The Protists Found in Water at the Kashibaru Marsh in Saga Prefecture, Kyushu Japan

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Introduction
Kashibaru Marsh is located among the Sefuri Mountains in Saga Prefecture, Japan, 591 meters high from the sea level. The total area of the marsh is as much as 8 hectares. This is known as the biggest marsh in Kyushu. The marsh is in the form of basin among mainly granite hills, and the soil is a layer of clay.
The main supply of the water into the marsh consists of flows from the mountains, spring water from the bottom, and rainfall. No water containing agricultural chemicals from the surrounding rice fields comes into the marsh due to artificial walls.
About 60 kinds of rare marsh plants are said to be native to the marsh, and rare insects such as the smallest dragonfly, Nannophya pygmaea, the blue bee are living in the area.
Since 1976, the marsh has been designated as Saga Natural Environment Protected Area to protect these rare natural creatures.
From August 2013 to November 2014, I visited the marsh every month except winter to find protists in water at the marsh.

Materials and Methods
I checked atmospheric temperature, water temperature and potential of hydrogen (pH) of the water. I estimated the pH with a use of indicator paper.
Then I aspirated several milliliter of water together with a small quantity of sediment with a long pipette.
The place which I took the samples was the same place every time at the marsh. I observed the samples under a microscope and photographed protists found. I sent the photomicrographs to Dr. Tsukii for his confirming identification of the species.

Results
Table 1 shows days of collection and the data. The lowest water temperature was 6°C in March 2014 and the highest was 27°C in August 2013. The water was clear and slightly acidic all the time.

Table 2 shows all protists found from the collected samples. In total, 35 species of protists were identified: 4 in Mastigophora, 2 in Heterokonta, 3 in Sarcodina, 4 in Ciliophora and 22 in Chlorophyta.
Besides these species, some protists, which were difficult to identify, were found in the materials. Diatoms such as Navicura sp., Cymbella sp., or Pinnularia sp. were commonly seen through all seasons, except wintertime.
Figure 1 shows a part of Kashibaru Marsh. Figure 2 shows all photomicrographs of the protists which I found in the marsh.

Discussion
Tsukii found a total of 299 kinds of protists from Kashibaru Marsh on 5 investigations until November 26, 2012.
Protists found in water at the Kashibaru Marsh

Together with his report, my present investigation show that a large number of protists are living in Kashibaru Marsh. On the other hand, the protists found from other ponds or rice fields in Saga Prefecture are very scanty\(^2\).

The main reason of the difference is thought to be the presence of agricultural chemicals in these ponds or rice fields.

No such chemicals, which kill protists come into the marsh from surrounding rice fields due to the protection by artificial walls.

As a conclusion Kashibaru Marsh is a precious treasury for protists, especially for Chlorophyta. We should preserve the present conditions for all time.

Acknowledgement

I express my sincere thanks to Dr. Yuuji Tsukii, Professor of Hosei University, for his valuable suggestion and identification of the protists. Thanks are also due to my wife for her assistance in taking materials at the marsh.

Literatures

1) Yuuji Tsukii
   http://protist.i.hosei.ac.jp/PDB/Sampling/Locations/09-Saga/Karatsu/Kashibaru-list.html
   (Accessed 20 January 2015)

2) Yuuji Tsukii
   http://protist.i.hosei.ac.jp/PDB/Sampling/Prefectures/index.html
   (Accessed 20 January 2015)
Table 1  Days of collection and the data.

<table>
<thead>
<tr>
<th>Day of Collection</th>
<th>Weather</th>
<th>Air Temp.</th>
<th>Water Temp.</th>
<th>pH</th>
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<tbody>
<tr>
<td>August 9, 2013</td>
<td>fine</td>
<td>—</td>
<td>27</td>
<td>6.5</td>
</tr>
<tr>
<td>October 4, 2013</td>
<td>fine</td>
<td>24</td>
<td>23</td>
<td>6.0</td>
</tr>
<tr>
<td>November 15, 2013</td>
<td>fine</td>
<td>12</td>
<td>10</td>
<td>6.5</td>
</tr>
<tr>
<td>March 7, 2014</td>
<td>fine</td>
<td>4</td>
<td>6</td>
<td>6.0</td>
</tr>
<tr>
<td>April 4, 2014</td>
<td>cloudy</td>
<td>5</td>
<td>8</td>
<td>6.5</td>
</tr>
<tr>
<td>May 1, 2014</td>
<td>cloudy</td>
<td>5</td>
<td>13</td>
<td>6.5</td>
</tr>
<tr>
<td>May 23, 2014</td>
<td>fine</td>
<td>22</td>
<td>18</td>
<td>6.0</td>
</tr>
<tr>
<td>June 20, 2014</td>
<td>cloudy</td>
<td>25</td>
<td>20</td>
<td>6.0</td>
</tr>
<tr>
<td>July 18, 2014</td>
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<td>25</td>
<td>25</td>
<td>6.0</td>
</tr>
<tr>
<td>August 31, 2014</td>
<td>fine</td>
<td>25</td>
<td>23</td>
<td>6.0</td>
</tr>
<tr>
<td>September 13, 2014</td>
<td>fine</td>
<td>23</td>
<td>21</td>
<td>6.0</td>
</tr>
<tr>
<td>October 3, 2014</td>
<td>fine</td>
<td>22</td>
<td>21</td>
<td>6.5</td>
</tr>
<tr>
<td>November 30, 2014</td>
<td>rainy</td>
<td>—</td>
<td>12</td>
<td>6.5</td>
</tr>
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</table>

Table 2  Protists found in the marsh.

**Mastigophora**
- *Cystodinium sp.* (Sep)
- *Euglena hemichromatata* (Oct*)
- *Merotrichia sp.?* (Aug*)
- *Merotrichia capitata* (Sep)

**Chlorophyta**
- *Pediastrum angulosum* (Aug*, May, Sep)
- *Tetracystis sp.?* (Aug*)
- *Pleurotaenium trabecula?* (Aug)
- *Triploceras gracile* (Oct*, Aug, Sep, Nov)
- *Closterium navicula* (Jul)

**Heterokonta**
- *Closterium toxon* (Jul, Oct)
- *Closterium aberuptum?* (May)
- *Closterium dianae* (Aug*, May, Sep, Oct, Nov)
- *Closterium baillyanum* (Aug*, May, Jun, Jul)

**Sarcodina**
- *Arcella vulgaris* (Apr)
- *Centropyxis aculeata* (May)
- *Trinema sp.* (May)

**Ciliophora**
- *Stentor fuliginosus?* (Aug*)
- *Spirostomum sp.?* (Mar)
- *Coleps hirtus* (Apr, May)
- *Stentor ralfsii* (May)
- *Closterium setaceum*
- *Closterium toxon* (Jul, Oct)
- *Closterium rectimarginatum* (Oct)
- *Closterium rostratum* (Jun, Aug)
- *Staurastrum subtiliferum* (Oct*)
- *Staurastrum sp.* (Jul)
- *Staurastrum tohopekaligense* (Aug*)
<table>
<thead>
<tr>
<th>Protist</th>
<th>Month, Year</th>
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</thead>
<tbody>
<tr>
<td>Protists found in water at the Kashibaru Marsh</td>
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<tr>
<td><em>Paramecium bursaria</em></td>
<td>(May)</td>
</tr>
<tr>
<td><em>Cosmarium contractum</em></td>
<td>(Aug, Nov*, Nov)</td>
</tr>
<tr>
<td><em>Cosmarium quadrifarium?</em></td>
<td>(Sep)</td>
</tr>
<tr>
<td><em>Cosmarium pandriforme?</em></td>
<td>(Apr, May)</td>
</tr>
<tr>
<td><em>Bambusina brebissonii</em></td>
<td>(Sep)</td>
</tr>
</tbody>
</table>

(Month in which found the protist)

*Year of 2013*

Fig.1  Kashibaru Marsh. (September 13, 2014)
Protists found in water at the Kashibaru Marsh

Fig. 2a Photomicrographs of protists found in the marsh.
Protists found in water at the Kashibaru Marsh

Fig. 2b Photomicrographs of protists found in the marsh.
Protists found in water at the Kashibaru Marsh

**Fig. 2c** Photomicrographs of protists found in the marsh.