The size of biofloc determines the nutritional composition and the nitrogen recovery by aquaculture animals

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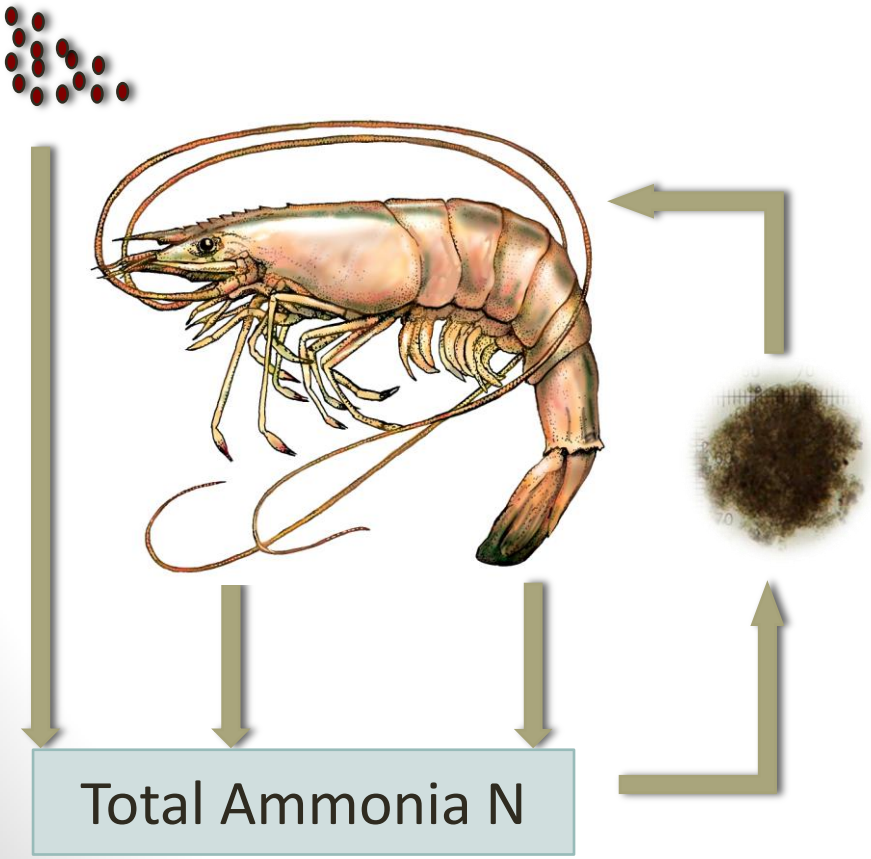
Uptake efficiency of biofloc

Biofloc utilization rate usually lower than production rate

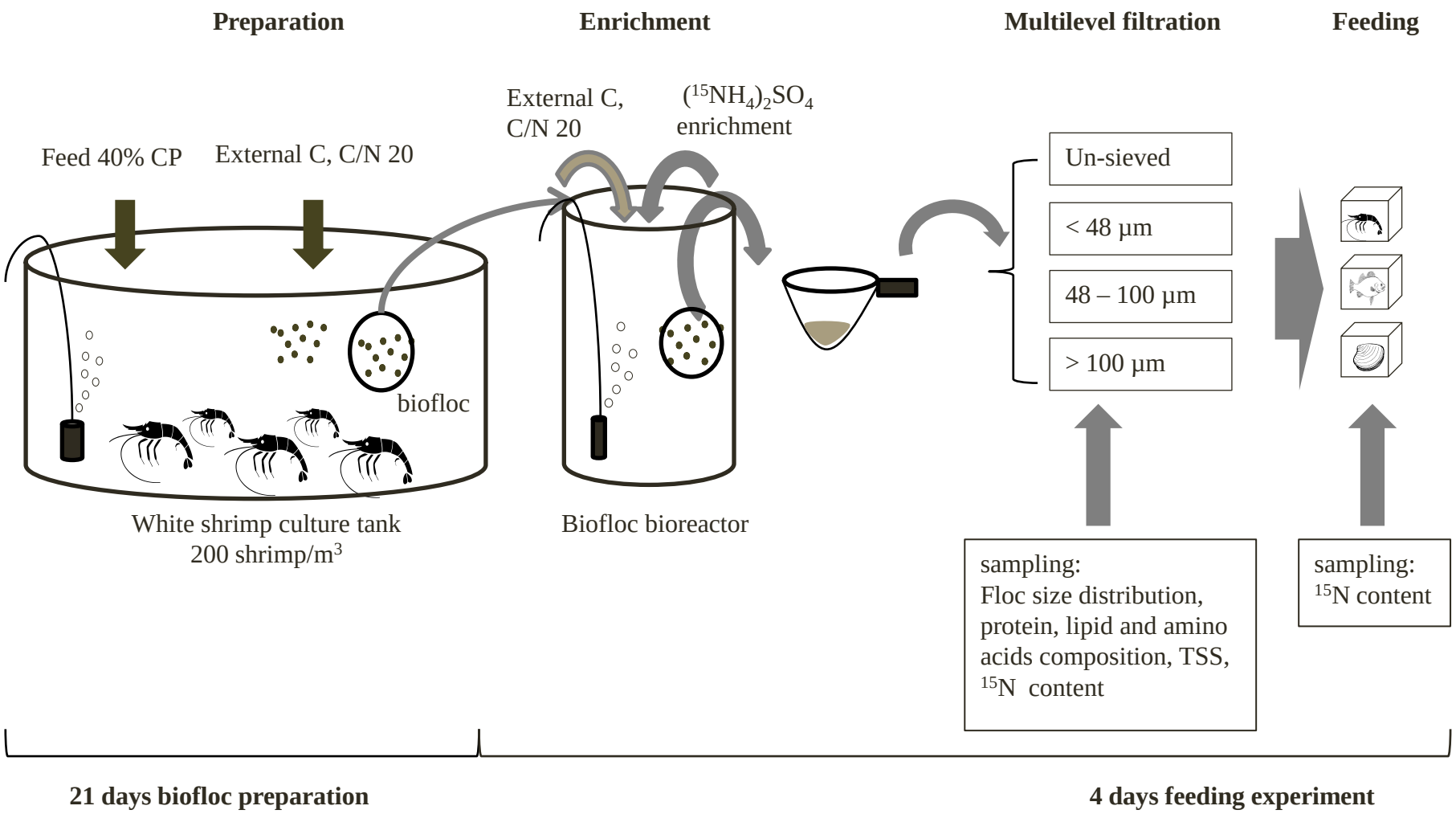
- Biofloc removal
- Increase utilization efficiency



- Biofloc utilization efficiency
  1. Increase in situ uptake potential
     - Accessibility: Floc size
     - Digestibility,
     - Nutritional value
  2. Utilization by other species (by polyculture)
     - Animal's feeding behavior: Floc size

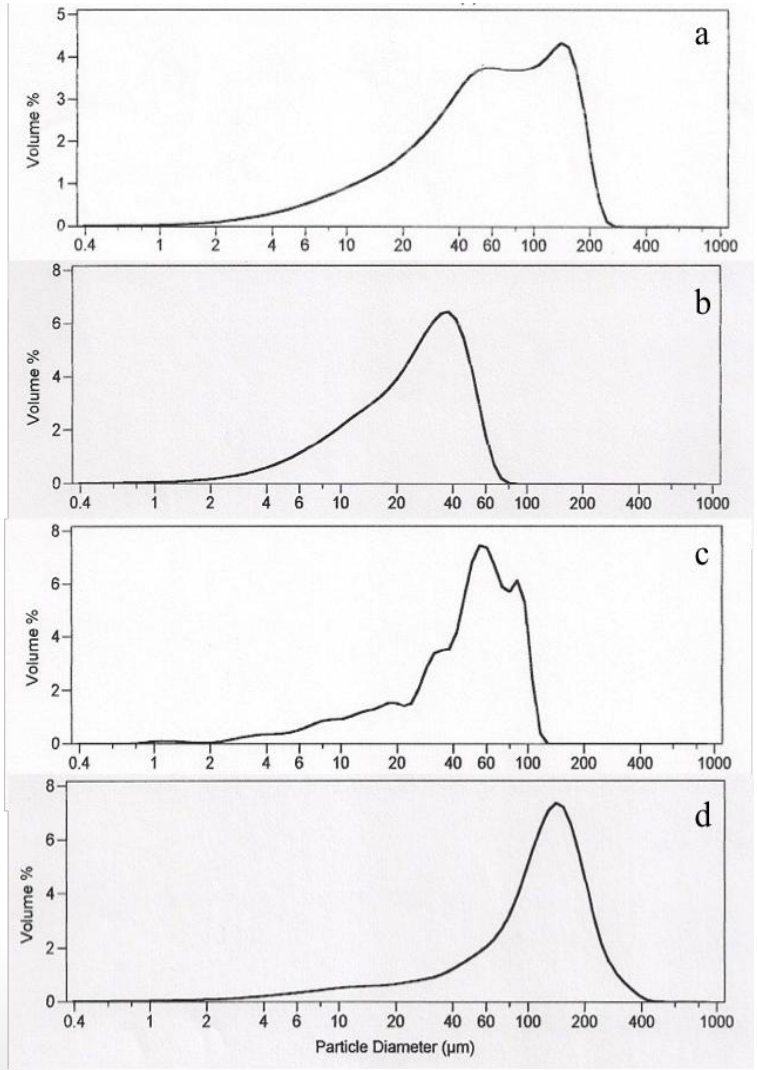
Objective

- biofloc particle size vs consumption and nitrogen utilization in shrimp, tilapia and mussel
- the relationship of the nitrogen retention from the biofloc and the essential amino acids profiles of different particle size



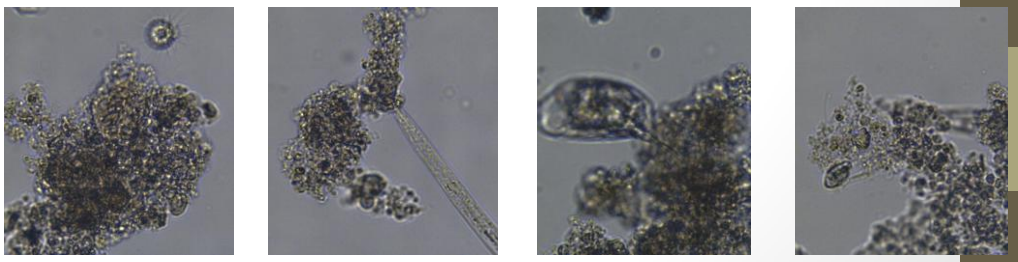
Materials and Method

Results: Floc size distribution



	Volume %	TSS%	V/W ratio
< 48 μm	45	53	0.85
48 – 100 μm	26	12	2.20
> 100 μm	29	36	0.82

- Floc density: Biological composition of biofloc

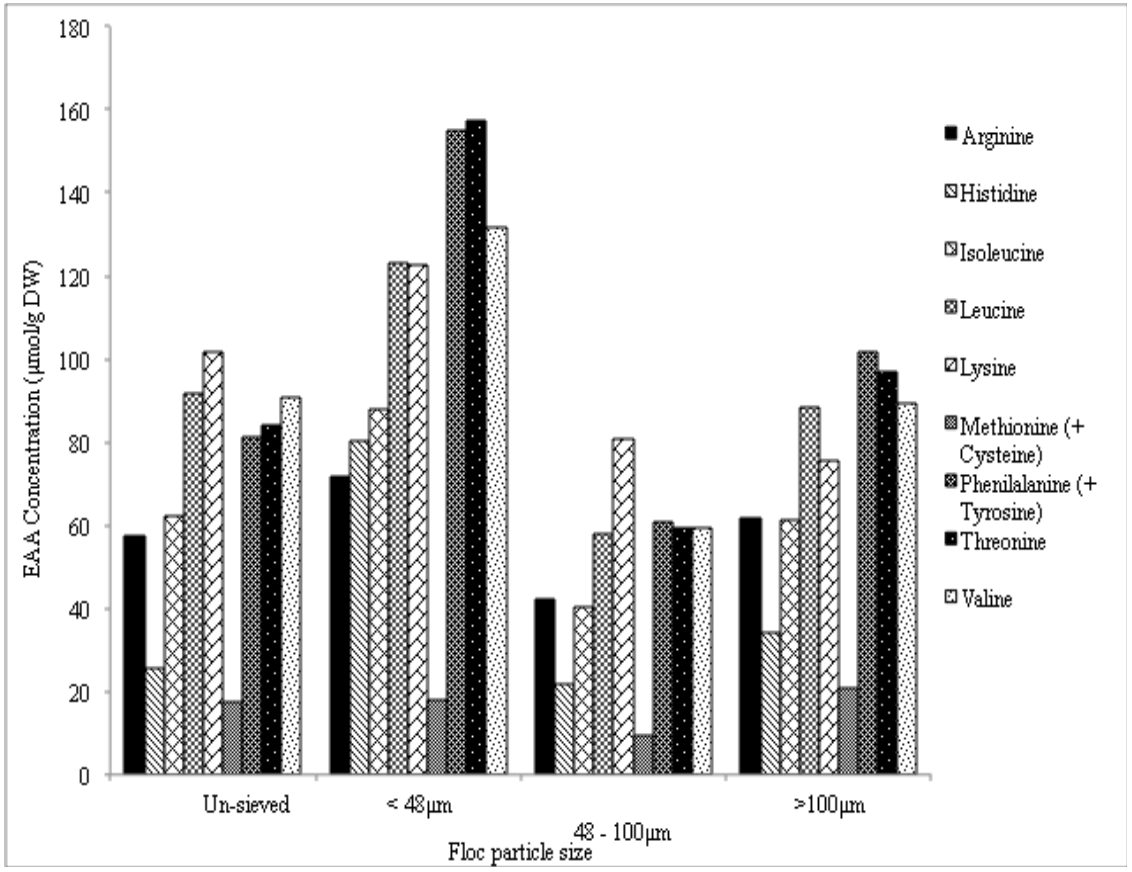


Results: Biofloc composition

Biofloc size class	Protein content (% on dry weight)	Lipid content (% on dry weight)
Un-sieved	25.0	7.2
< 48 µm	17.2	6.7
48 – 100 µm	23.4	6.0
>100 µm	27.8	7.5

- Biofloc composition
  - Biological composition: microorganisms
  - Chemical composition: EPS

Results: EAA concentrations

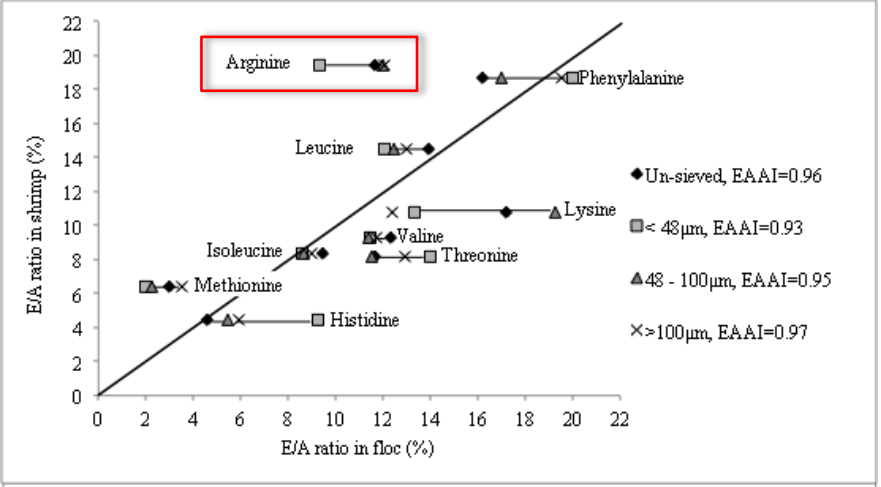


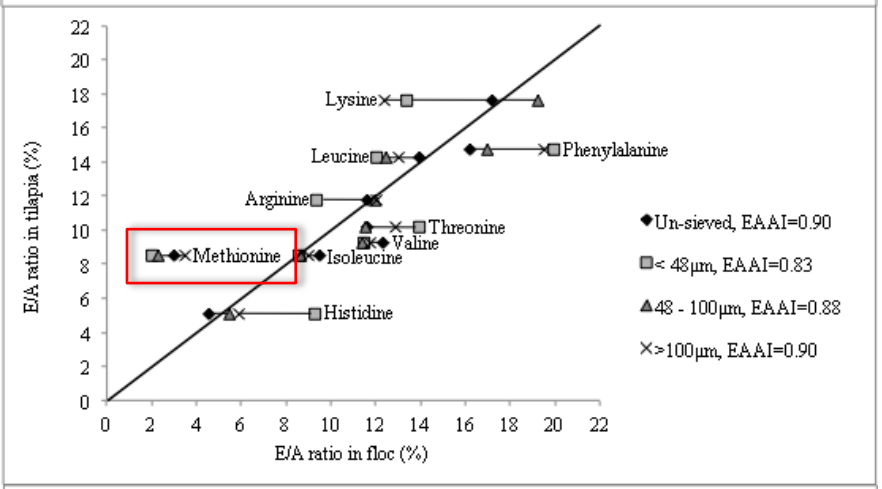
- **Rich** in valine, lysine, leucine, phenylalanine and threonine
- **Deficient** in methionine

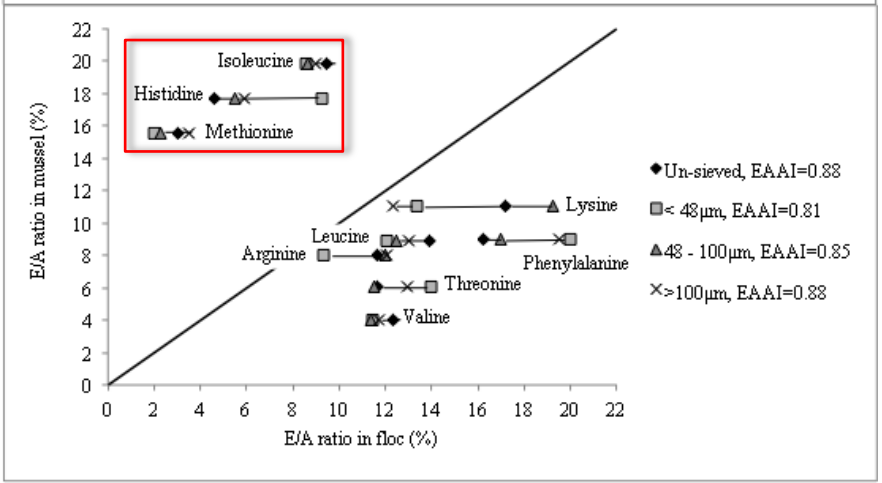
Results: EAAI

Biofloc size class	Shrimp	Tilapia	Mussel
Un-sieved	0.96	0.90	0.88
< 48 µm	0.93	0.83	0.81
48 – 100 µm	0.95	0.88	0.85
>100 µm	0.97	0.90	0.88

- EAAI (Penaflorida 1989): EAA profile in the diet relative to the EAA composition of the animal
- Quality protein source:
  - Good: EAAI > 0.9
  - Useful: EAAI 0.7 – 0.9
  - Inadequate: EAAI < 0.7







EAAI

- Relative to the tested organism, biofloc deficient in:
  - Arginine (shrimp)
  - Methionine (tilapia)
  - Isoleucine, Histidine and Methionine (mussel)

Results: Biofloc Consumption

Biofloc uptake (g TSS/kg animal wet weight)

	Un-sieved	< 48µm	48 - 100µm	>100µm
Shrimp	27.9 ± 6.5	≥ 36.5 ± 7.2	64.2 ± 22.6	34.3 ± 7.6
Tilapia	≥ 88.9 ± 6.4^{ab}	≥ 39.3 ± 3.9^{a}	≥ 93.2 ± 11.2^{ab}	≥ 117.3 ± 24.9^{b}
Mussel	47.9 ± 4.3	≥ 36.0 ± 4.8	57.2 ± 22.4	41.6 ± 5.5*

- Shrimp, tilapia and mussel prefer smaller size floc
- Tilapia can harvest all the floc regardless of the size
- 40% mortality in mussel fed with >100µm

Results: N recovery (%)

	Un-sieved	< 48µm	48 - 100µm	>100µm
Shrimp	21 ± 12	95 ± 5	53 ± 26	78 ± 23
Tilapia	32 ± 12^{ab}	245 ± 29^{b}	29 ± 10^{a}	66 ± 15^{ab}
Mussel	16 ± 4	49 ± 18	18 ± 10	26 ± 4

- Highest N recovery : < 48µm
- More digestible and better utilized?

Conclusion

- Particle size plays an important role in the quality of biofloc and the capacity of N retention by shrimp, tilapia and mussel
- This results can be used as a basic information to develop an integrated multitrophic-biofloc system to manage suspended solids in BFT and nutrient utilization efficiency enhancement



Acknowledgement

- This research was financially supported by the Flemish Interuniversity Council–University Development Cooperation (VLIR).


Thank you