Animal Community is the Key of Ecological Purification Process in the Ecological Water Purification System to make Safe Drinking Water

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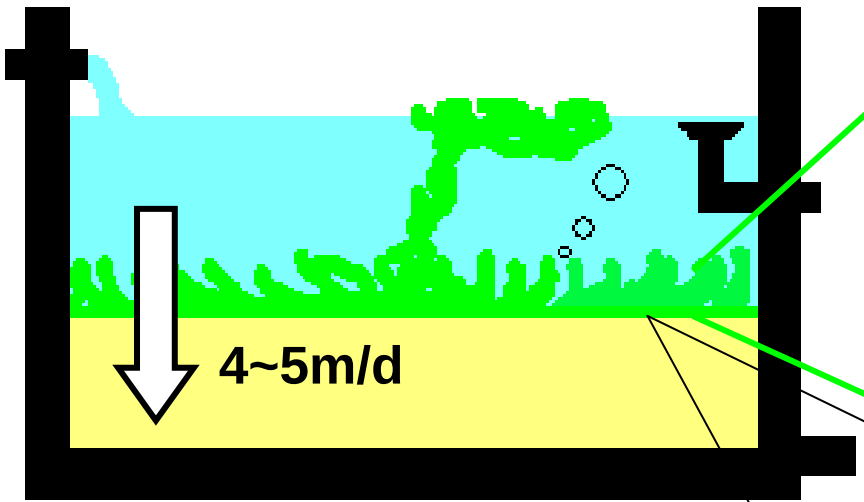
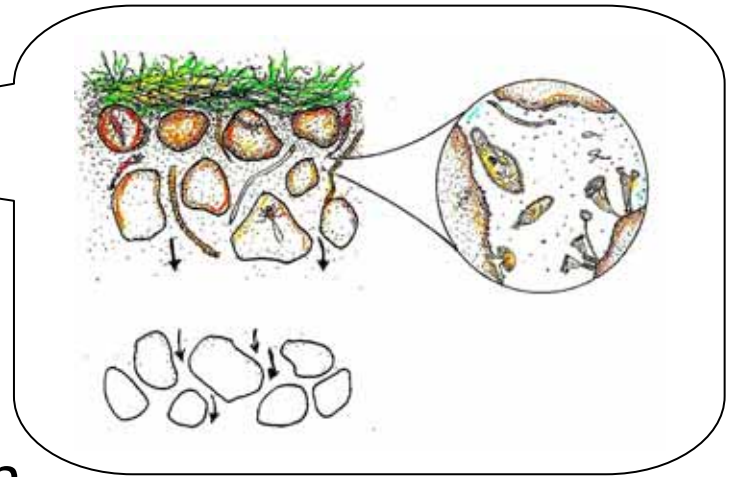


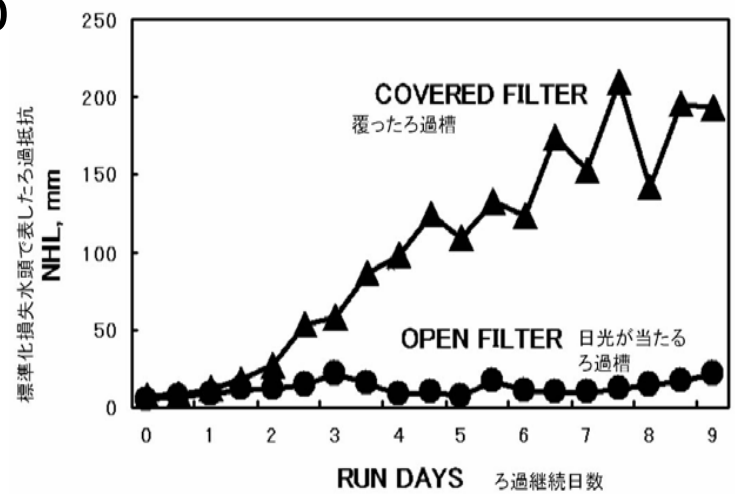
Slow filtration rate is a standard. In the supernatant water on the sand bed, algae grow well under sunshine. Algal growth gives better environment for animal community. The biological community of algae and animal is essential for the ecological purification system.

Beneficial effect of algal growth on filter clog using bucket model experiment



Open bucket: Algal growth under sun shine→Algal and animal can grow.→no clog: long filter run

Covered bucket: Increase the filter resistance: easily clog the filter→ No growth of algae→no food for animals→Animal as a collector of suspended matter does not grow.

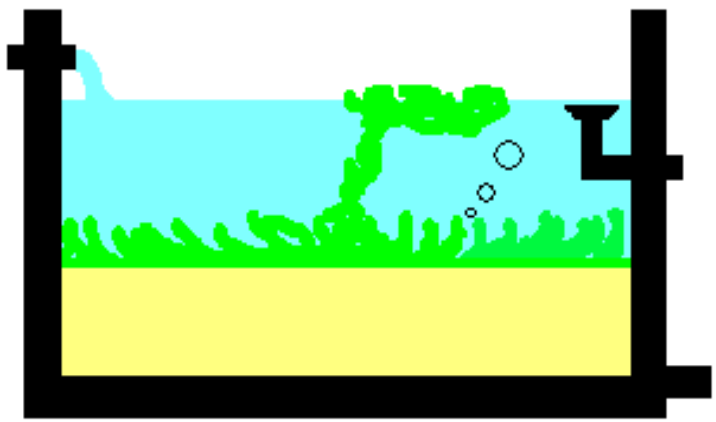


There are some mistreatments for algal growth

Algal growth control

Covered filter

Leave a floating algae

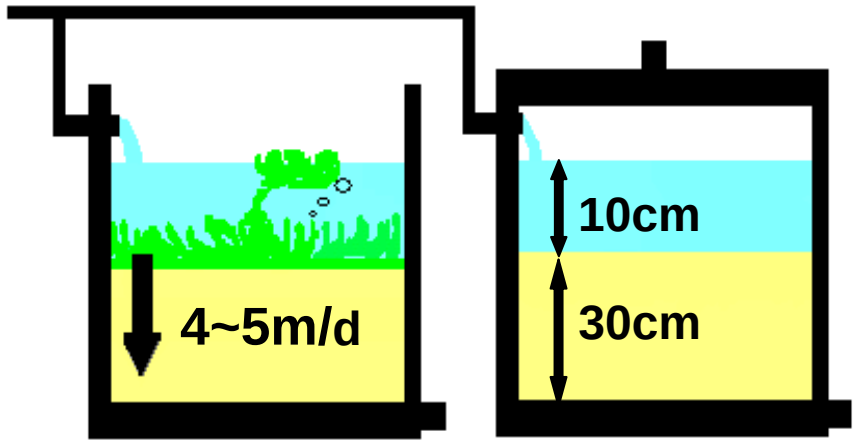


floating algae

Algal growth gives a better condition for animal community: aerobic condition, food production.

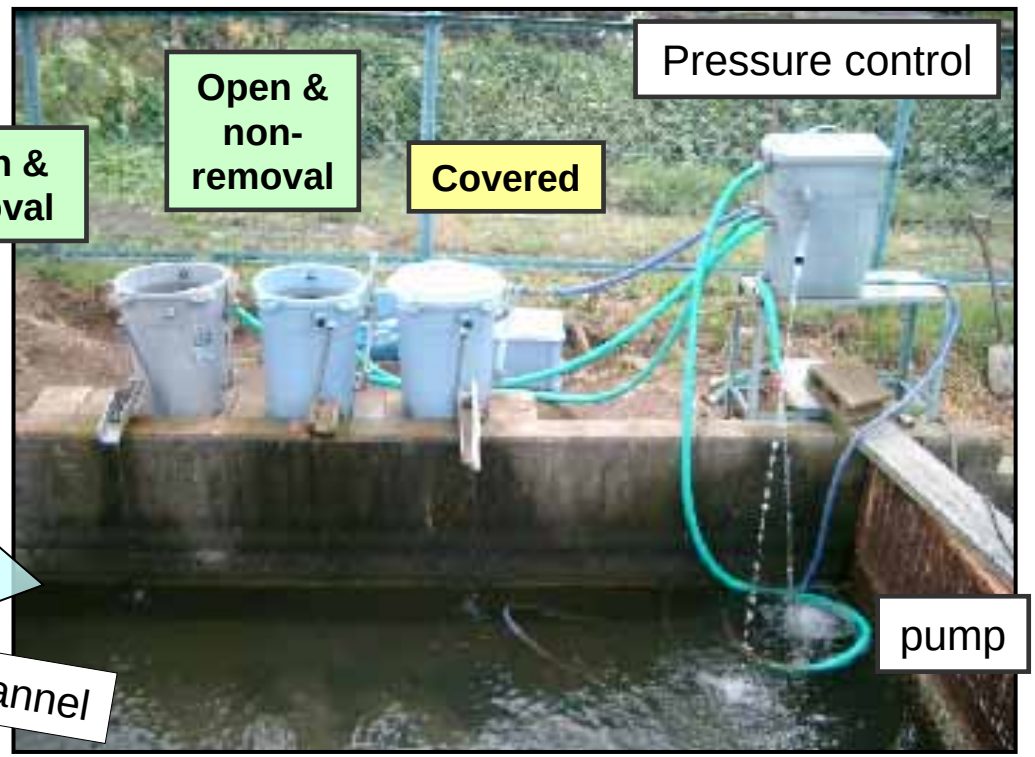
Beneficial effect of algal growth on filter clog and removal of floating algae using buckets model experiment

Experimental design



River : surface water

Irrigation channel



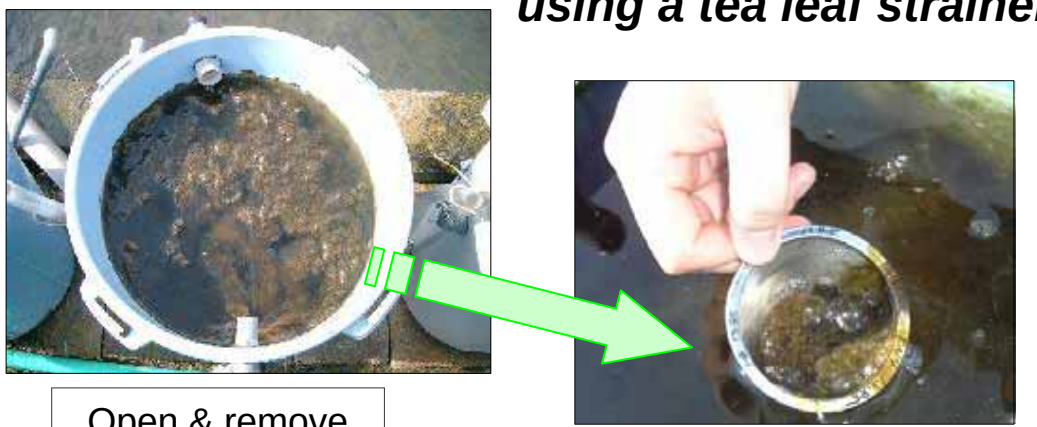
Measurement

Algal biomass, Animal biomass, Turbidity, filter resistance

(Bio-volume : specific gravidity=1, as weight, mg)

(Normalized Head Loss)

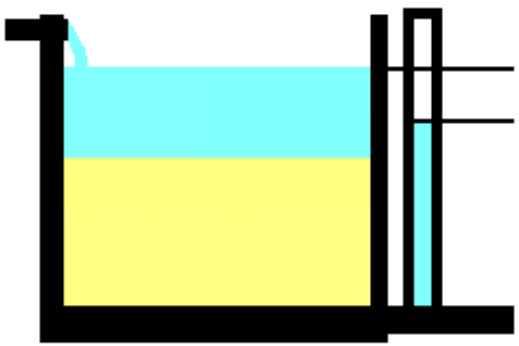
Removal of floating algae using a tea leaf strainer



Open & remove

Biomass sampling of algae and animal on the sand surface using a hand suction pump.

Filter resistance : Head Loss



Head Loss (HL) as an indicator of filter resistance is related with filtering rate.

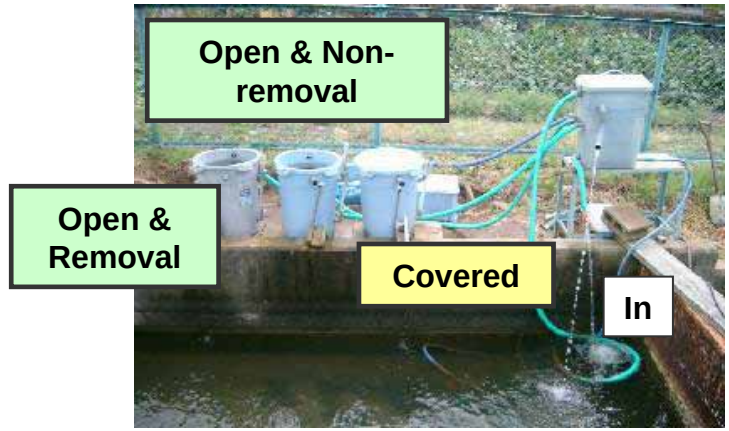
Normalized Head Loss (NHL) is used which is calculated under the standard filtering rate (4.8m/d).

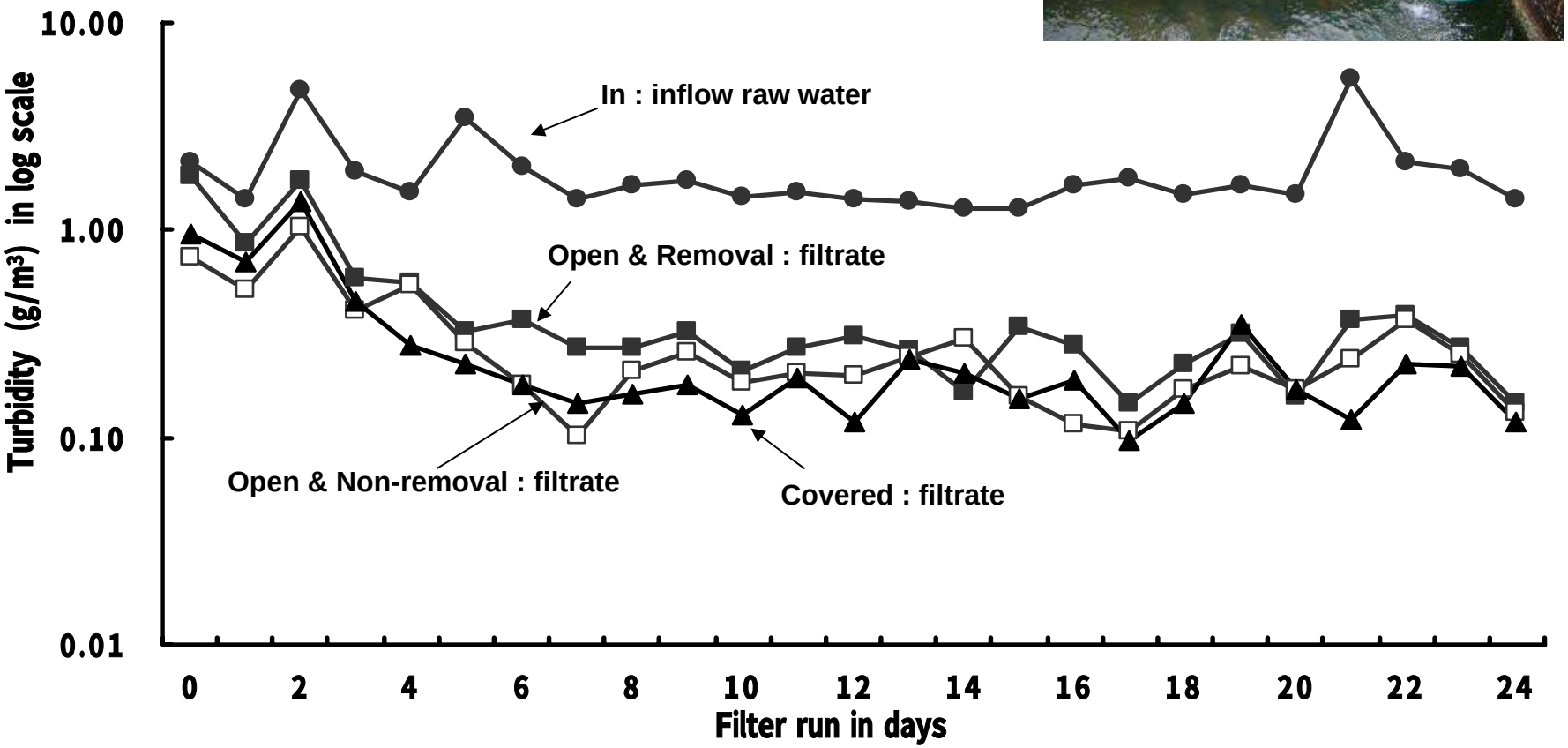
NHL (m)＝ 4.8 (m/d) / real flow rate (m/d) ×real HL (m)

Experimental period : Sept.29. – Oct. 23. 2007 (25 days) in autumn.

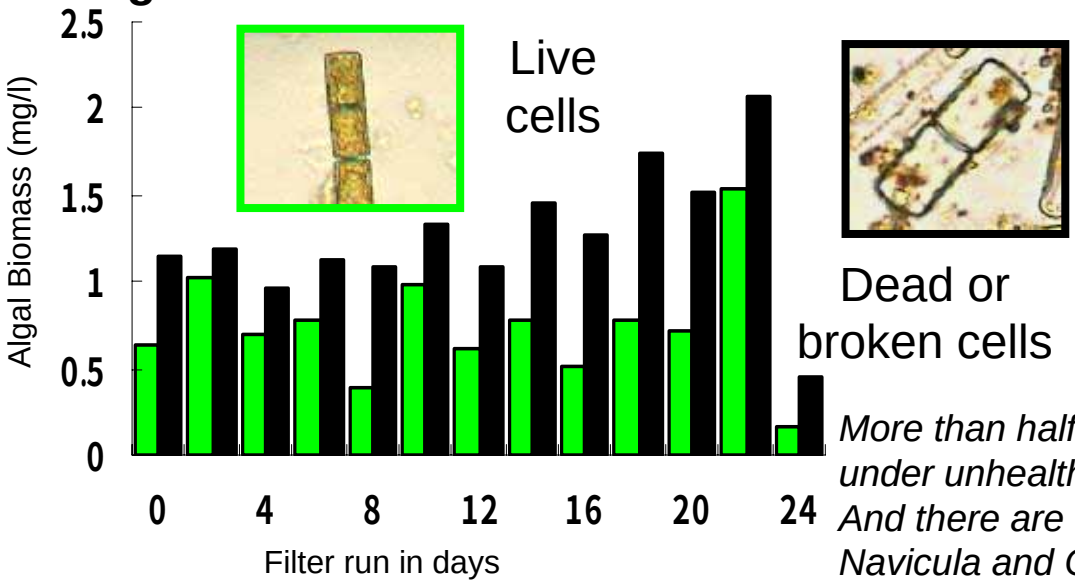
Turbidity

The turbidity in each filtrate water became low day by day within one week. However clear difference among the different treatment were not observed.



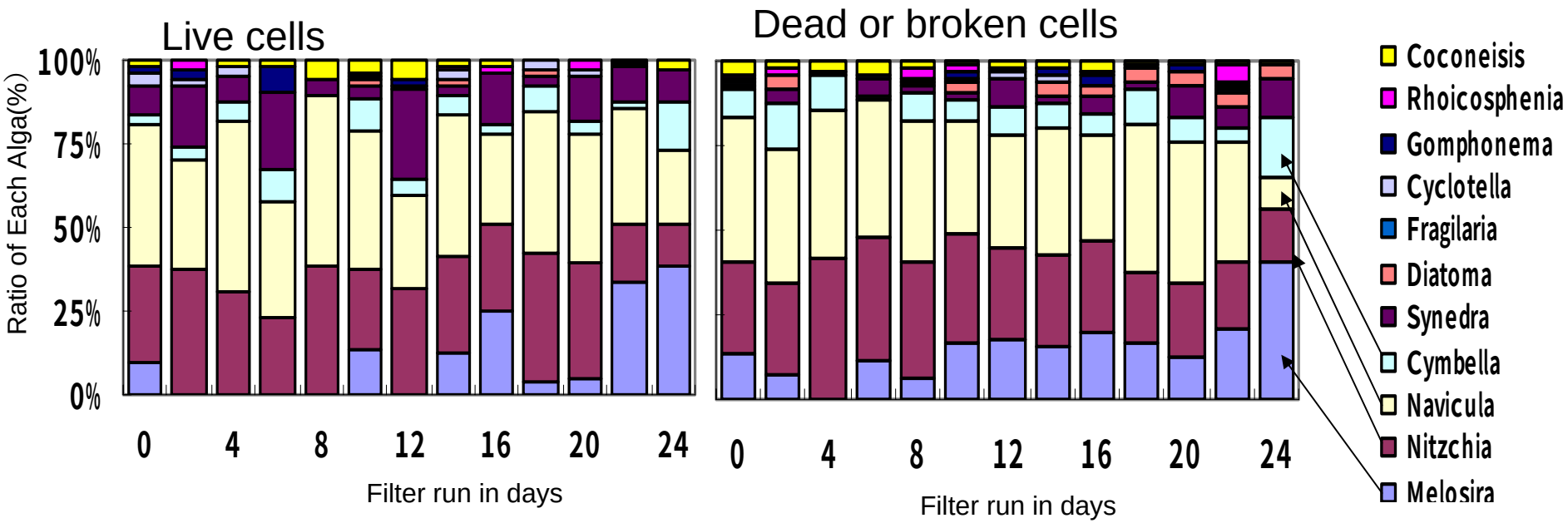


Changes in algal biomass in raw water (inflow) during the filter run.



Inflow: raw water

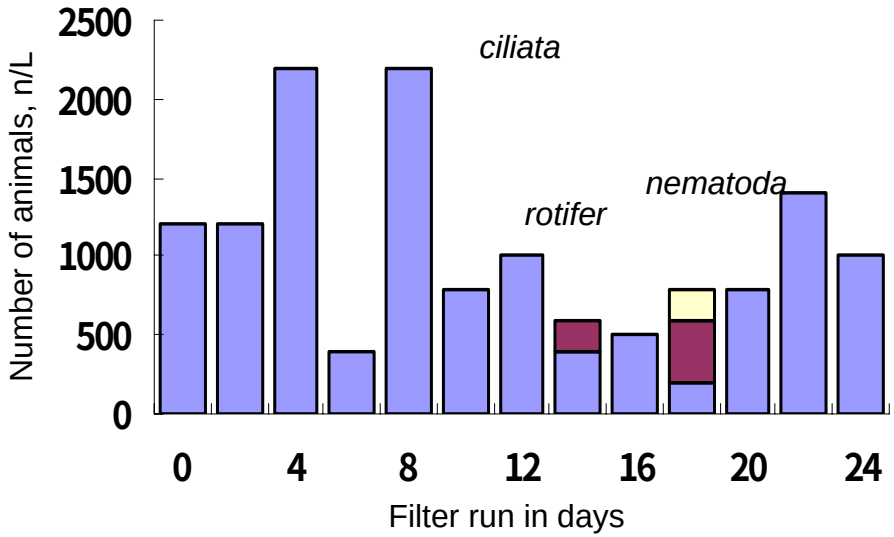
More than half of inflow algae from the irrigation channel is under unhealthy condition such as dead or broken cells. And there are various species in water. Attached algae of Navicula and Cymbella are remarkable.

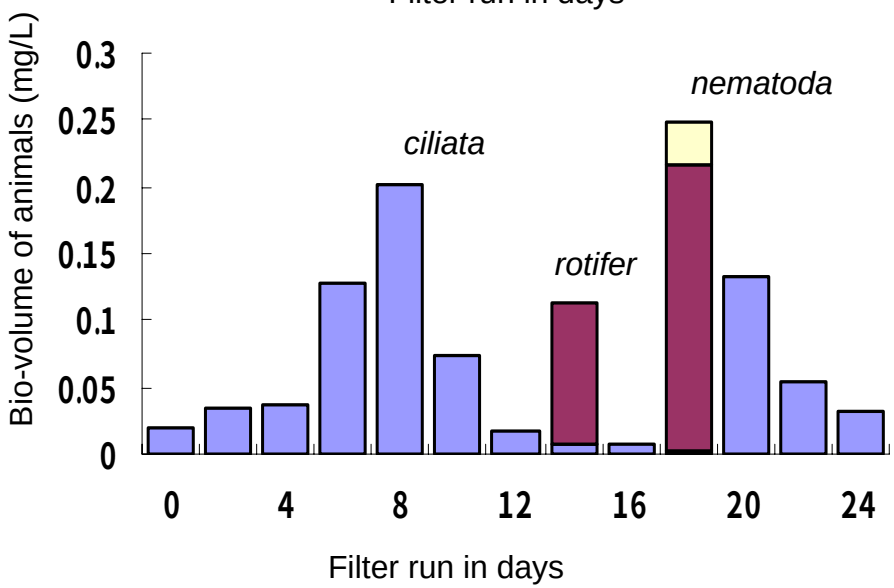


Changes in animal biomass in raw water (inflow) during the filter run.

Inflow: raw water

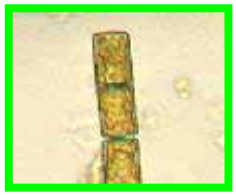
The biomass of inflow water changes on the day. Dominant species is ciliata.





Algal biomass change during the filter run.

Live cells

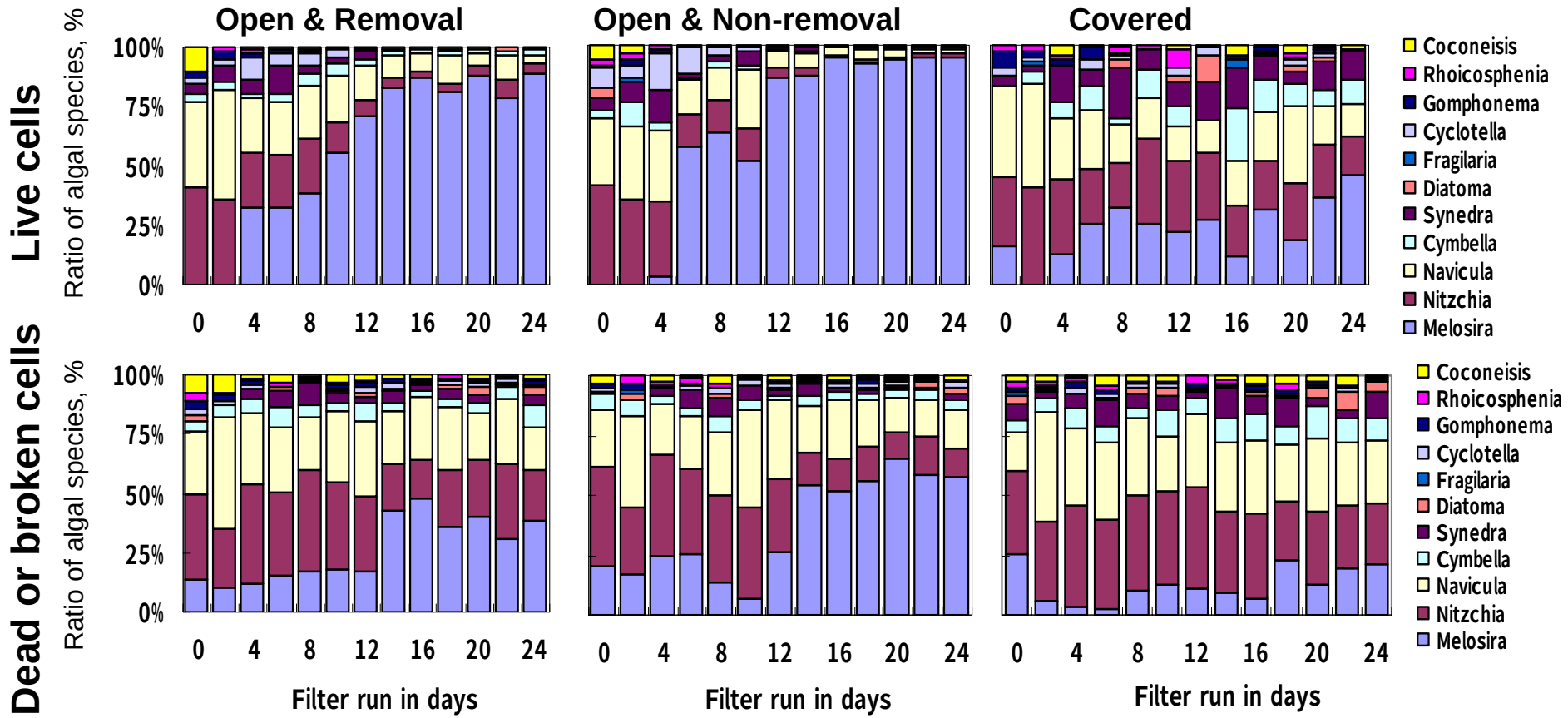


Dead or broken cells

Biomass of algae became large amount during the filter run. And live cells of algae dominated in open models.

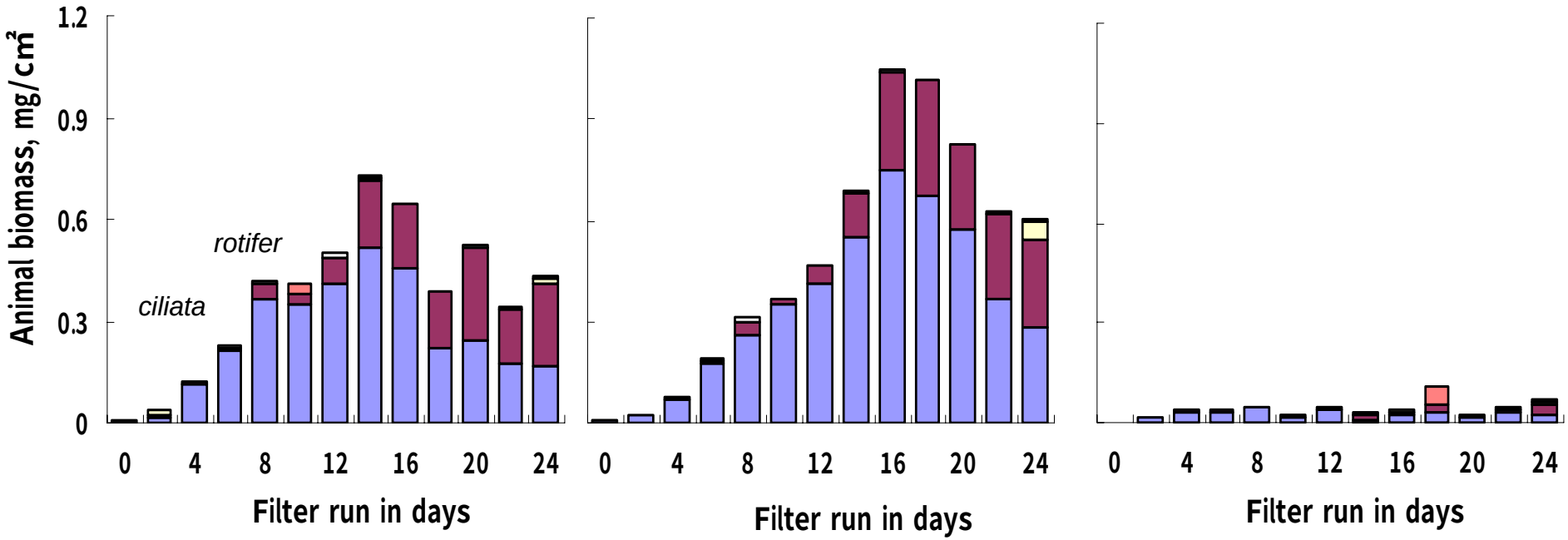
Open & Removal | **Open & Non-removal** | **Covered**

Only the filamentous diatom of Melosira grew well and it became dominant in open models during the filter run. However same algal species as the inflow algae were accumulated on the surface of the covered model.



Change of animal biomass during the filter run

Development of animal community were observed only in the open models like as algal development. Dominant animal as bio-volume was ciliate and the second dominant was rotifer.

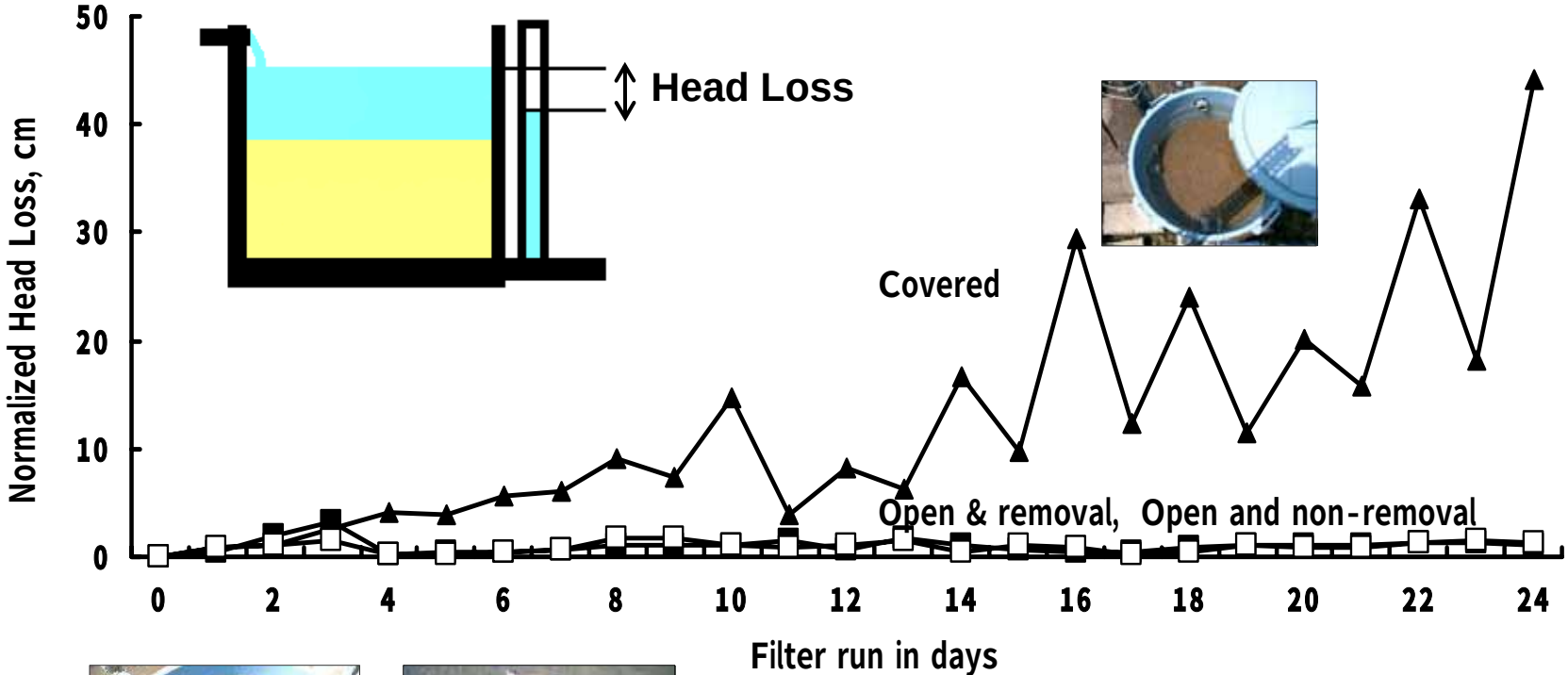


Open & removal

Open & non removal

Covered

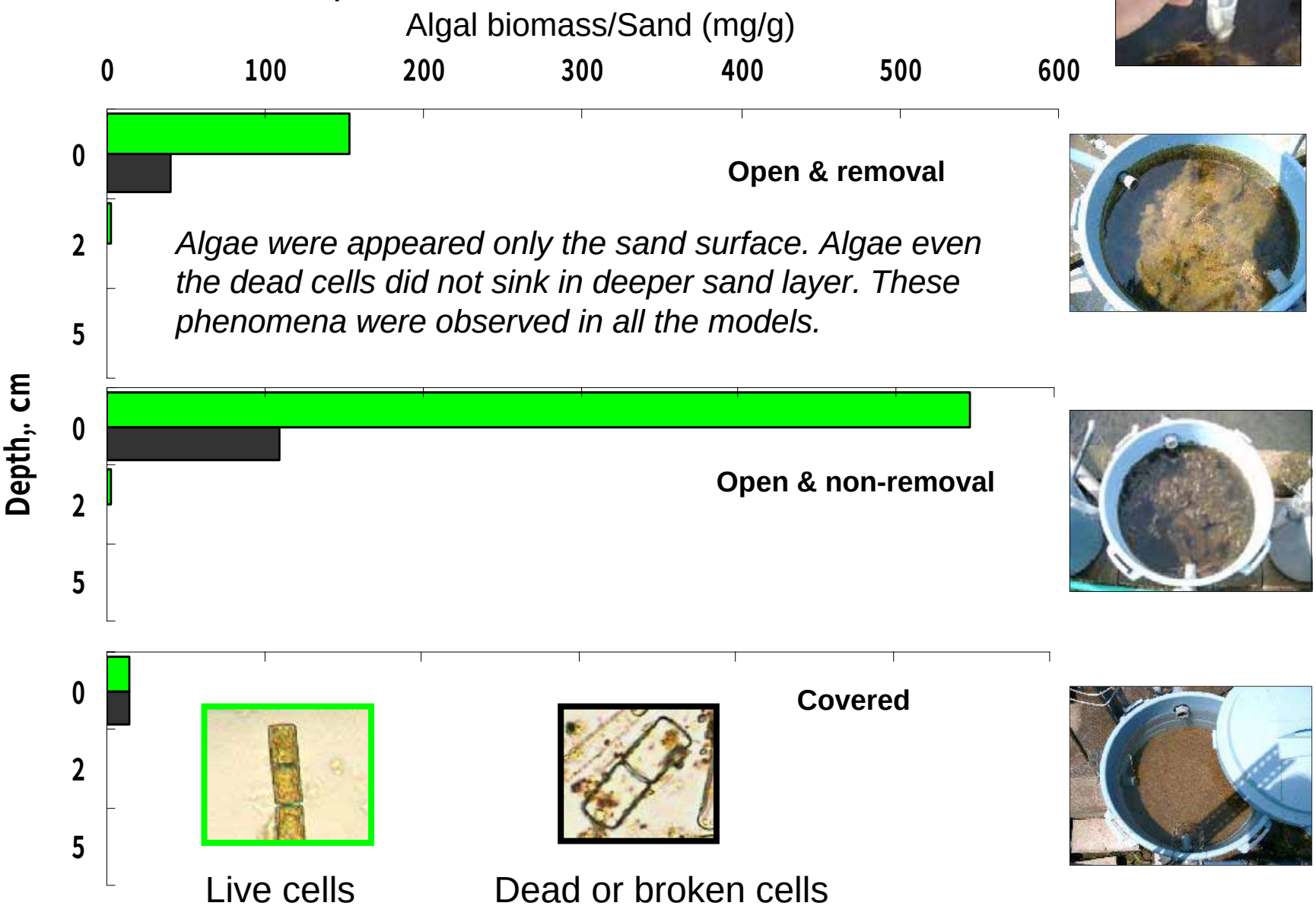
Change of filter resistance as NHL (Normalized Head Loss) during the filter run.



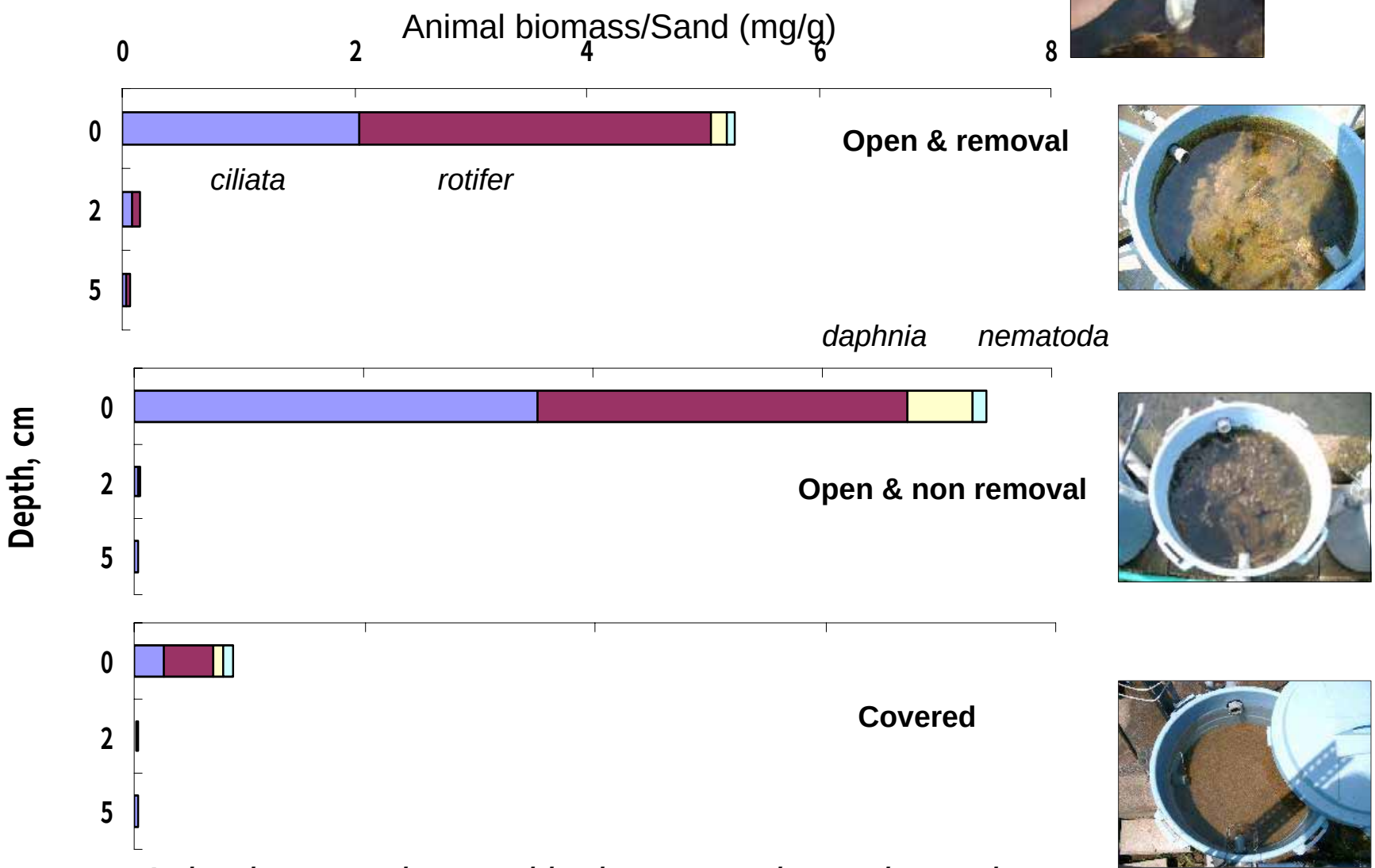
Algal growth was essential for the prevent the filter

No filter clog was observed in the open models where algal growth was observed. However, the filter resistance of the covered model increased during the filter run. There was no difference between the removal model and the non-removal model.

Vertical profile of algal bio-mass in the upper sand layer at the end of the experiment

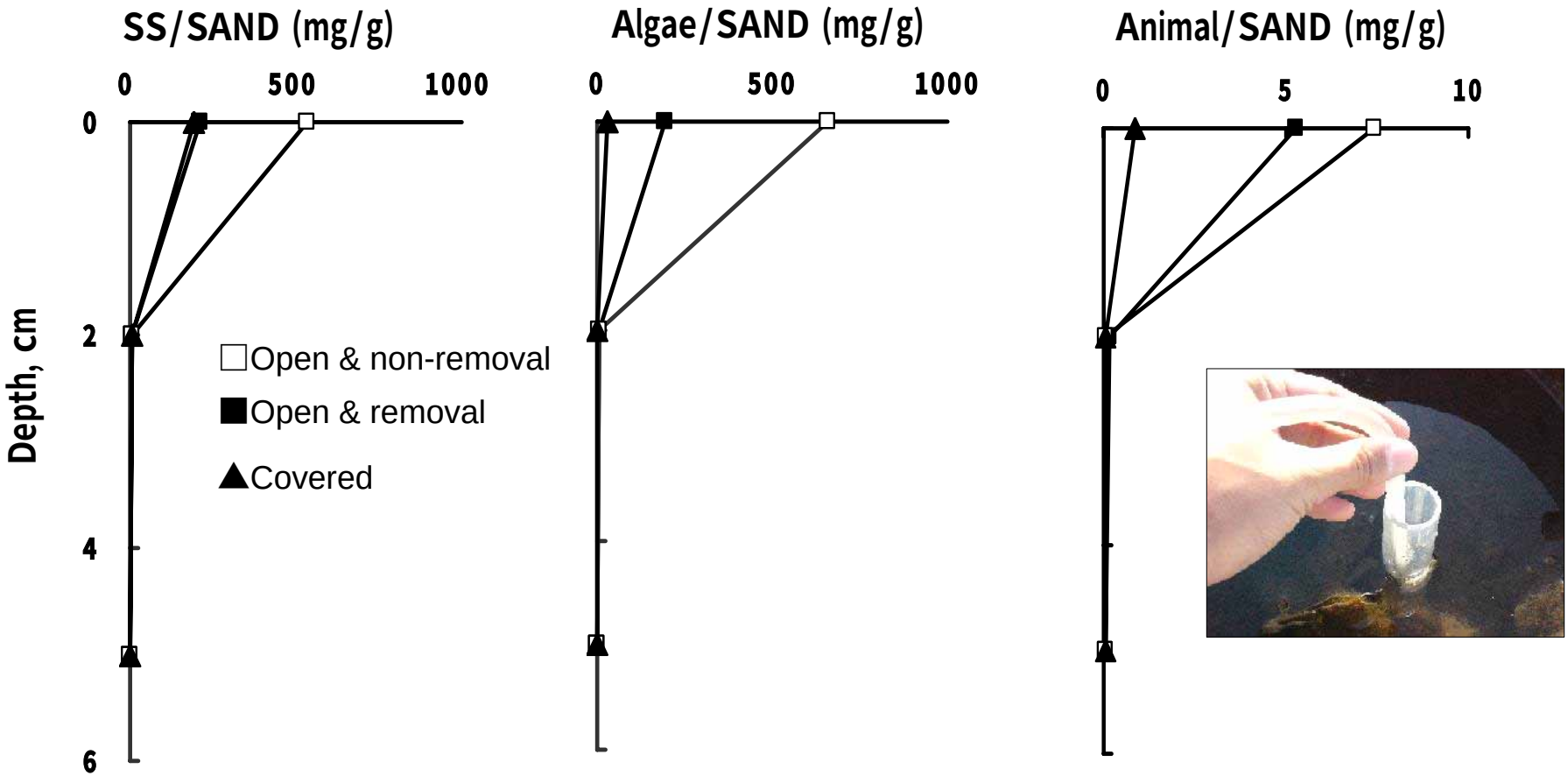


Vertical profile of animal bio-mass in the upper sand layer at the end of the experiment



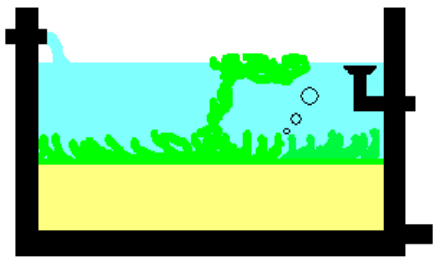
Animals were observed in the same place where algae was observed in the surface layer of sand column.

Vertical profile of Suspended Solid, Algae and Animals

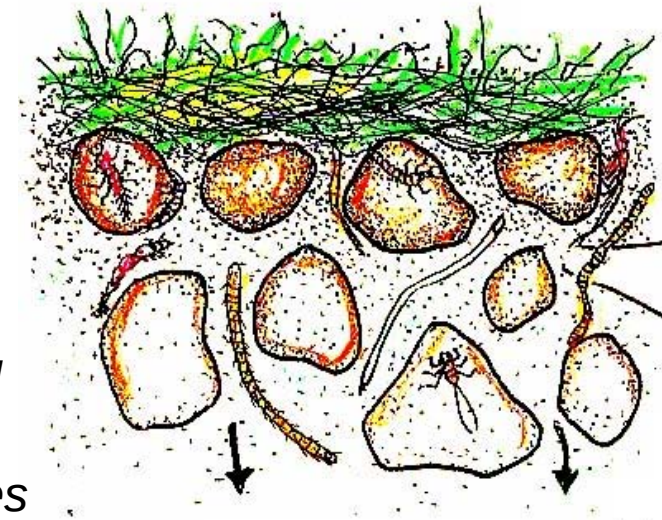


Any particulate matter of non-biological (Suspended Solid) and biological matter (algae and animal) were trapped at the top of sand column.

Conclusion : Filter did not clogged in both open models (removal and non-removal) . In the open model, algal growth was observed. And animals were also developed where algae grew. Algal growth and animal community may be essential for well condition of ecological purification system of slow sand filtration.

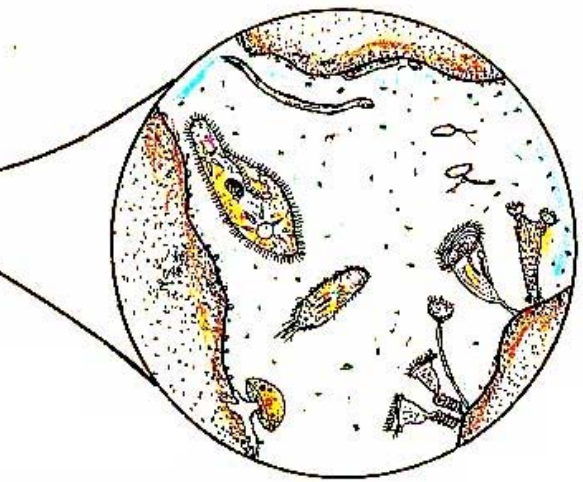


Algae are better food for animals. Algal photosynthesis makes a lot of oxygen. And algal growth makes aerobic condition.

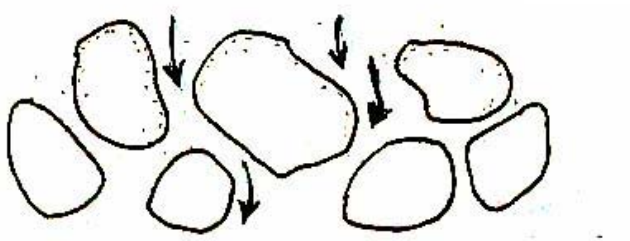


Natural flow

Remove particulate and dissolved matters.



Animal activity is the key for prevent the filter clogging.



Particle free water: ready to drink as safe water