



# **EFFECT OF DIFFERENT SALINITIES ON FORMATION AND DEVELOPMENT OF BIOFLOC AND HETEROTROPHIC BACTERIA IN FERTILIZATION PONDS**

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# Introduction

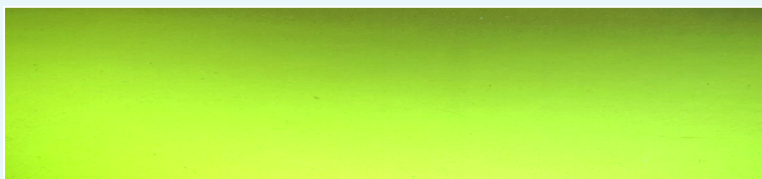
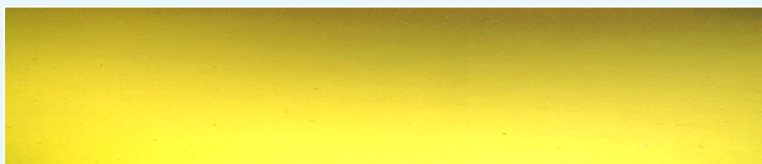


Smaller, concrete-lined ponds apply biofloc technology in Bali, Indonesia.



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# Introduction



**Diatom**  
**Chloro.**  
**Cyano.**





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# Objectives

**Determine suitable salinities for development of biofloc and heterotrophic bacteria in fertilization ponds to provide biofloc as feed for *Artemia* cultured in salt ponds**



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# Methodology

- ✓ Time: experiment was conducted from 6-27/01/2013
- ✓ Location: Experimental station, Soc Trang province
- ✓ Experimental ponds: 150 m<sup>2</sup>, water level: 30-35 cm
- ✓ **Pond management:**
  - Raking pond bottom: 1-2 times/day
  - Water supply: every 2-3 days
  - Supplement of chicken manure & tapioca: C:N > 10
  - Chicken manure: 1,5 kg/pond 150 m<sup>2</sup> (100kg/ha/3days)
  - Tapioca powder: 0,3 kg/pond 150m<sup>2</sup> (20 kg/ha/3days)



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# Experimental set-up

## Four different salinity treatments x 3 replicates

- Treatment 1: 35 ppt (control)
- Treatment 2: 60 ppt
- Treatment 3: 80 ppt
- Treatment 4: 100 ppt



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# Experimental system





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## P, C, N contents of tapioca and chicken manure used in experiment (% DW)

|                | Moisture    | P           | C           | N          | C:N         |
|----------------|-------------|-------------|-------------|------------|-------------|
| Tapioca powder | 10,92± 0,45 | 0,41 ± 0,11 | 72,14± 1,81 | 1,32± 0,09 | 54,61± 4,91 |
| Chicken manure | 23,72± 2,04 | 4,25± 2,27  | 14,83± 2,06 | 1,88± 0,57 | 8,23± 2,05  |



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# Data collection

- Temperature, pH, DO: daily measurement at 7:00 & 14:00 h
- KH, TN, TP,  $\text{NH}_4^+$ ,  $\text{NO}_3^-$ , TOC, Chlorophyll *a*, TSS & VSS
- Biofloc volume, total bacteria & bacteria composition: determined every 3 days.



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# RESULTS & DISCUSSION

## Abiotic factors in experimental ponds

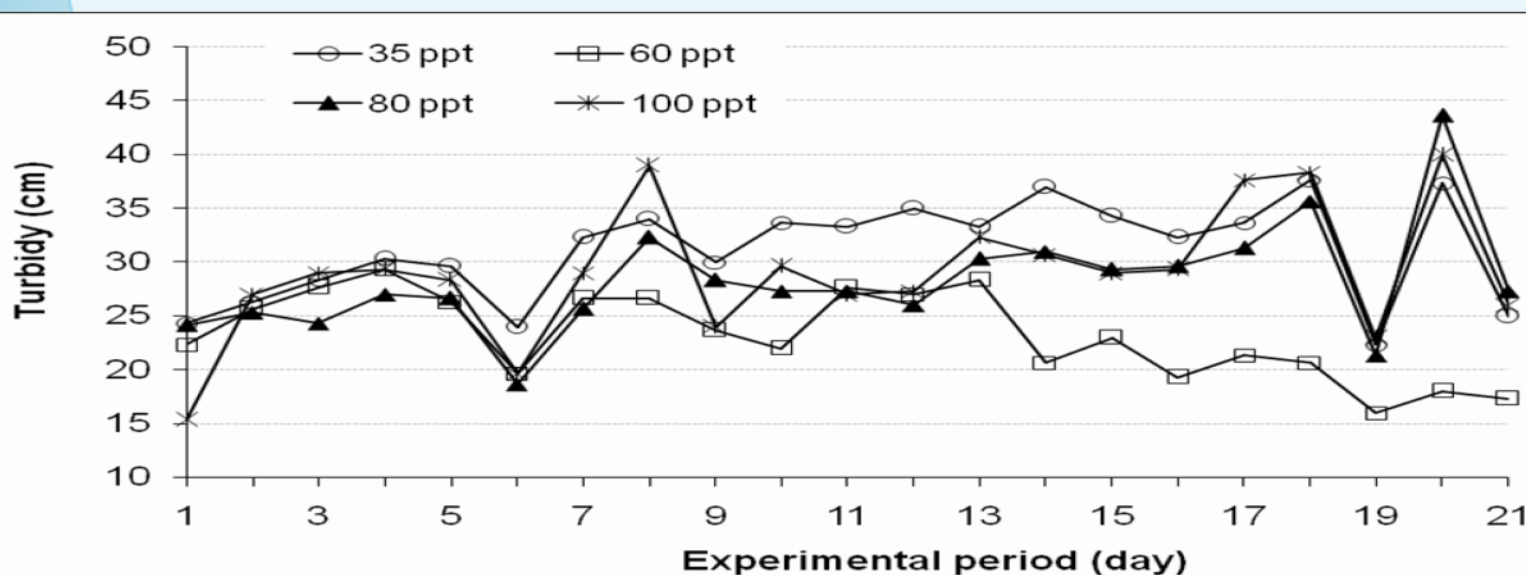
- ✓ Temperature: 28.8 - 34.2°C
- ✓ pH: 7.6-8.3
- ✓ DO: 4.4-10.9 mg/L
- ✓ Salinity: fluctuated during experiment
  - Treatment 1: 29-37 ppt
  - Treatment 2: 56-65 ppt
  - Treatment 3: 75 -85 ppt
  - Treatment 4: 96- 105 ppt



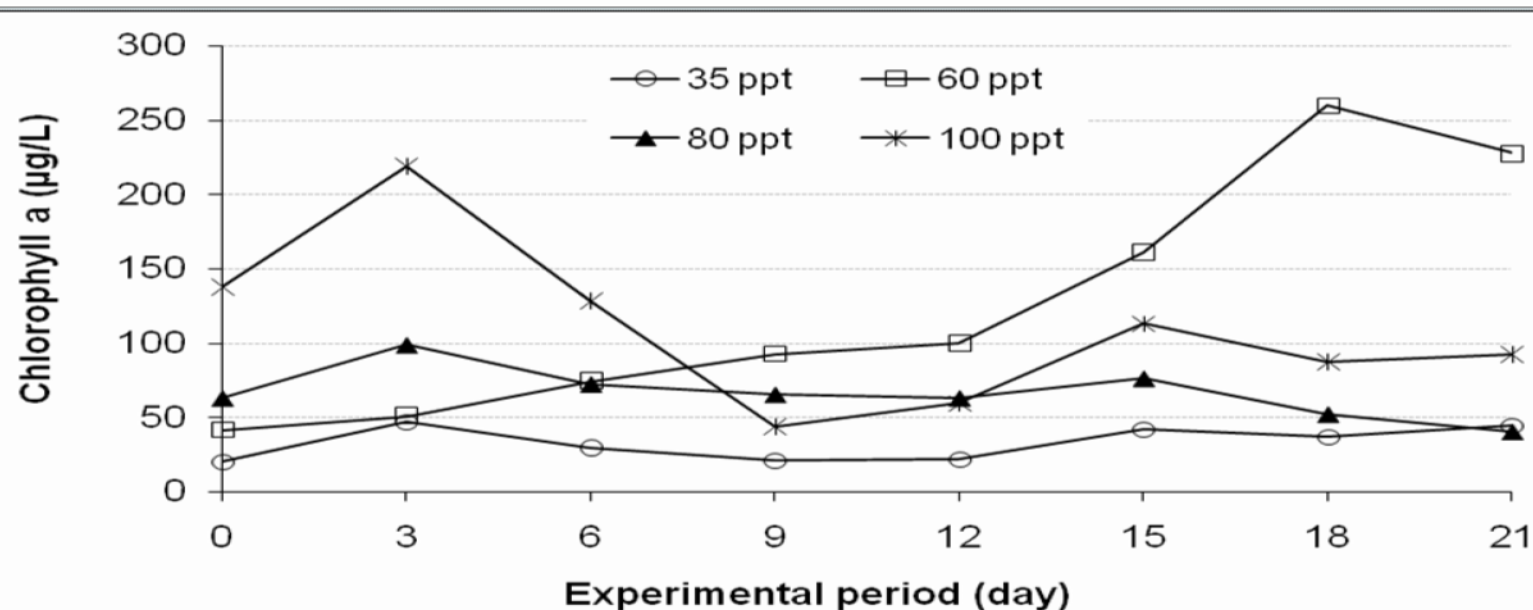
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# Turbidity & chlorophyll a in fertilization pond

60ppt with higher  
turbidity after 2  
weeks



60ppt with higher  
Chlorophyll a  
after 2 weeks

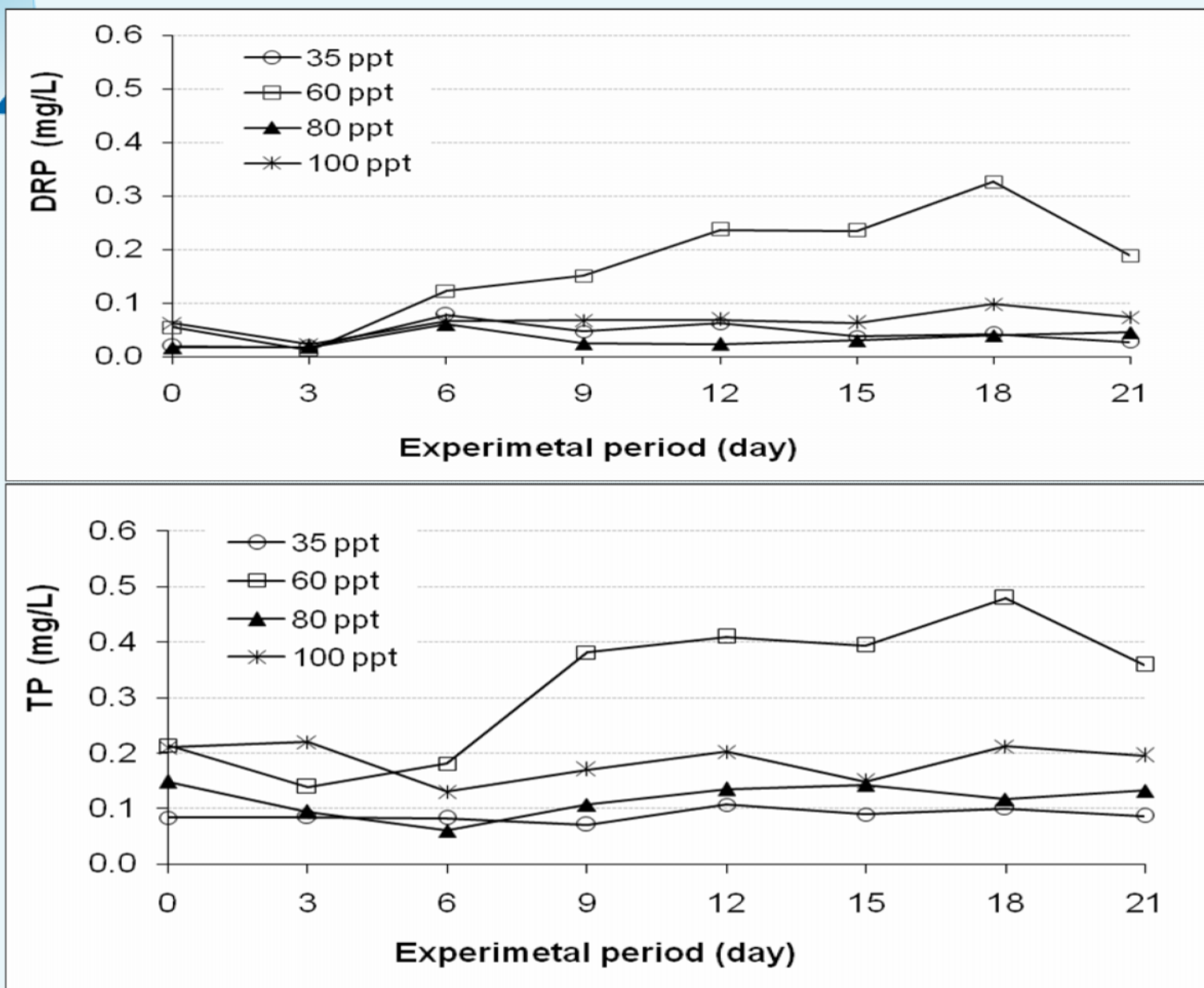




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# Contents of TP & DRP in fertilization pond

60ppt with higher  
DRP and TP  
after Day 9

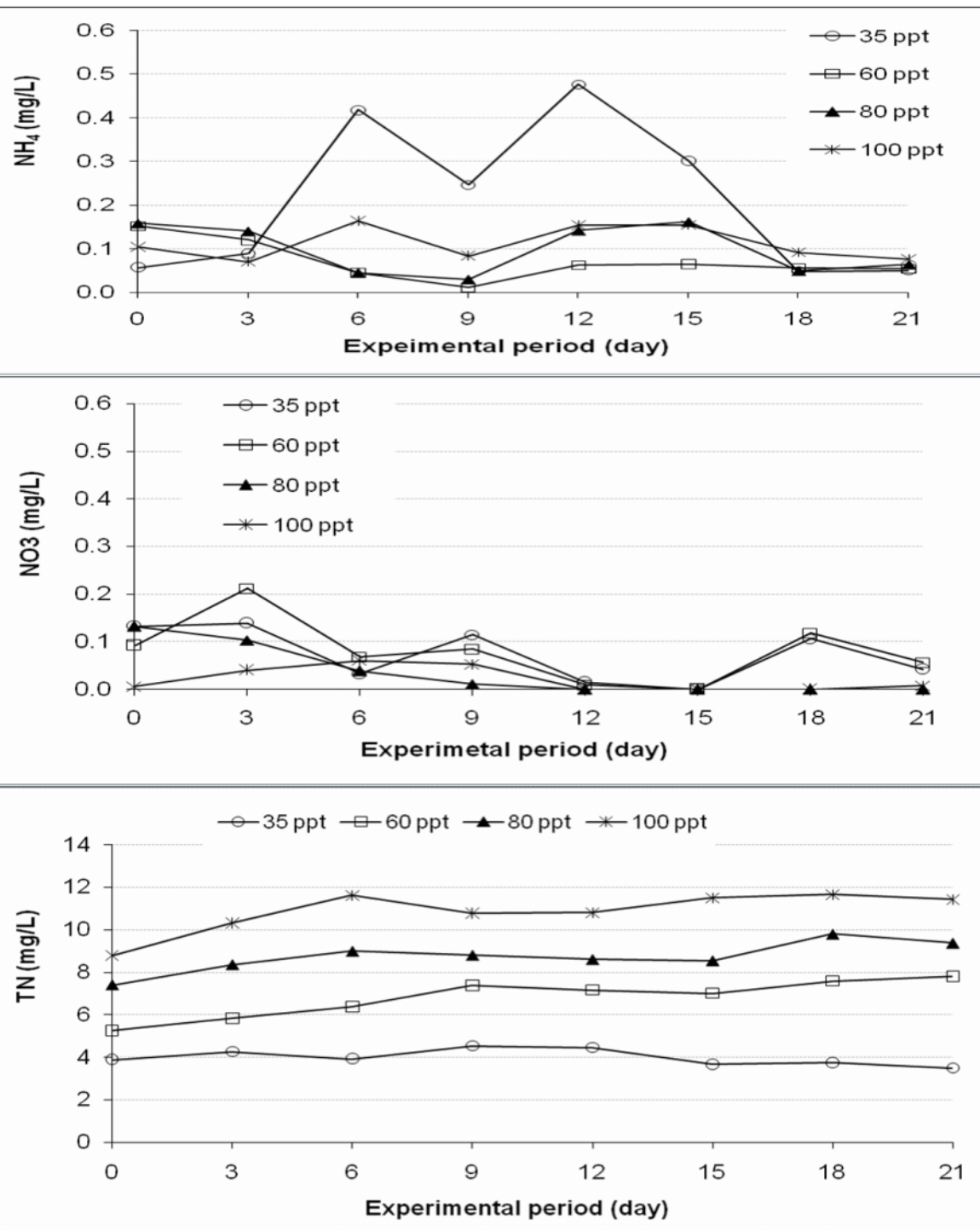




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## Fluctuation of $\text{NH}_4$ , $\text{NO}_3$ and TN at different salinities in fertilization pond

Higher TN content found at higher salinities due to nitrified bacteria have poor growth at high salinity resulting in low nitrification process

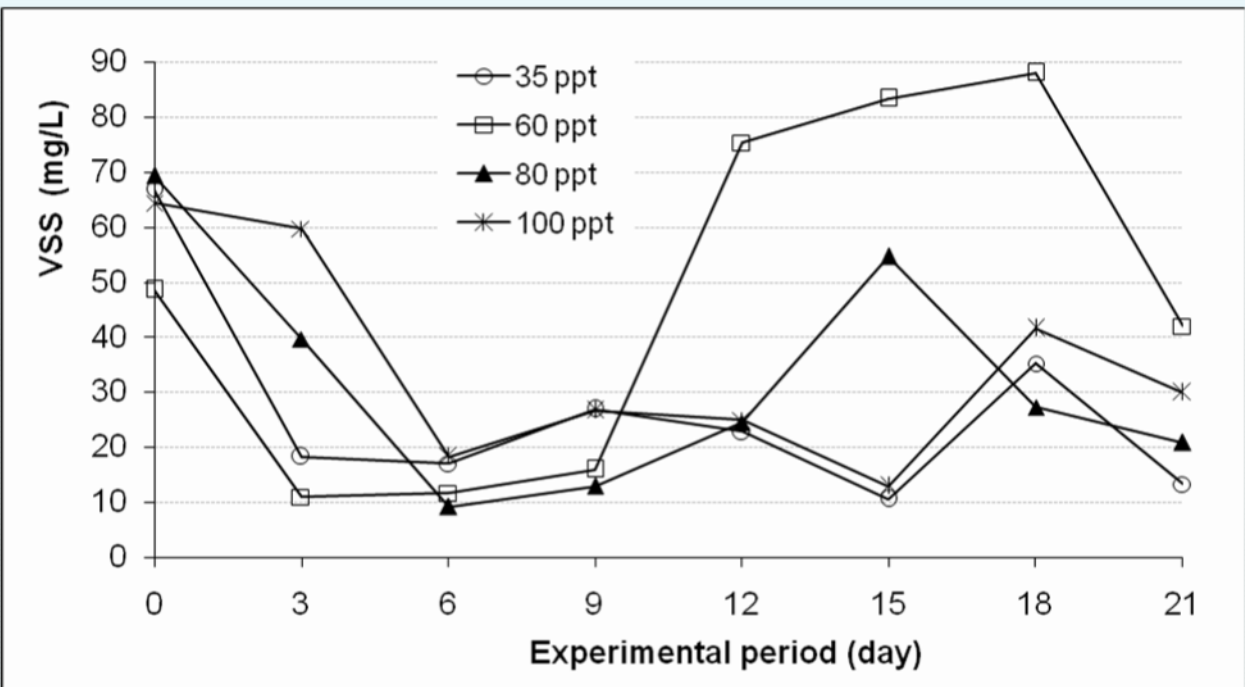
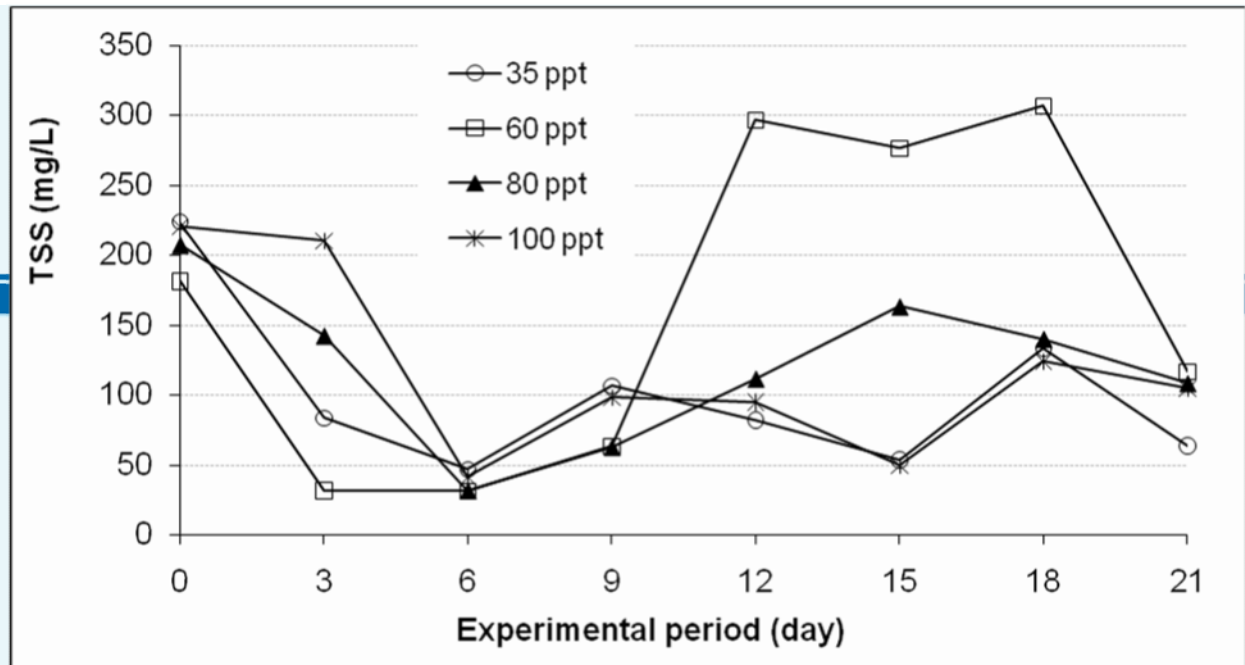




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## Fluctuation of TSS and VSS at different salinities in fertilization pond

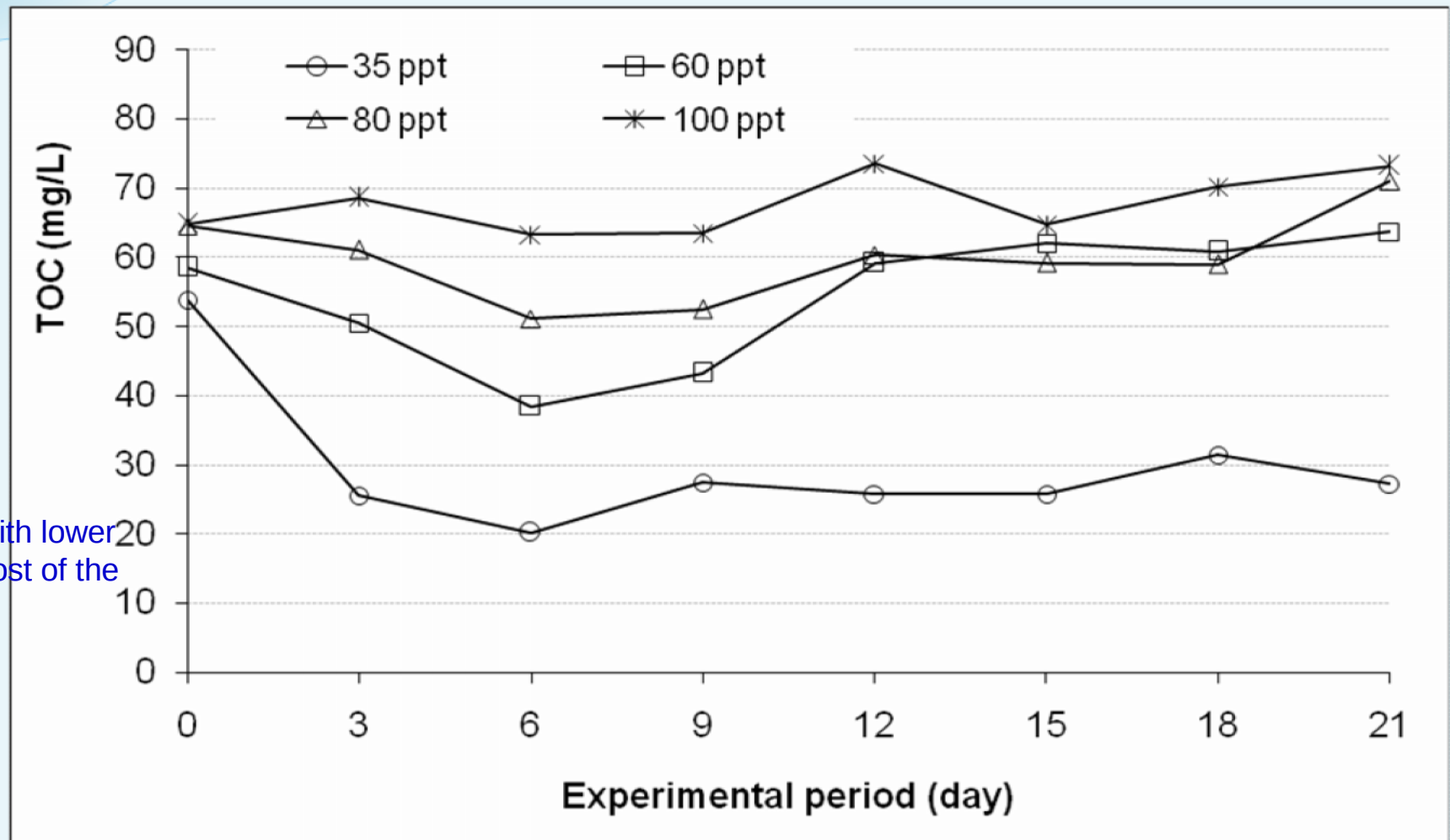
60ppt with higher TSS and VSS after Day 9





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## Fluctuation of TOC at different salinities in fertilization pond

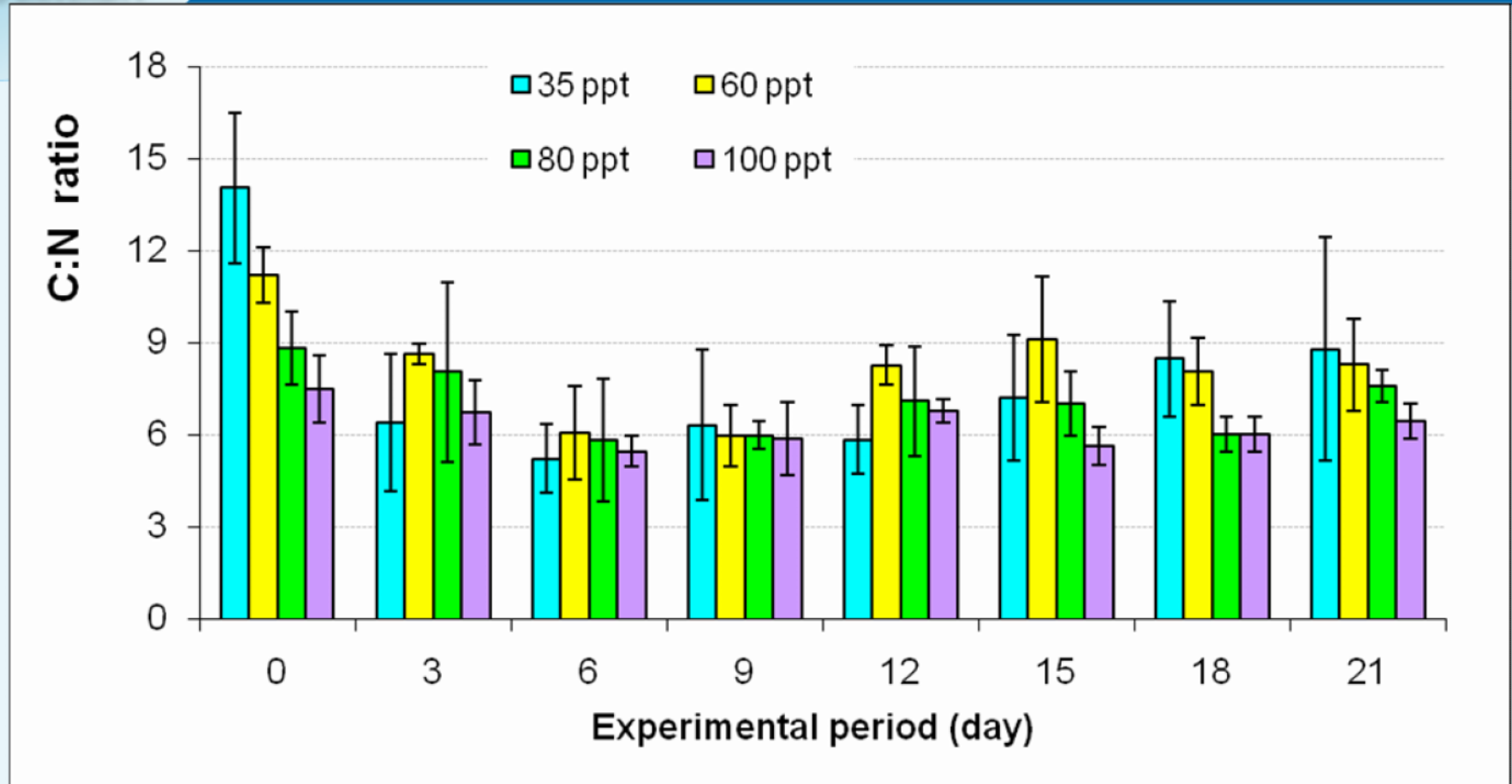


30ppt with lower  
TOC most of the  
time



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## Fluctuation of C:N ratio in fertilization pond at different salinities

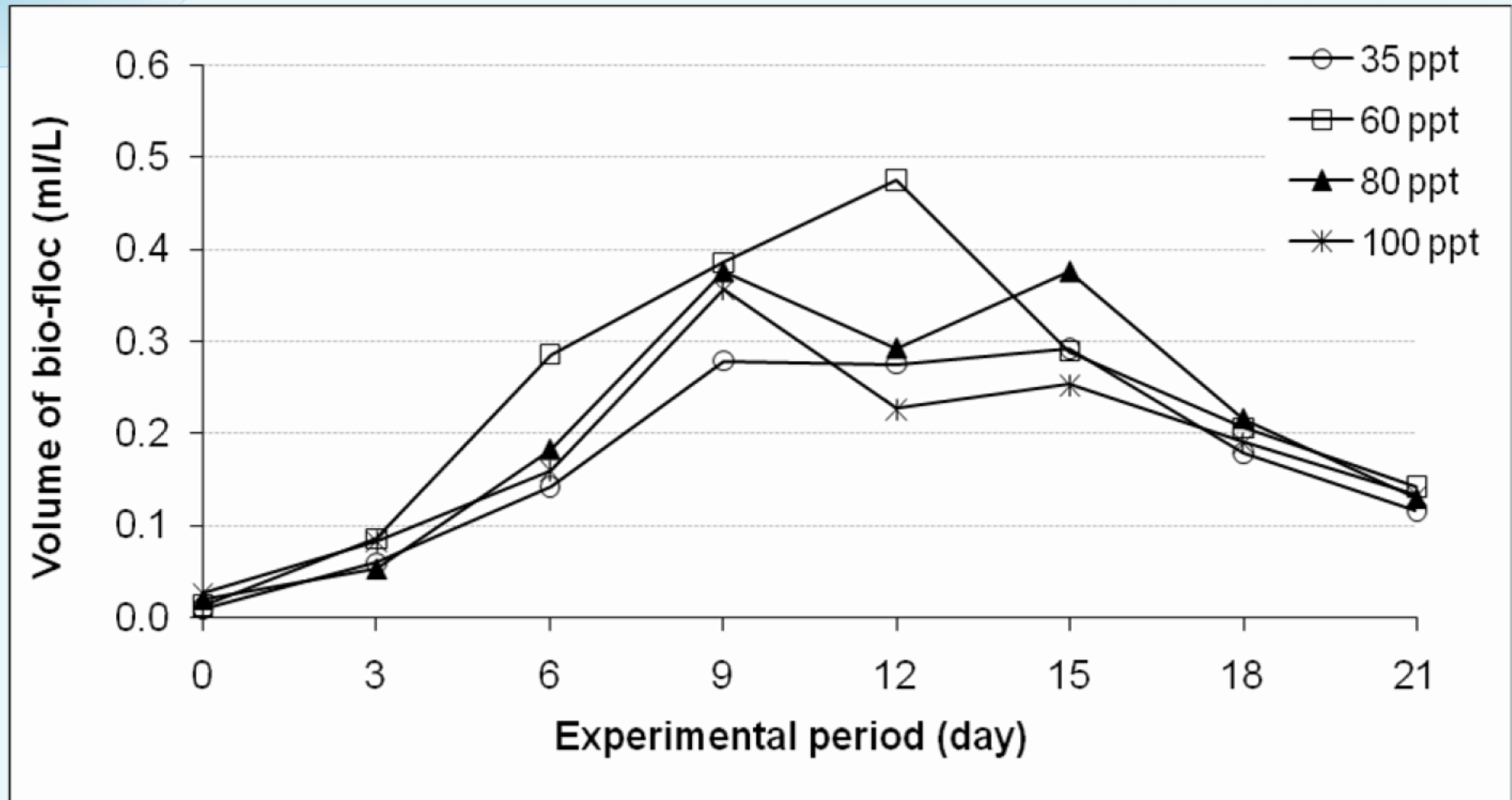


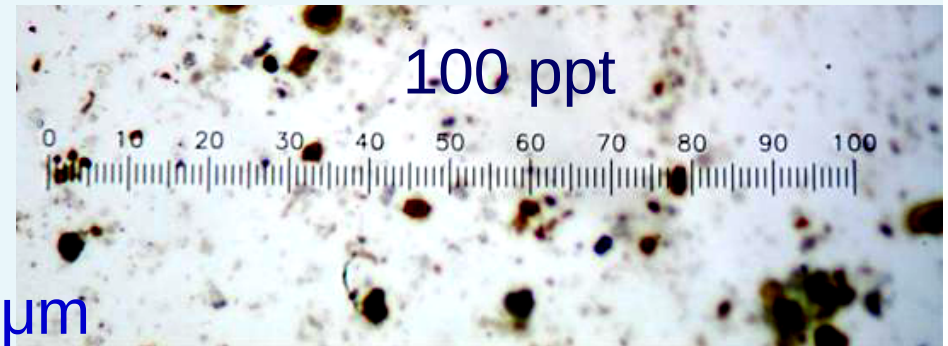
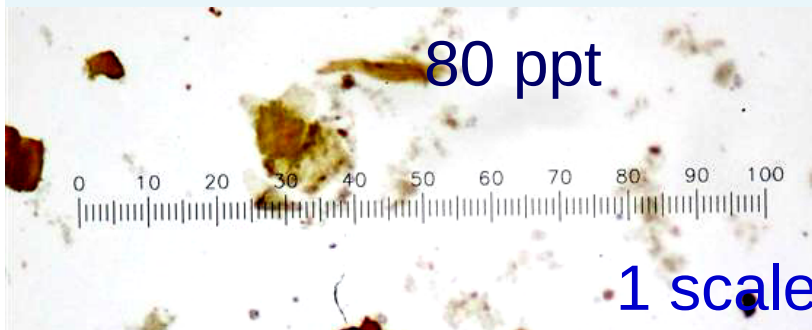
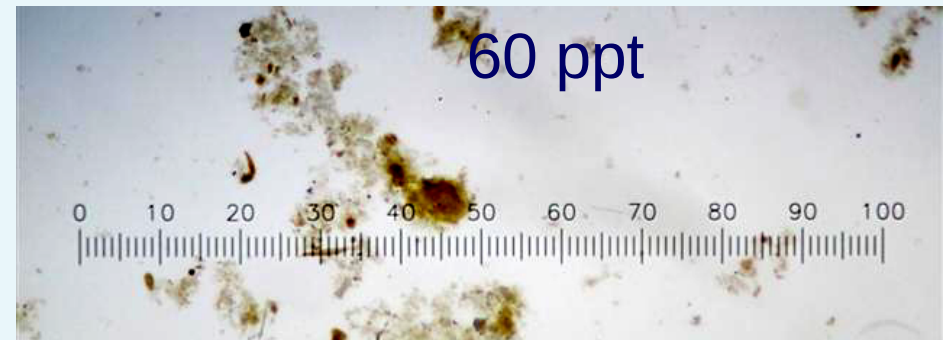
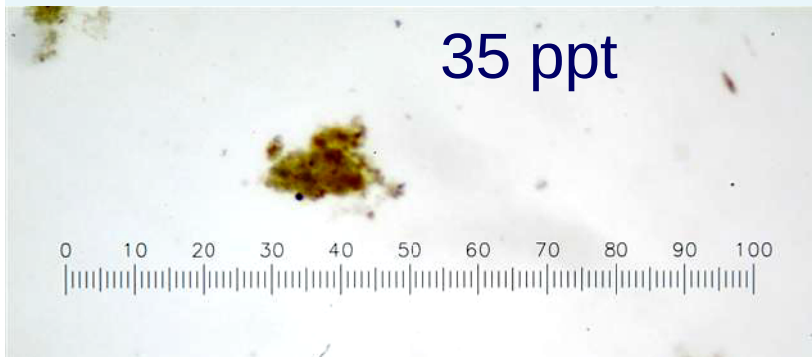
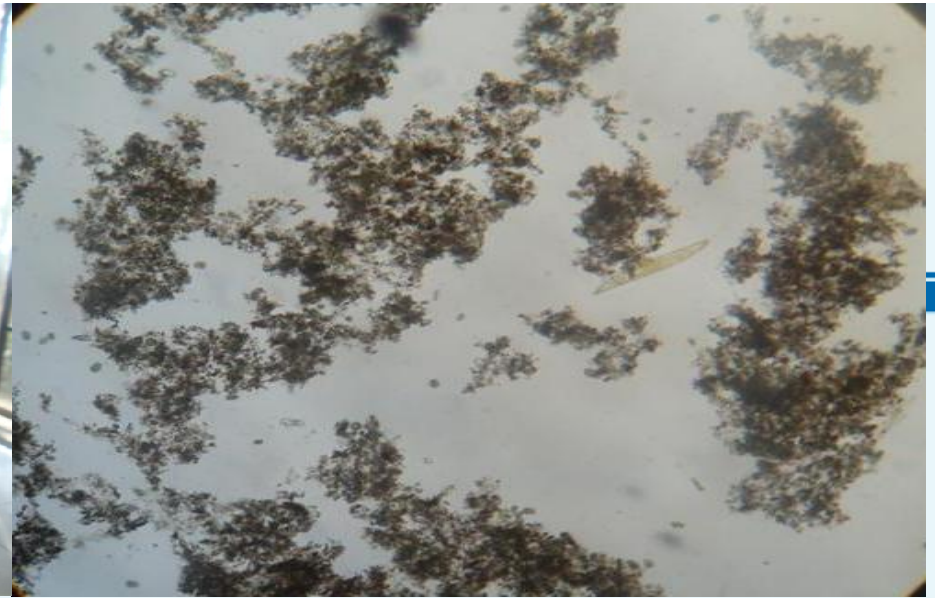
High salinity  $\longrightarrow$  low C:N ratio



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## Fluctuation of biofloc volume in fertilization pond at different salinities





1 scale = 25  $\mu\text{m}$

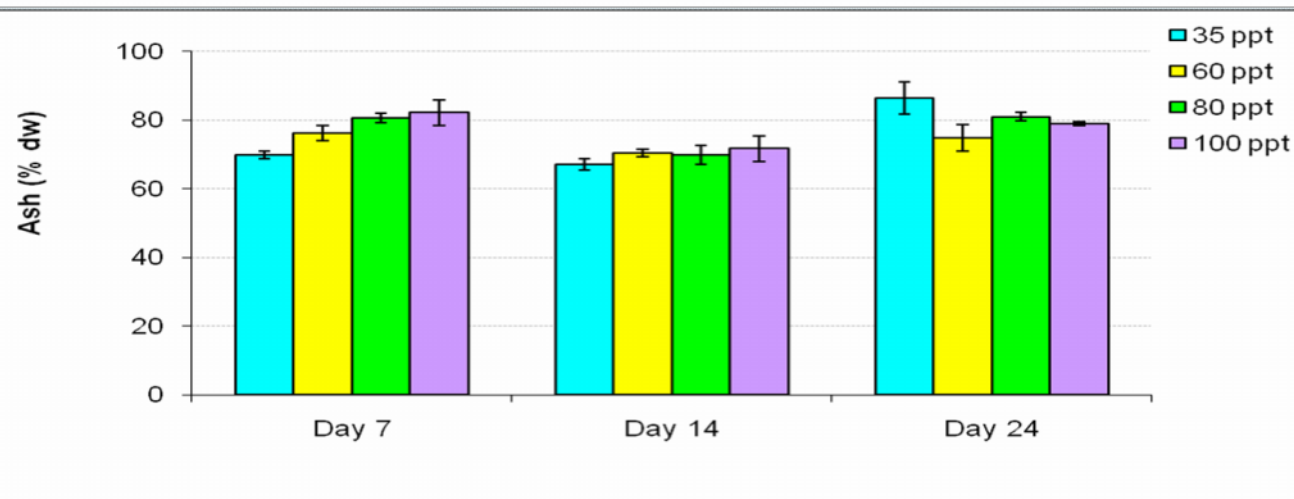
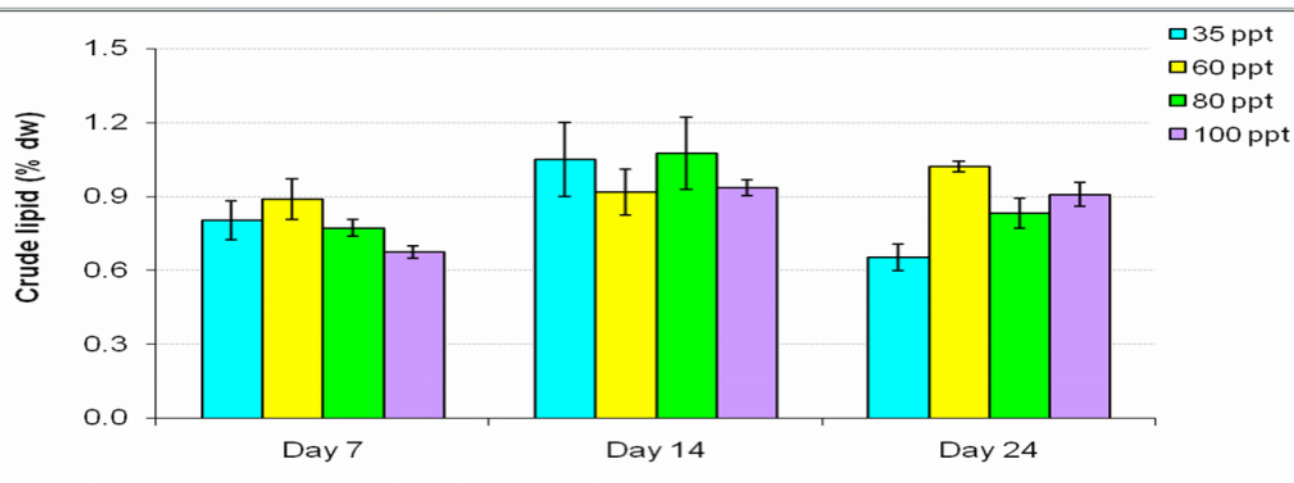
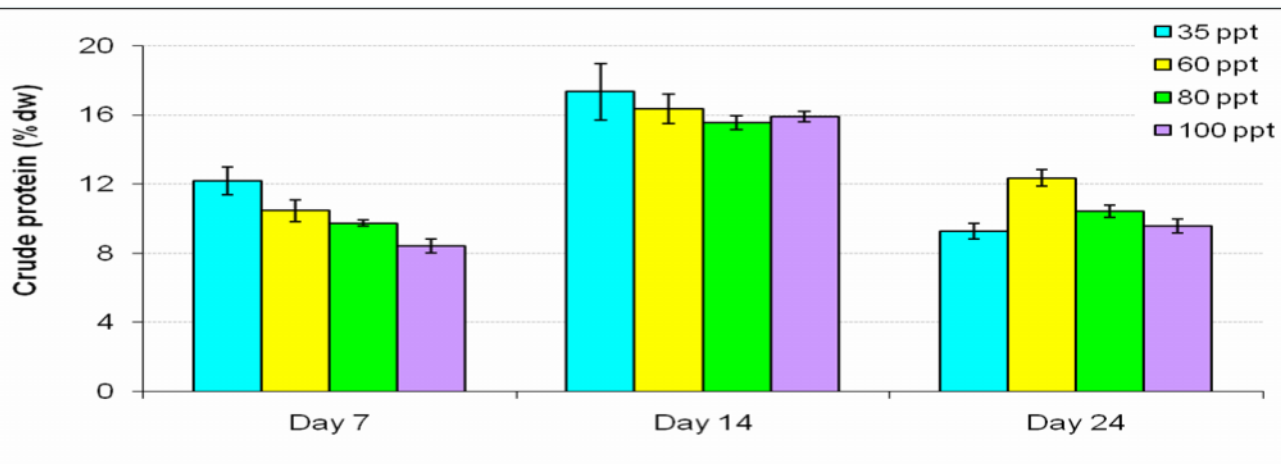


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# Proximate composition of biofloc formed at different salinities

It needs further analysis for HUFA content...

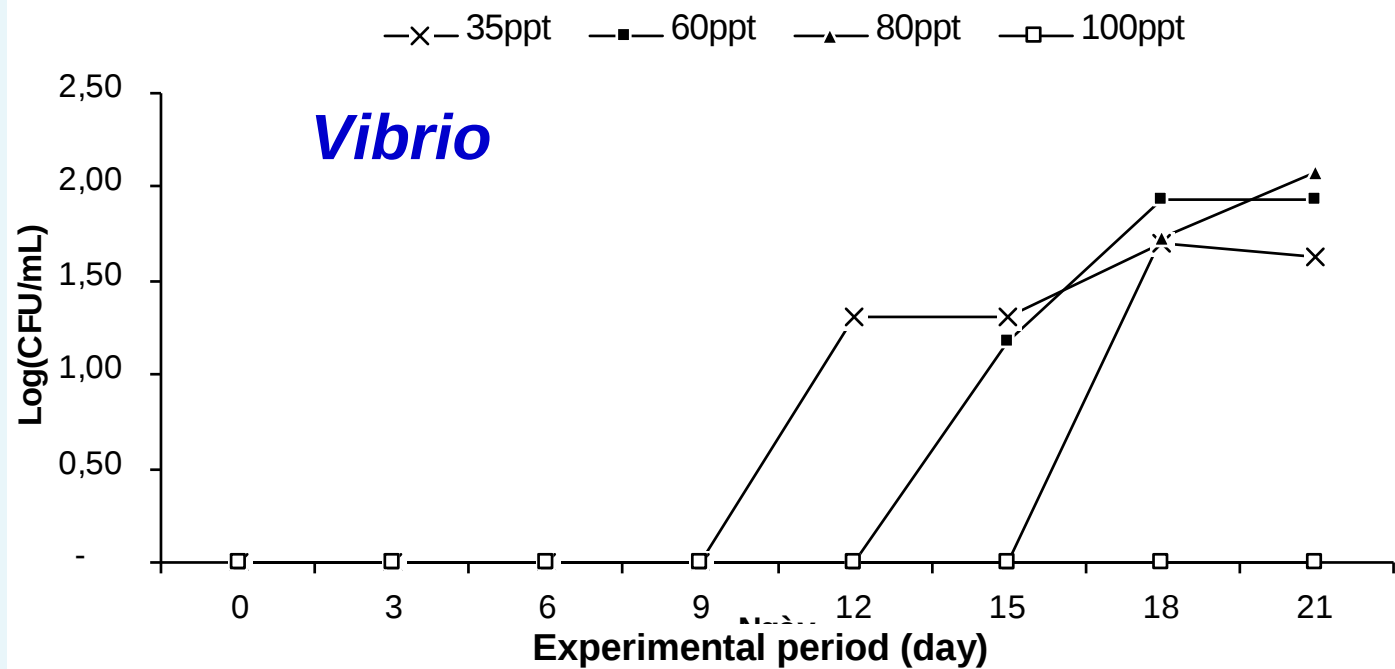
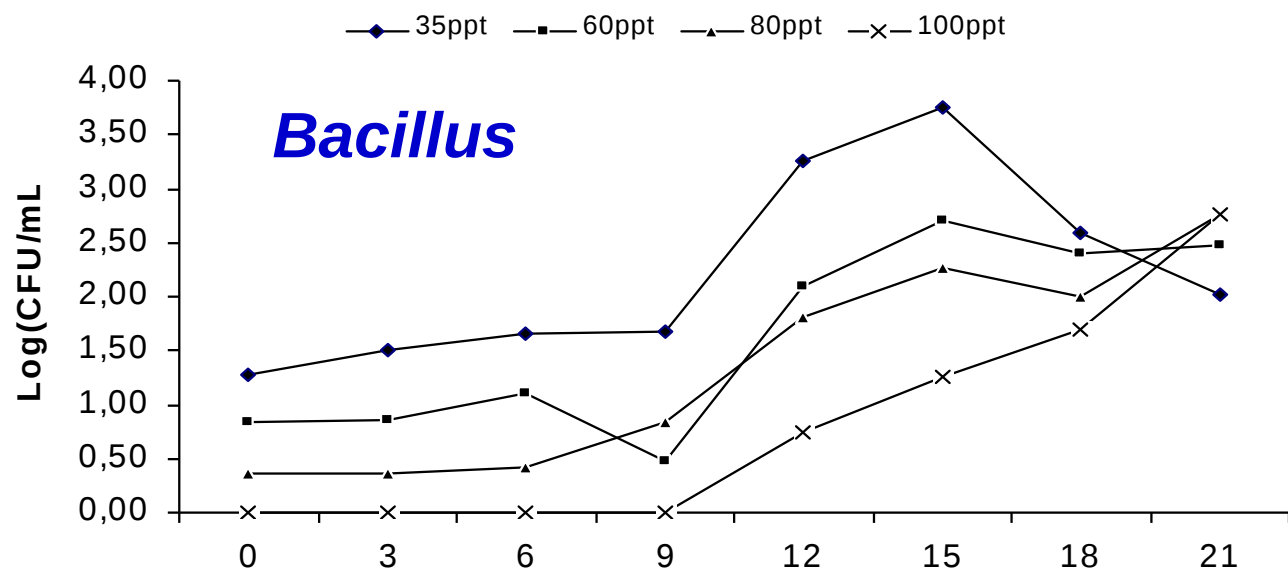
Floc dimension;





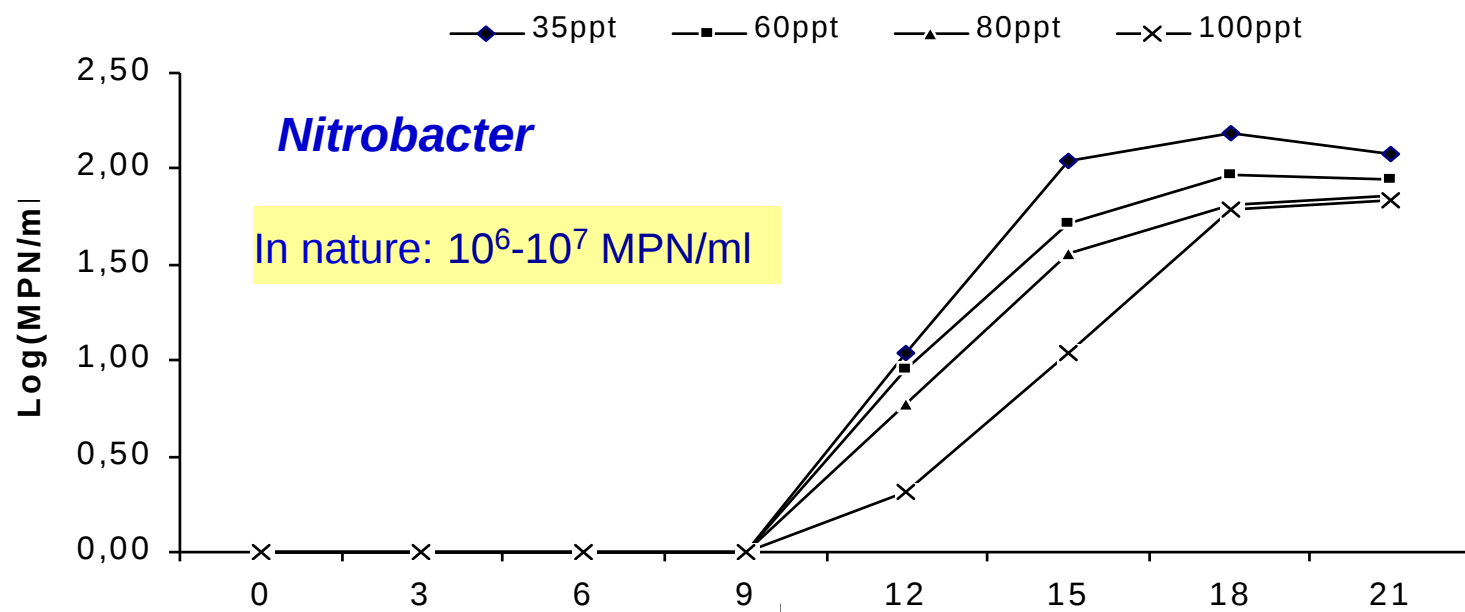
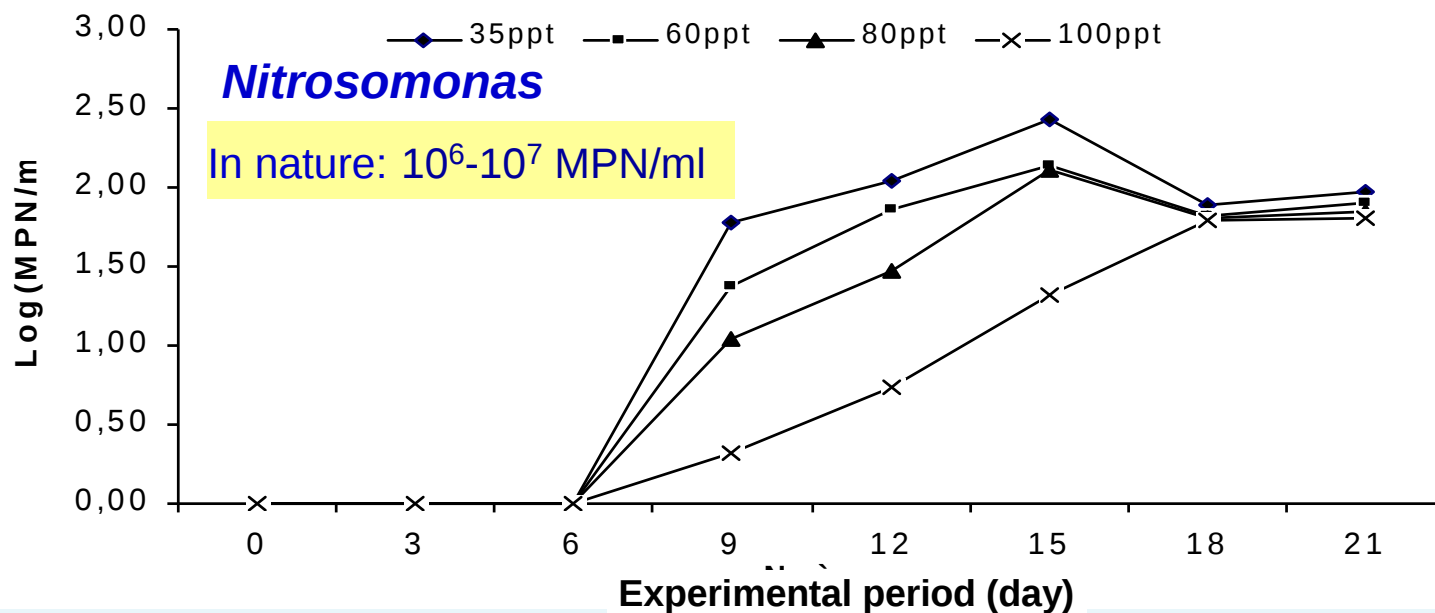
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***Vibrio* > 10<sup>4</sup> CFU/ml:  
causing disease**



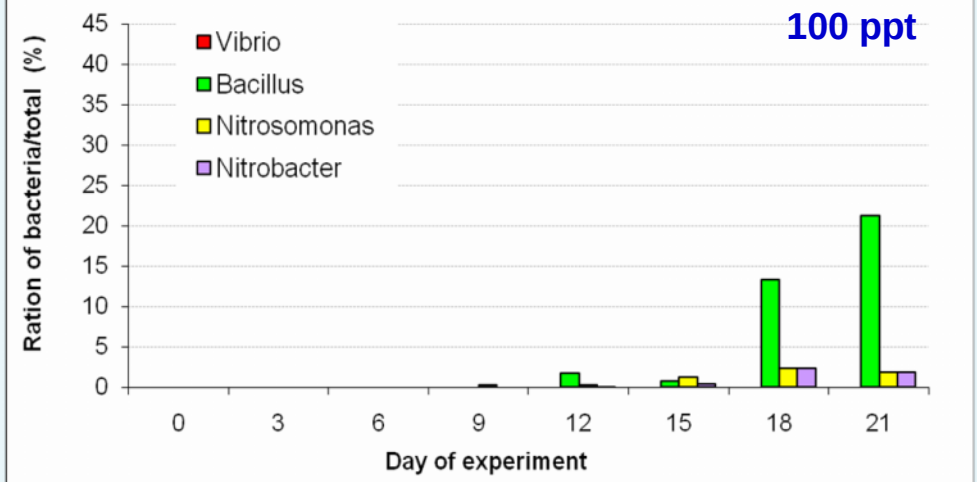
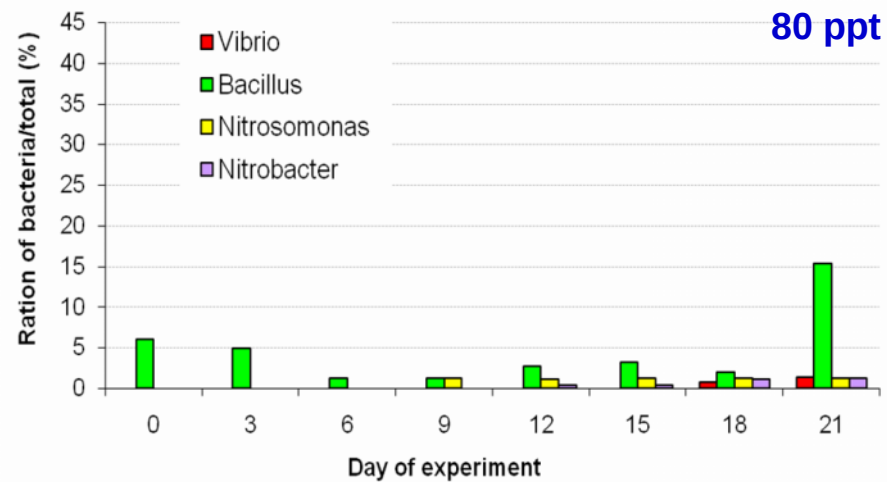
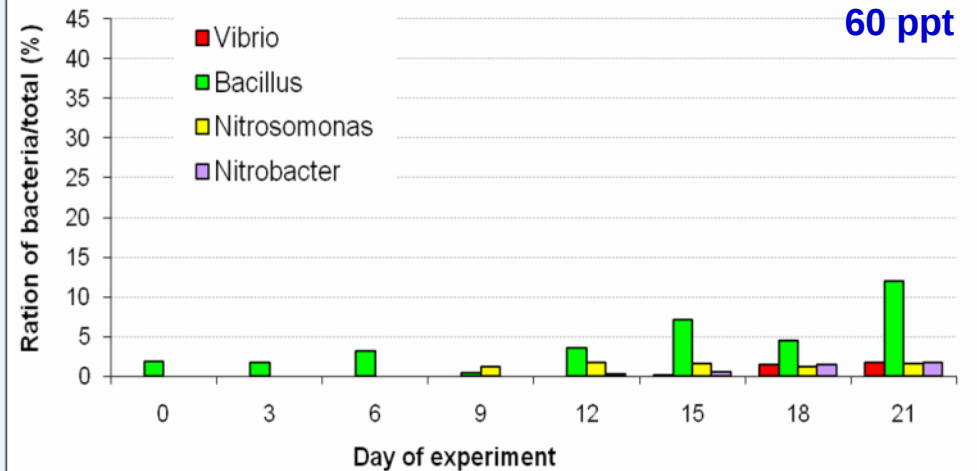
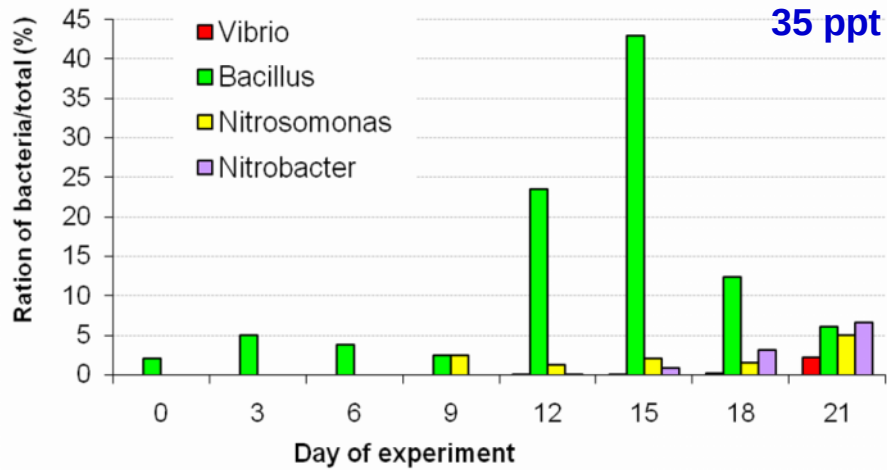


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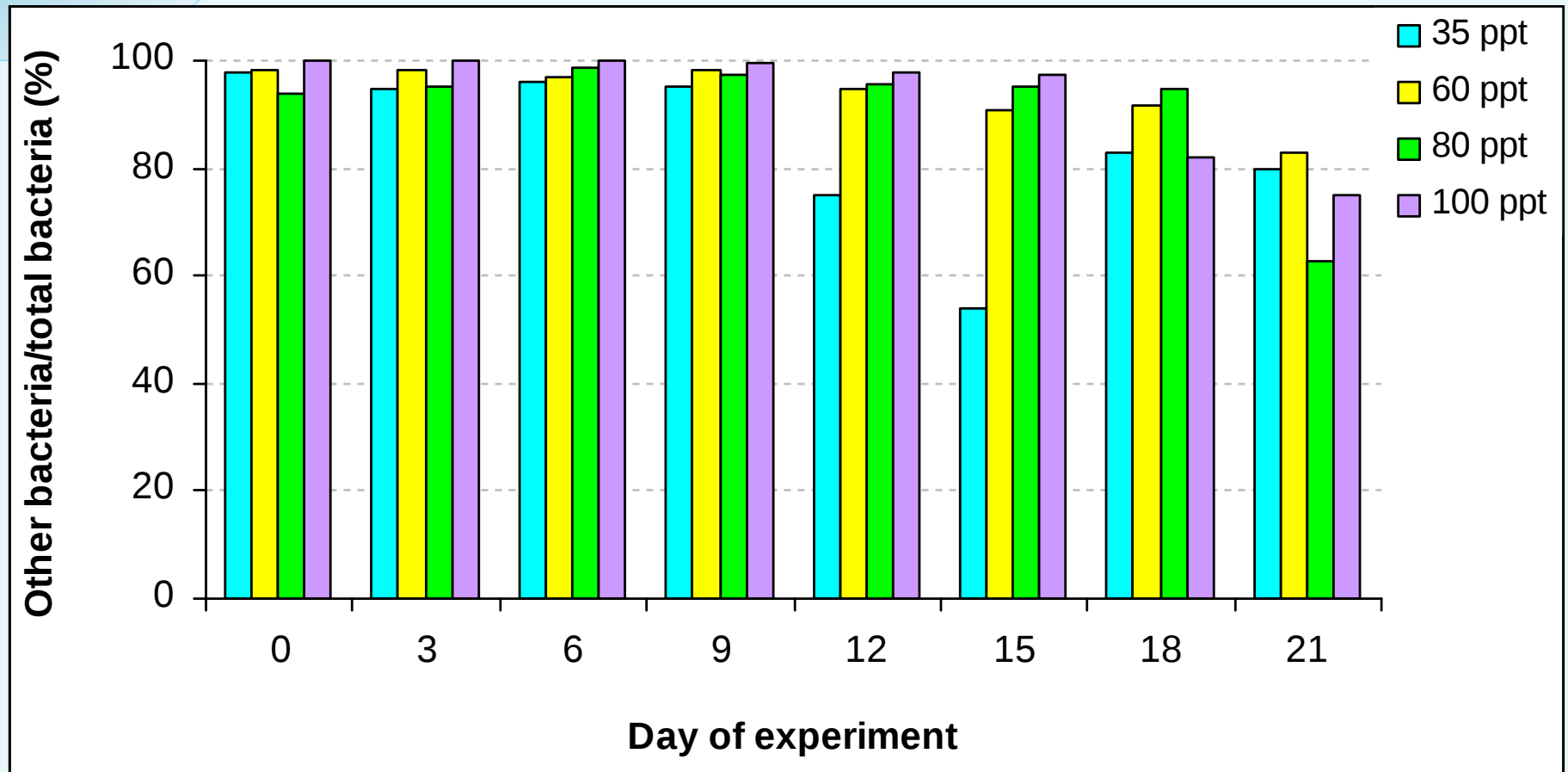
# Ratio (%) of bacteria strain per salinity





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# Percentage of other bacteria/Total bacteria have not been identified





# Conclusions

- ✓ Biofloc developed at salinities of 60, 80 và 100 ppt and highest volume from day 9-15 (in this period density of *Bacillus* decreased with increasing salinity, similar trend observed for *Nitrosomonas* and *Nitrobacter*)
- ✓ Volume of biofloc were highest 0,4-0,5 ml/L and decreased with increasing salinity
- ✓ C:N ratio sharply reduced at 35 and 60 ppt in day 3, at higher salinity C:N ratio were relatively stable (5-9); C:N ratio reduced at higher salinity (to adjust C:N at higher salinity?); then bact. composition may vary accordingly?
- ✓ High ratio of unknown-bact. Requires further identify.
- ✓ Protein and lipid contents were highest at day 14 (and highest at 60 ppt)



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# Thank you for your attention