%. In remaining months the intensity varied between 2.25 and 3.58.