EVALUATION OF NITROGEN UPTAKE AND EXCRETION BY TILAPIA IN BIO-FLOCS TECHNOLOGY MODELS USING 15N TRACING

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Research questions:

- Do the fish (shrimp) eat the flocs?
- Are they assimilating it?
- How much?? (We need numbers!!)
- What are the effects of fish species, size, etc?
- What are the effects of biofloc? characteristics (size, with/without algae, composition etc.)?

Field/pond evaluation

- Usually we try to answer these questions by following growth of fish in ponds (tanks).

- HOWEVER:
- We need a long time.
- It is difficult to check variables (fish size, biofloc characteristics etc.)

Using ^{15}N tagging is very useful, and not so difficult

Nitrogen is made of 2 stable isotopes: 15N and 14N

- ^{15}N makes 0.366% of total nitrogen

(International standard reference).

We can get artificially enriched ^{15}N sources

(Price is quite high).

With modern instrumentation, determination

Of ^{15}N enrichment is fast and very accurate.

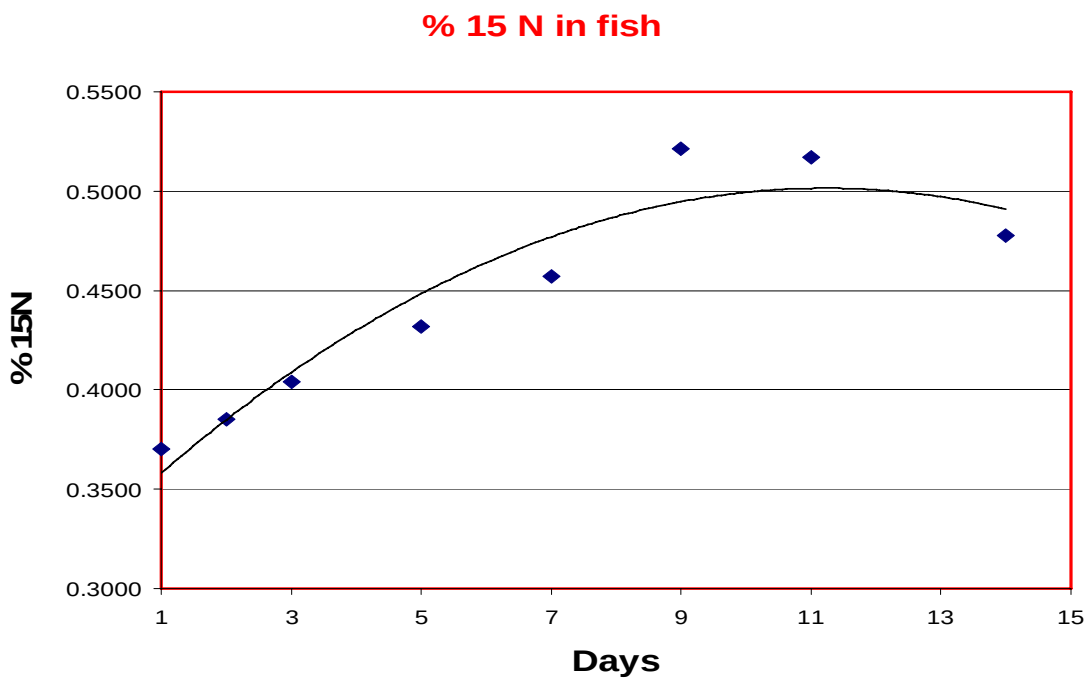
How to get a ^{15}N enriched biofloc sample?

- 1. Prepare large enough batch of biofloc suspension (water + feed, mix & aerate).
- 2. Add ^{15}N salt.
- 3. Add starch, at a C/N ratio of > 15
- 4. After a few hours, practically all ^{15}N is in the bioflocs.

How to run the experiment?

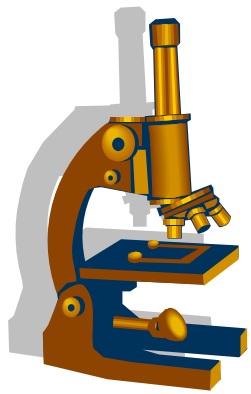
- 1. grow fish with the ^{15}N enriched biofloc suspension.
- Sample both water and fish at T=0 and later-on.
- Filter the water to collect bioflocs.
- Send samples to an isotope laboratory.
- It is not to difficult or expensive (if you use small scale systems).

Results 1: % ^{15}N in fish



Partial conclusions:

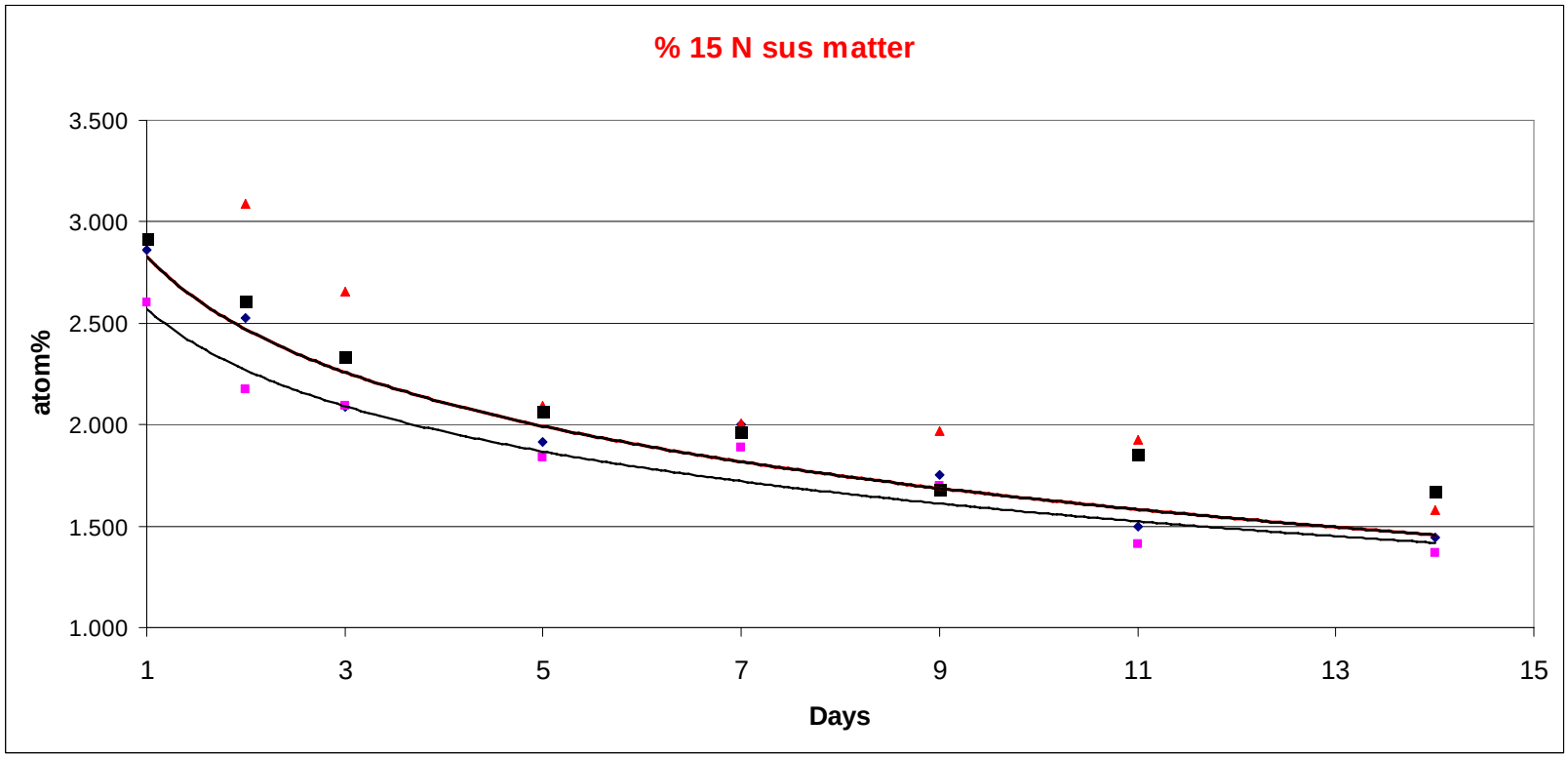
- 1. Fish ate and assimilated ^{15}N tagged bioflocs.
- 2. We can calculate total nitrogen assimilation.
- 3. The net uptake slows down with time
- **(A point to take home: Sampling during the first few days is essential)**
- Net ^{15}N uptake = ^{15}N Gross Uptake
  - ^{15}N excretion



Net Uptake

- The evaluation of net uptake of the tagged material, through the determination of tagged nitrogen accumulation in the fish is relatively straight forward.
- In the present study it was found that the daily net uptake of microbial protein by *tilapia* from a bio floc suspension amounted to the daily uptake of 1.56 g protein/kg fish, about 25% of the normal protein ration given to *tilapia*.

^{15}N% in bioflocs decreases since fish excrete more ^{14}N

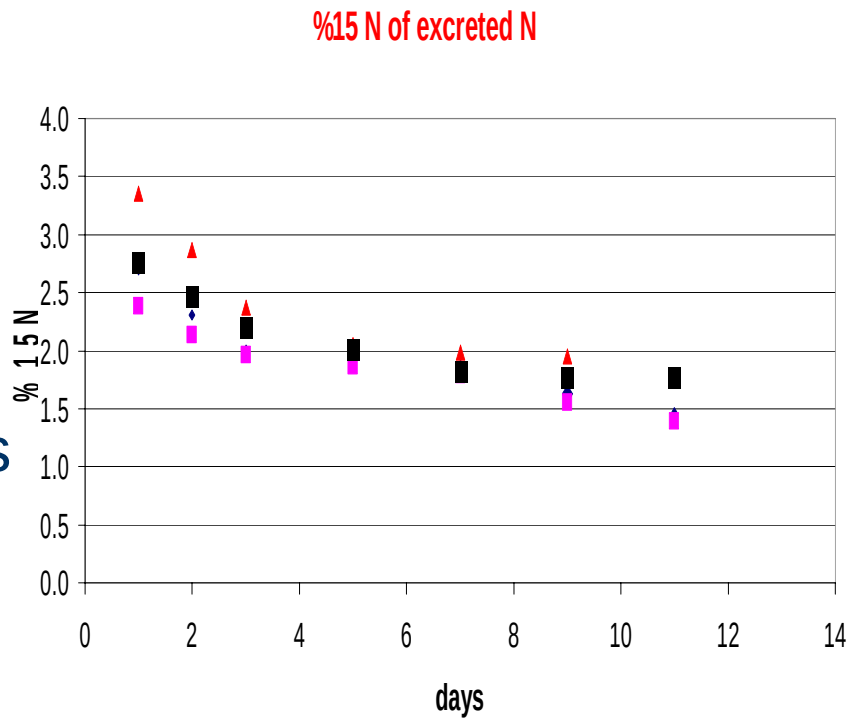


More calculations

- There is not enough time to get into the detailed computations enabling to get more insight into the dynamics of the system.
- For details see
- Avnimelech Y. and Kochba M 2009
- Evaluation of nitrogen uptake and excretion by tilapia in bio floc tanks, using 15N tracing.
- Aquaculture 287:163-168

Excretion of nitrogen

- Excretion of nitrogen was found to be twice its net uptake. (It is in line with data on the utilization of protein).
- This implies that the gross uptake of bioflocs is x3 the net uptake.



Residence time of bioflocs

- Bioflocs were taken up by fish and degraded biologically. Yet, the amount of bioflocs stayed almost constant. This implies that new flocs are constantly produced (using the excreted N).
- The residence time of bioflocs was calculated to be around 8 hours. The flocs seem to be a very dynamic system.
- most cells in the flocs are young and active.

Summary

- Using ^{15}N tagged bioflocs one can evaluate the contribution of bioflocs to fish feeding.
- It is possible to compute and evaluate a number of processes in this dynamic system.
- The methodology is not so complex. More detailed studies of this topic should be done.