

# Distribution of *Euglena mutabilis* Schmitz and its Function on the Formation of Chemical Environment in Acid Mine Drainage (AMD) Mari Tanaka, Kenta Komatsu and Tsutomu lyobe

Faculty of Environmental Engineering, The University of Kitakyushu, Kitakyushu 808-0135, Japan E-mail: e5102901@hibikino.ne.jp

## Introduction

The flagellate, Euglena mutabilis Schmitz is an index species of acid mine drainage (AMD)

· AMD is usually characterized by low pH and high concentration of heavy metals and sulfate ic

• E. mutabilis has tolerance to highly acidic condition and high contamination of heavy metals.

However, the environmental condition of the habitat of E. mutabilis and the requirement for the growth has not been reported.

In this study, we surveyed the distribution sites of *E. mutabilis* in the northern part of Kyushu and estimated the water chemical condition for the growth of the species in natural condition. And then we determined the chemical requirements of the species by the experiments of incubation under different chemical condition.

## Distribution

We surveyed the 15 sites of acidic springs including AMD in the northern part of Kyushu and recorded the existence or nonexistence of *E. mutabilis* as well as water chemistry at the sites.

Environmental parameters ···· temperature, pH, EC, SO<sub>4</sub><sup>2-</sup>, dissolved metal (Cu, Fe, Ca, Mg, Si)

The existence of *E. mutabilis* ···· field observation and determination by microscope

#### Incubation

Sampling site of materials used for incubation experiments was Minamidagawa river in Sensui, Kurate, Fukuoka. We used AMD, biofilm including *E. mutabilis*, *E. mutabilis* biofilm with sediment material, and sediment material without biofilm for incubation media. Five types of incubation media were prepared(Table1).

Table.1 Five types of incubation media

	Incubation media
1	AMD (60ml) + <i>E. mutabilis</i> (7 mL) + sediment material (6g)
2	AMD (60ml) + <i>E. mutabilis</i> (7 mL),
3	AMD + sediment material (6g),
4	AMD (60ml),
5	AMD (60ml) + chloroform (1mL).

Incubation condition .... in growth chamber at 20°C, photon flux density of 160mmol m<sup>-2</sup> sec<sup>-1</sup>, 12hours light-dark cycle condition

Measurements parameters ••••• pH, ORP and concentration of dissolved iron at every day.





#### **Results and Discussion**





Fig.1 Value of pH, Ca, Fe, SO<sub>4</sub><sup>2</sup> at each of the surveyed site

Existence of *E. mutabilis* was confirmed in Insen, spring of Bougatsuru mire and Tadewara mire, and Minamidagawa river. We found that *E. mutabilis* is acid tolerant species, however low pH is not a required condition that the species grow. The significant differences of water chemistry were not observed between sites with and without *E. mutabilis* in the surveyed sites.







 $O: E.mutabilis + bottom of material \triangle : E.mutabilis \square: bottom of material \diamondsuit: AMD \bullet: sterile AMD$ 

Fig.2 The change of pH, ORP and dissolved iron during 12days incubation experiments under the condition

*E. mutabilis* inhibit pH decrease by exposure to light. One of the possible reasons why *E. mutabilis* inhibit pH decrease by exposure to light is the consumption of  $CO_2$  by photosynthesis of *E. mutabilis*. In addition, dissolved iron concentration in incubation media with *E. mutabilis* increased from the 10th day in AMD under the dark conditions. The increase of iron concentration just corresponded to the morphological change of organisms. (Fig.3)Thus we found that *E. mutabilis* release accumulated iron after the death of organisms.



Fig.3 Morphological change

