RESPECTIVE CONTRIBUTION OF THE ARTIFICIAL FEED AND NATURAL PRODUCTIVITY DETERMINED BY C AND N NATURAL STABLE ISOTOPES IN BIOFLOC EXPERIMENTAL REARING SYSTEM OF THE SHRIMP *Litopenaeus stylirostris*

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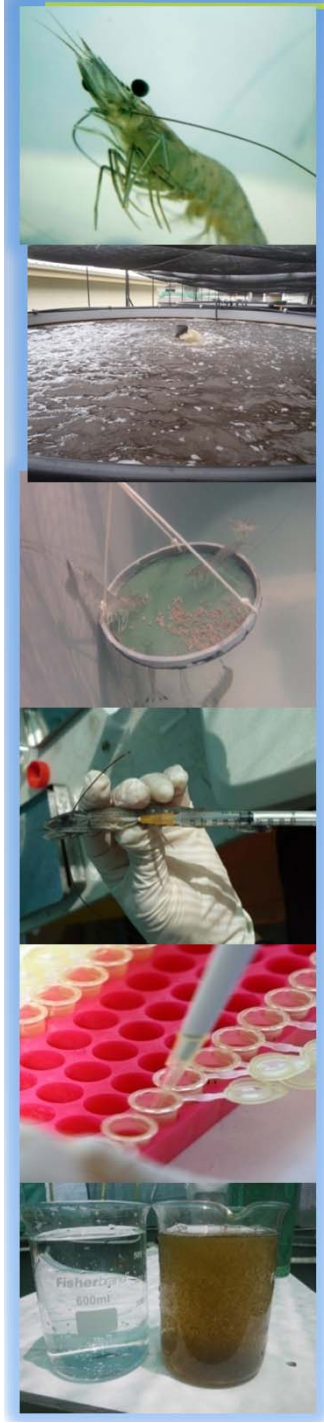
IFREMER. Tahiti Oceanology center of Pacific ; Laboratory Marine ressources

La Rochelle University. France ; Laboratory Coastal Environment and Society

APA13 POSITIONING FOR PROFIT



Objective

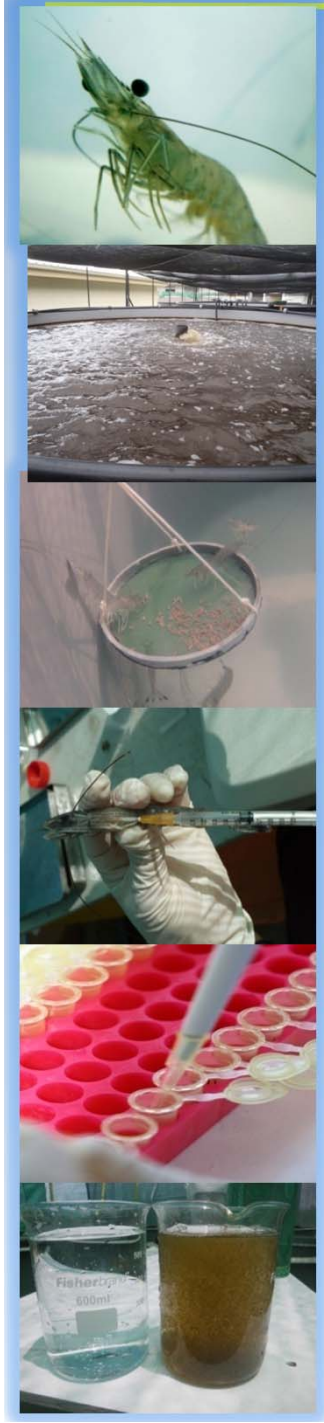
To quantify the contribution of natural productivity in food supply for shrimps reared in biofloc

\+

= 100 %

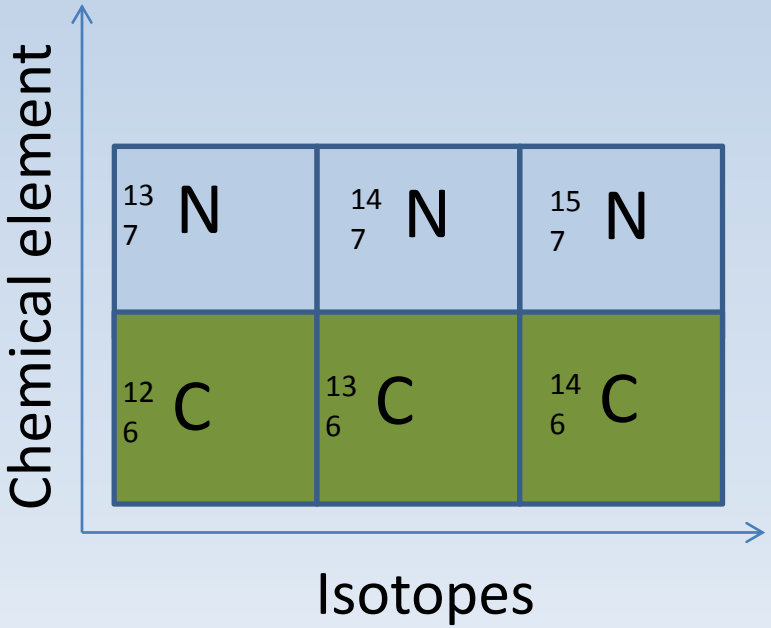
Methodology

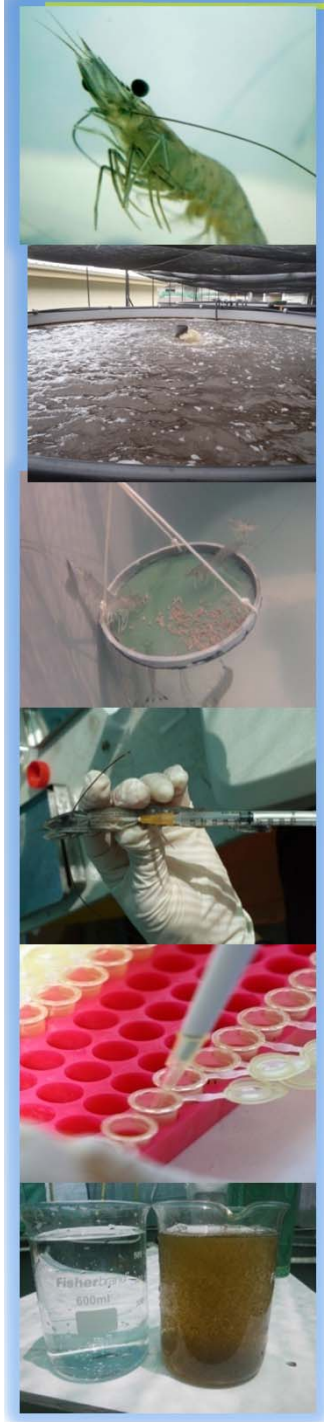
Study of natural stable isotopes of carbon and nitrogen in pellet feed and in biofloc particulates



Natural stable isotopes

Same chemical element with different numbers of neutrons





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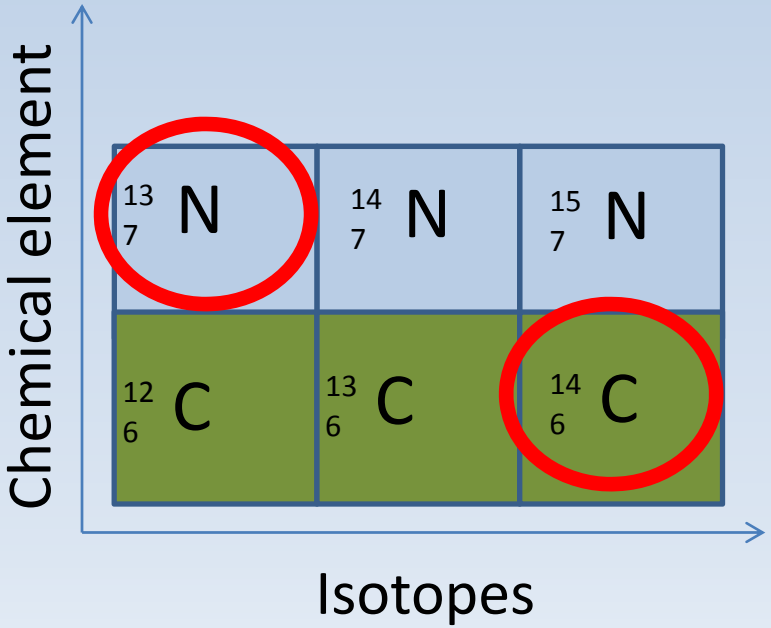
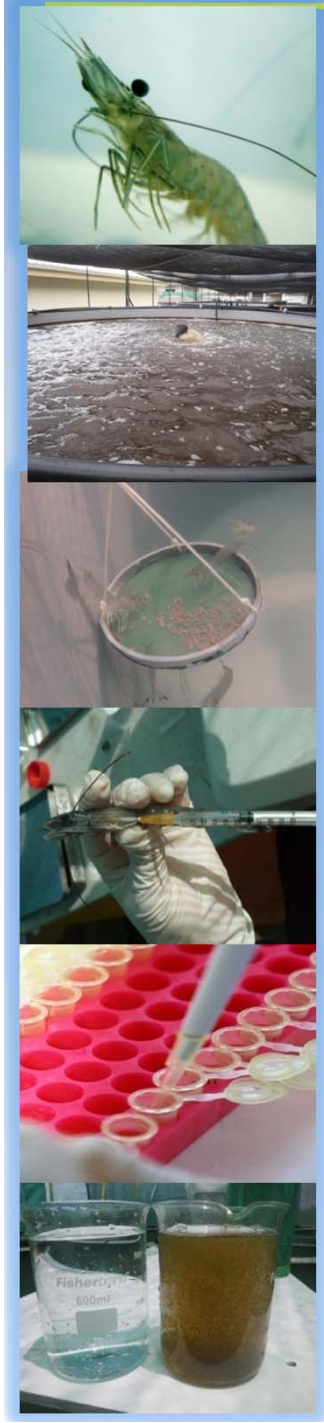


No stable isotopes = Radioactive isotopes



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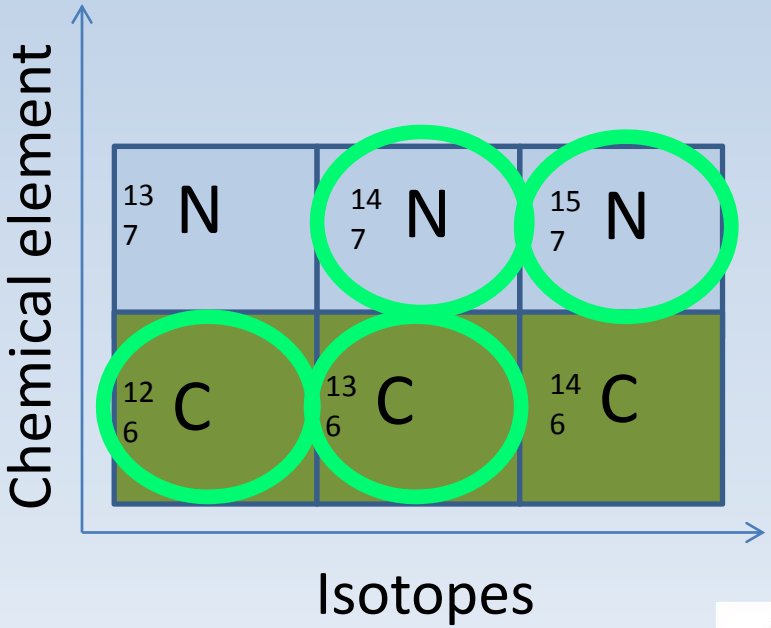
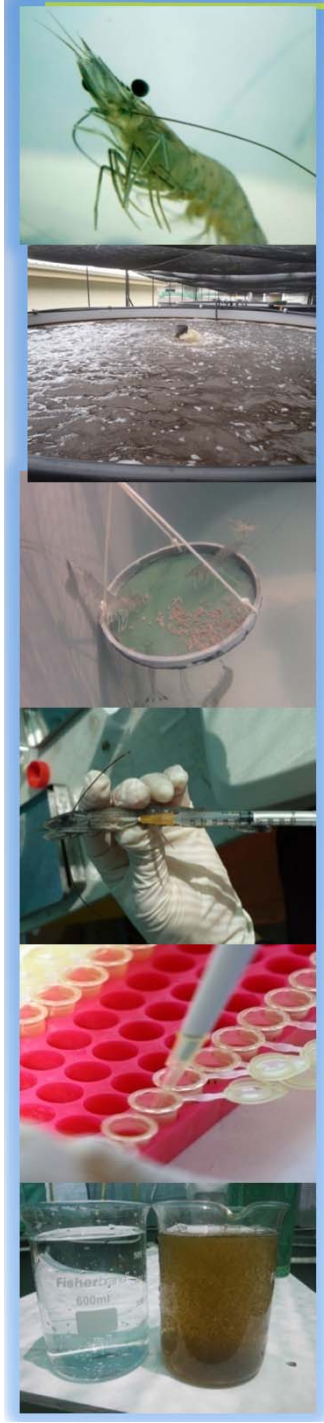


Stable isotopes

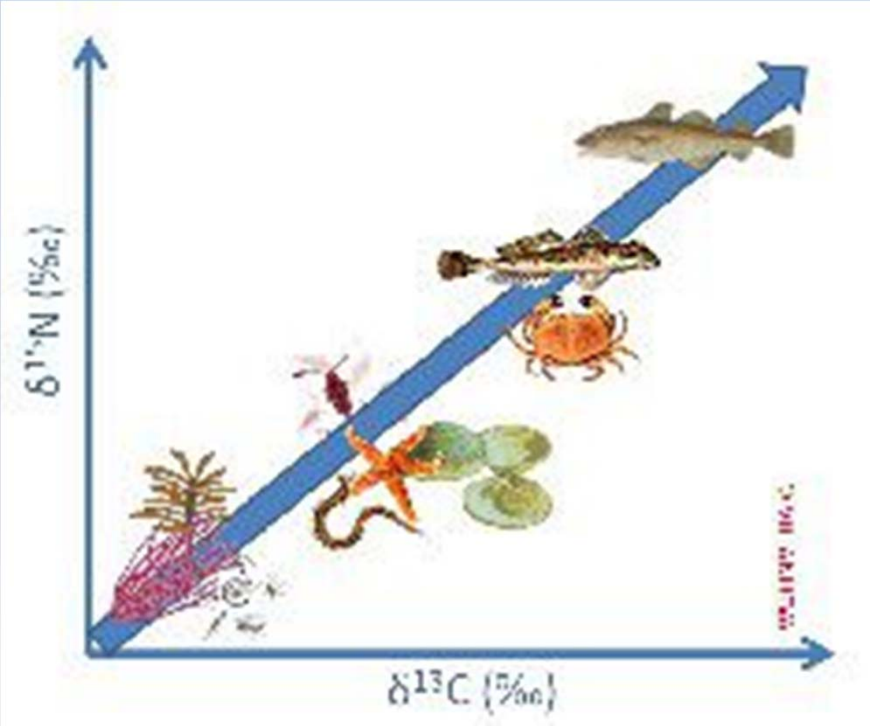


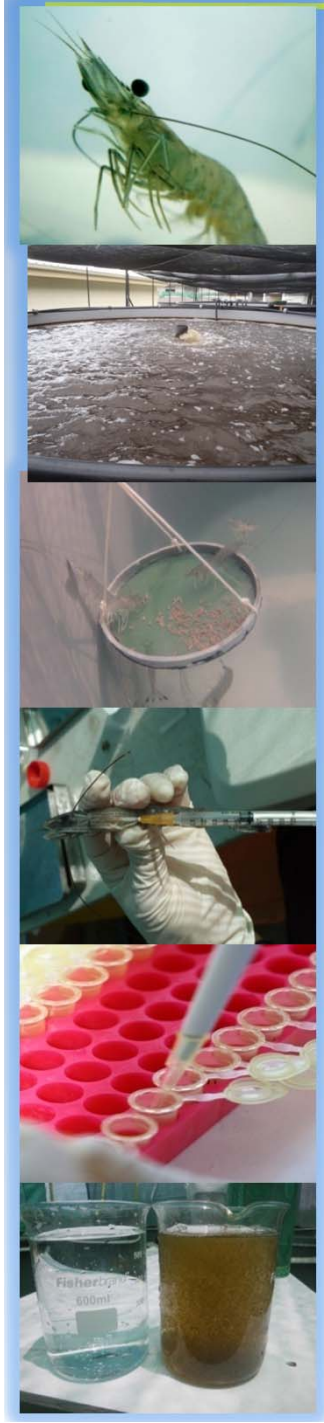
Food webs study with stable isotopes

Use of ratios

- $^{13}C/^{12}C$ ($\delta^{13}C$)
- $^{15}N/^{14}N$ ($\delta^{15}N$))

General principle :
Higher up the food chain
Higher is the ratio
(accumulation of heavy
Isotope in consumer)

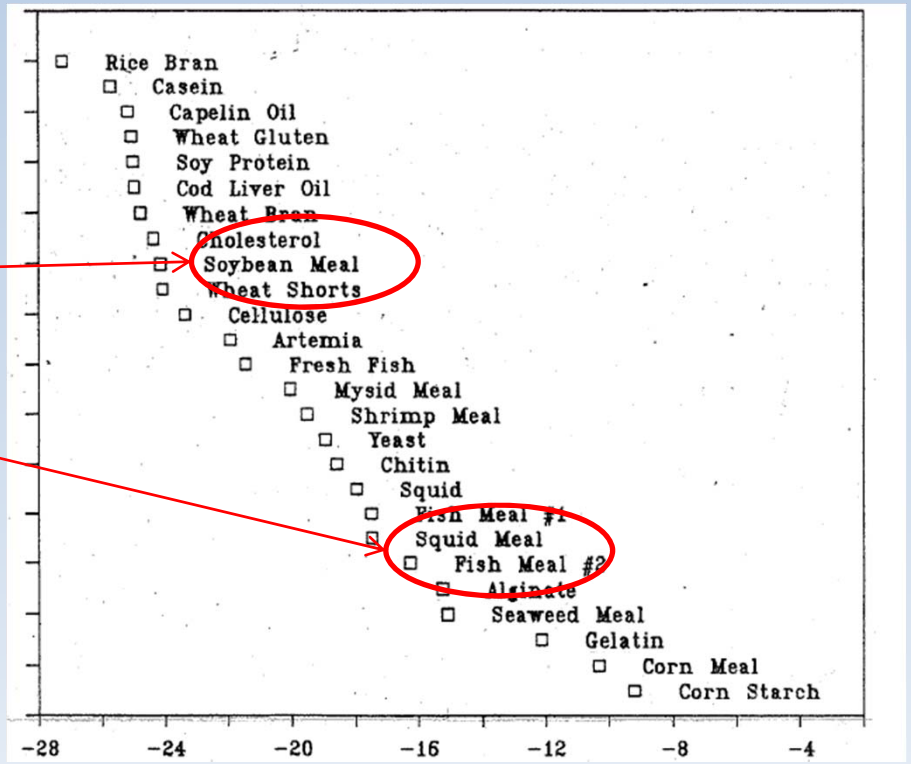




Food webs study with stable isotopes

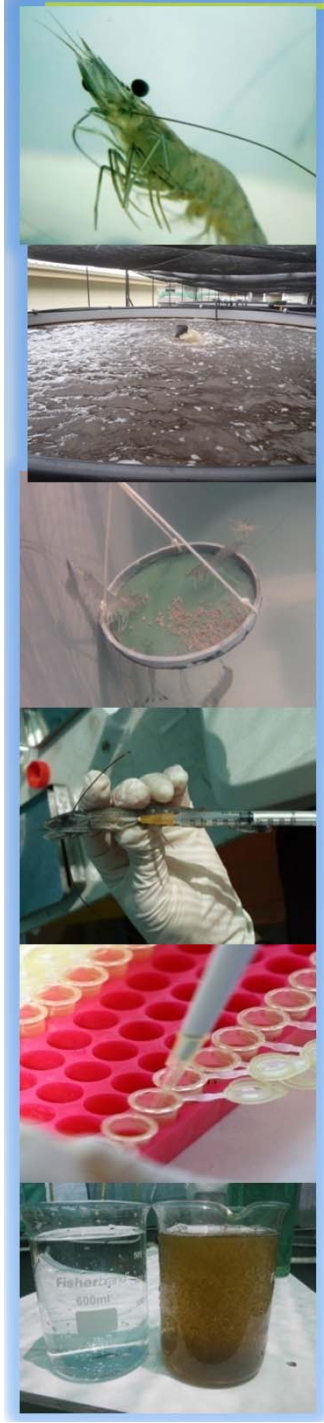
Soy meal : low isotopic label

Fish meal : high isotopic label



The δ13C of the individual components used to formulate the feeds (Anderson et al.. 1987)

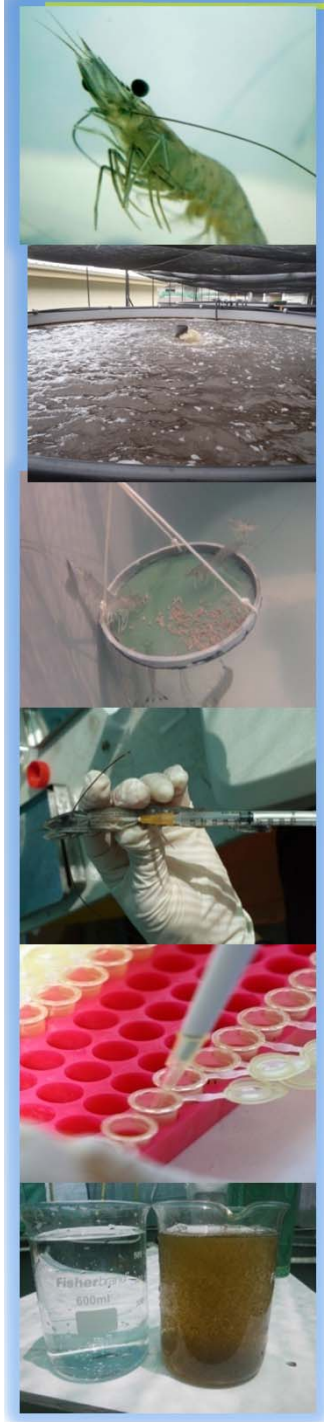
➔**Discriminate isotopic signatures of two food sources : Natural productivity and artificial food.**



Experimental Protocol

Pellet rich in soy meal

Natural productivity enriched with powder feed rich in fish meal



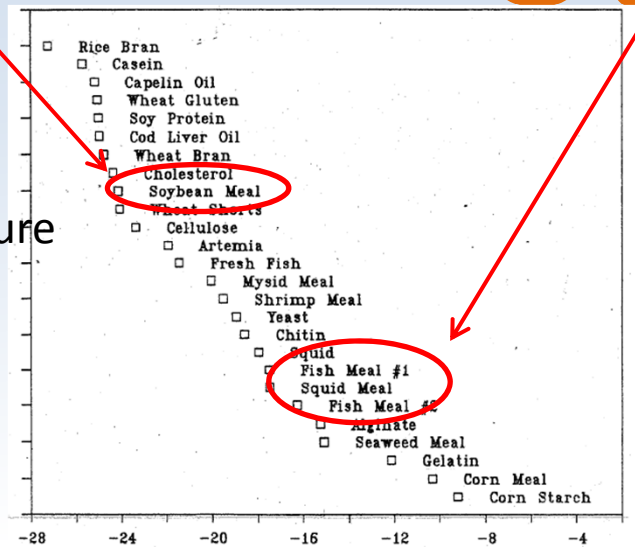
Experimental Protocol

Pellet based on soy meal

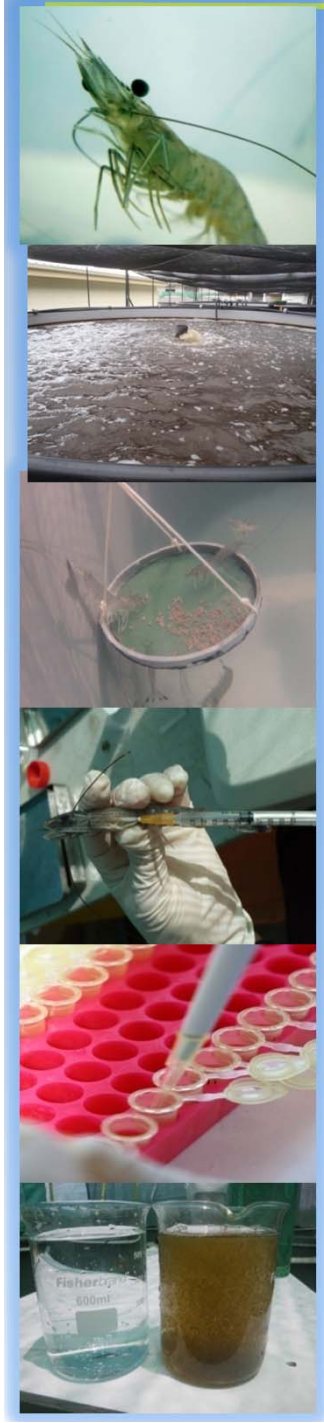
Natural productivity enriched with powder feed rich in fish meal

Biofloc

Low isotopic signature



High isotopic signature



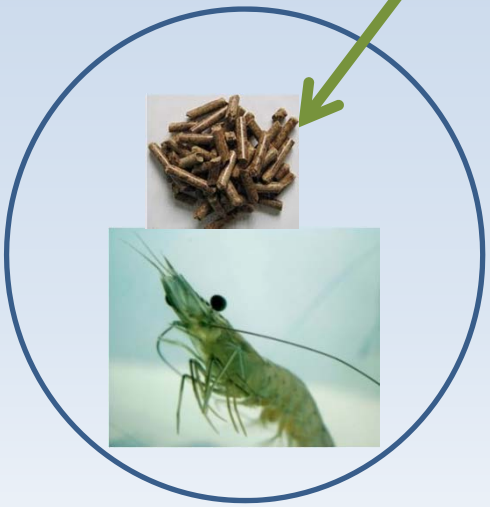
Experimental Protocol

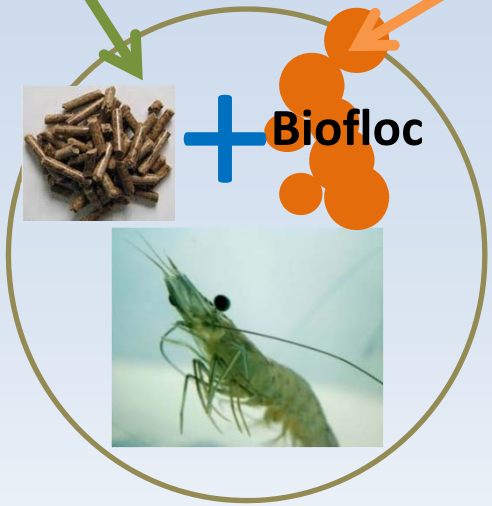
Clear water

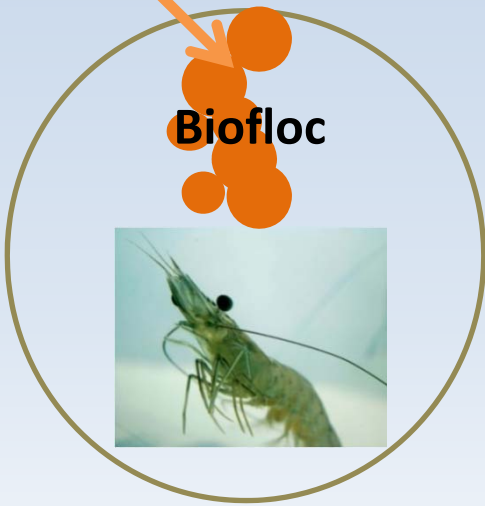
Biofloc

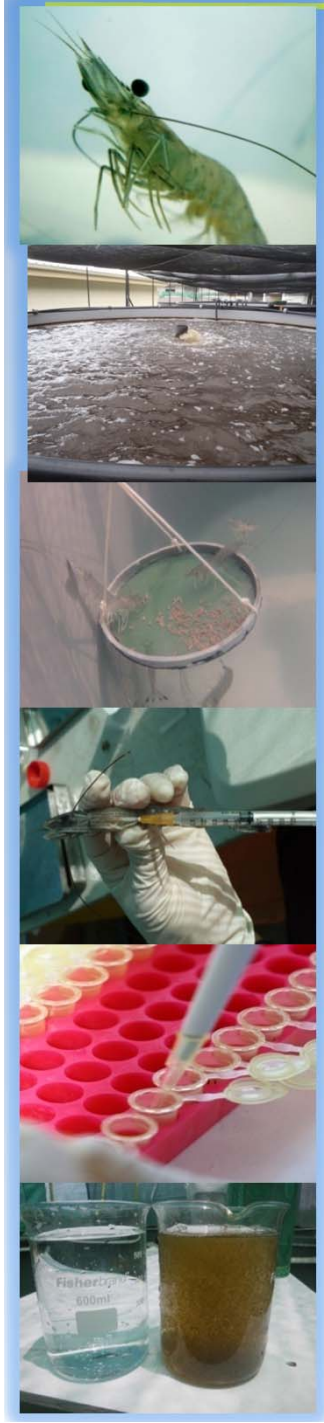
Pellet rich in soy meal

Powder feed rich in fish meal









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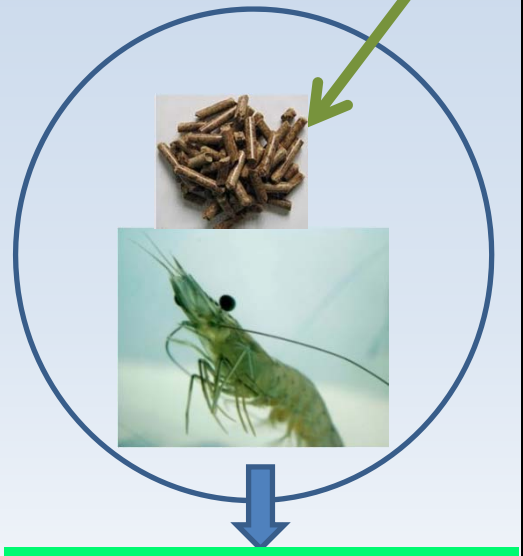
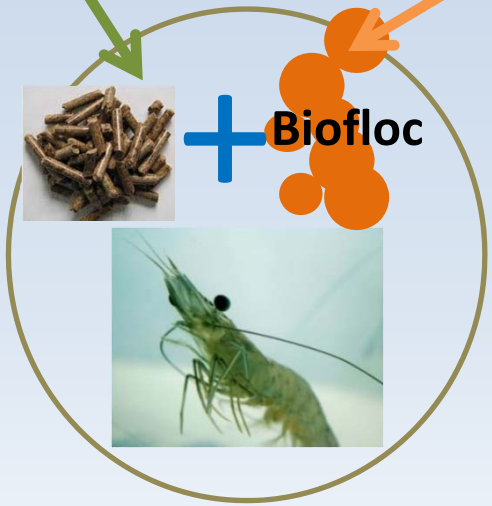
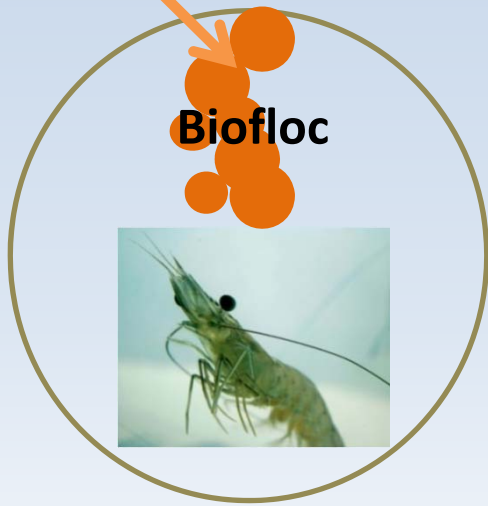
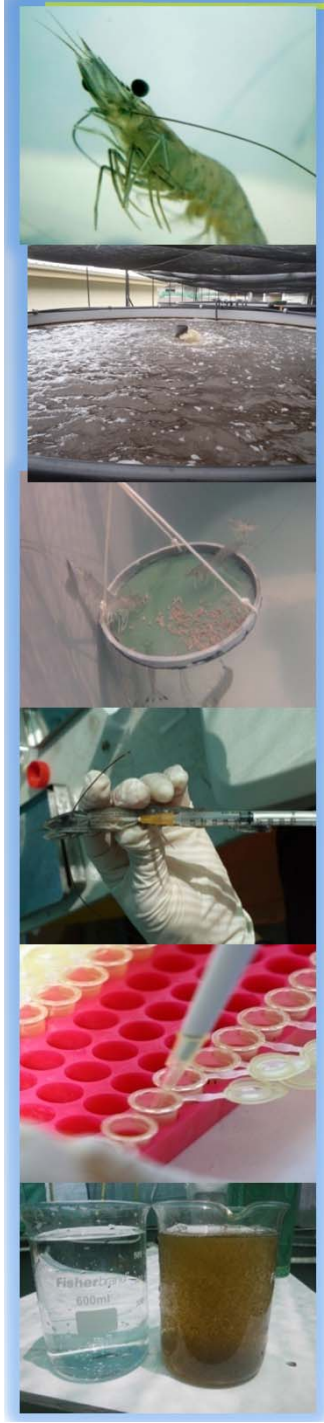






Reference for shrimp fed only with plant pellet



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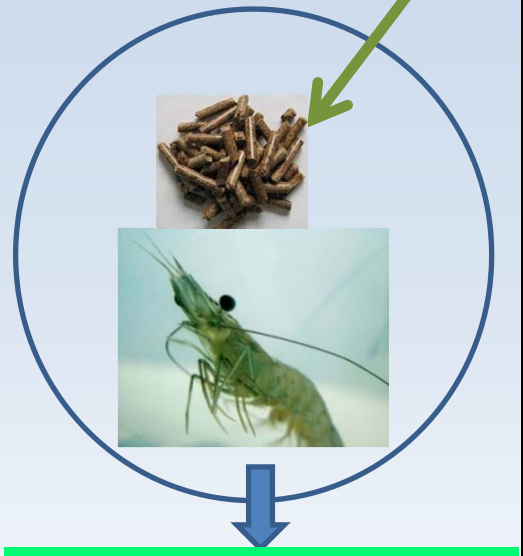
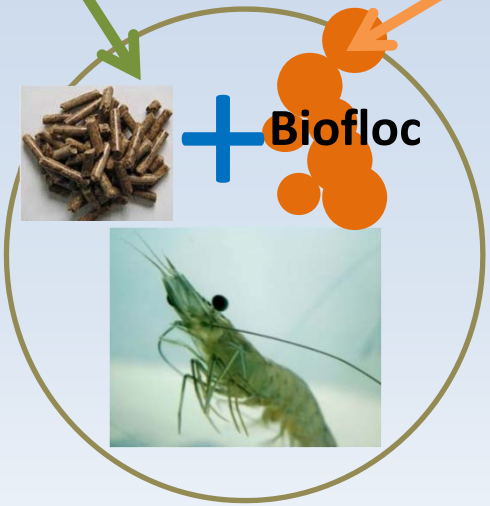
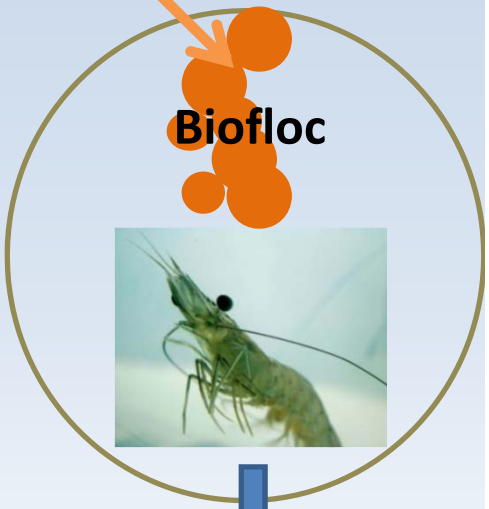
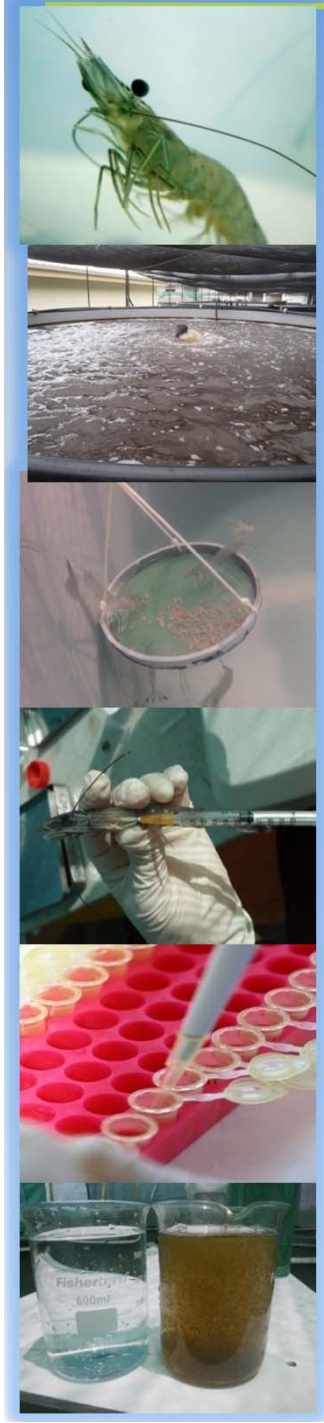






Reference for shrimp fed only with plant pellet

Reference for shrimp fed only with natural productivity



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Clear water

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Pellet rich in soy meal

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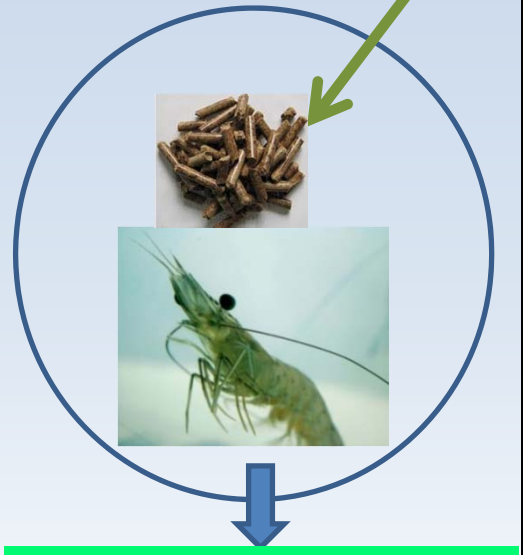
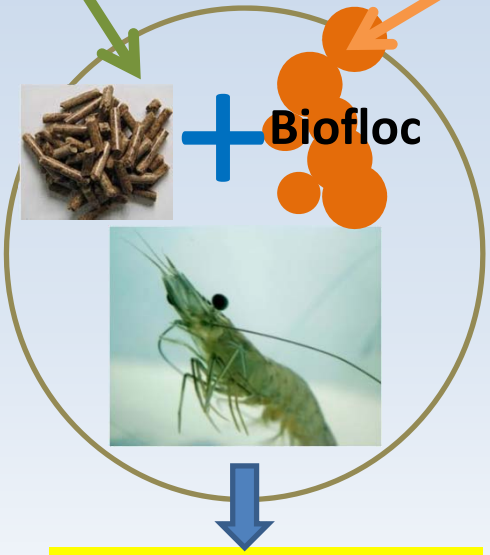
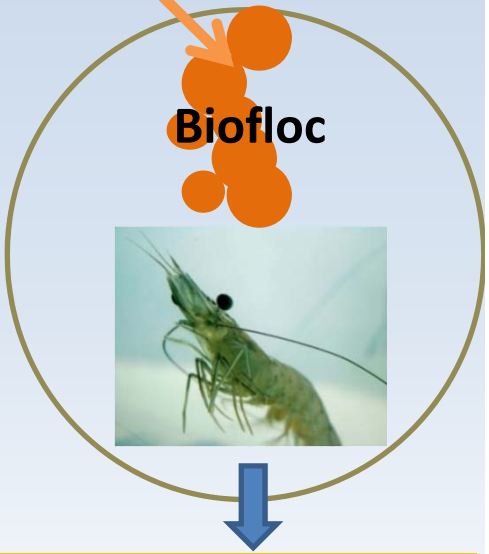


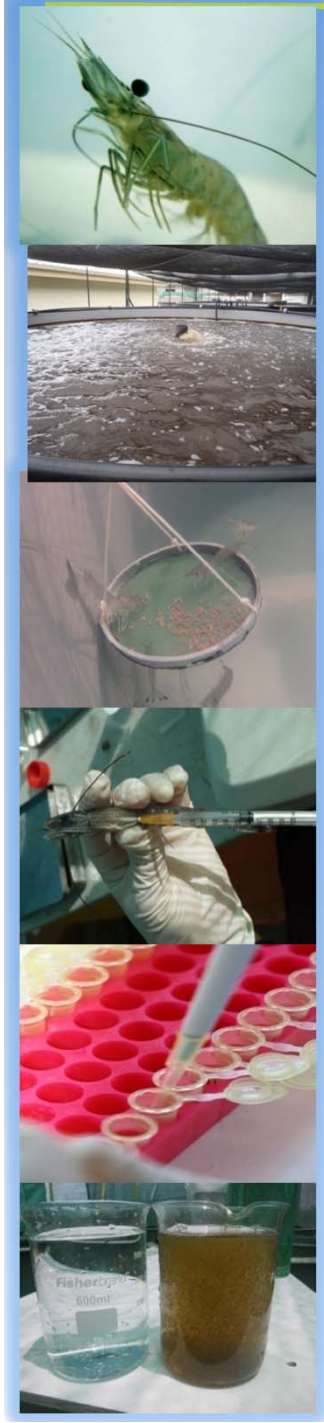




Reference for shrimp fed only with plant pellet

Shrimp fed with the two food sources

Reference for shrimp fed only with natural productivity



Stable isotope analyse

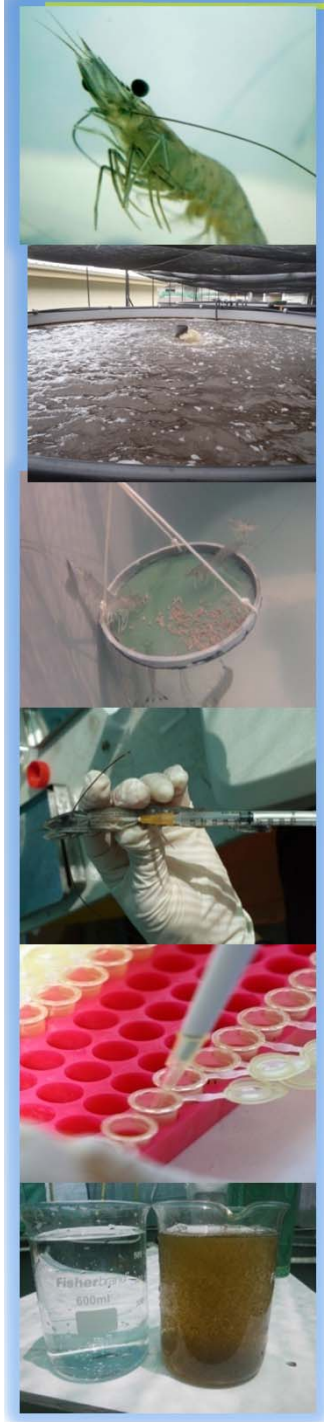
Analyze on two tissues :

- Muscle ➔ Slow protein turnover

Isotopic signature record of a food source for a long time period

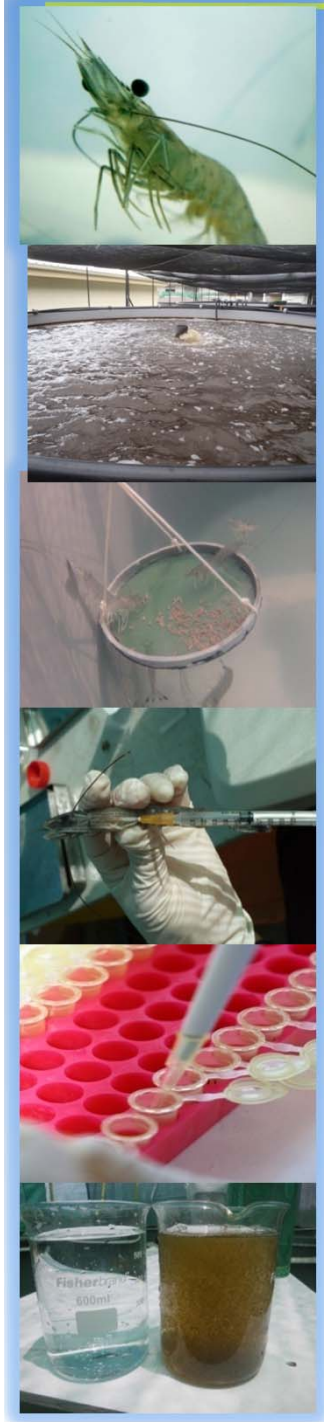
- Cuticle ➔ Rapid protein turnover

Isotopic signature record of a food source for a short time period



Results

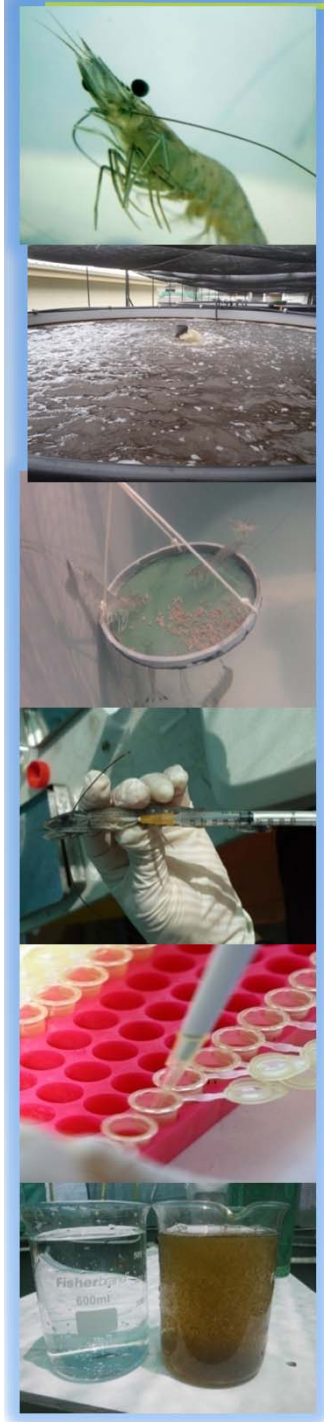
- The pellets based on soy meal but with crab meal as attractant were well consumed by shrimps



Results

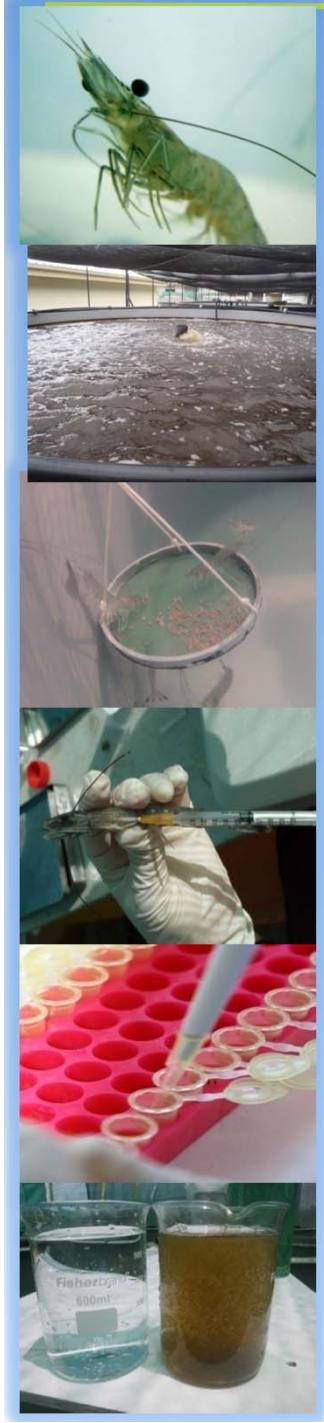
- The pellets based on soy meal but with crab meal as attractant were well consumed by shrimps
- Different isotopic signatures of pellet and natural productivity

Natural productivity	Pellets based on soy meal
$\delta^{13}C$= -19.44 ‰	$\delta^{13}C$= -24.5 ‰
$\delta^{15}N$= 9.29‰	$\delta^{15}N$= 1.41‰



Zootechnical results

	Treatment		
	Biofloc + Feed	Biofloc only	Clear water + Feed
Initial weight (g)	0.32 ± 0.19		
Final weight(g)	^{a}1.14 ± 0.35	^{a}0.88 ± 0.25	^{b}0.44 ± 0.05
Survival (%)	^{c}93 ± 13	^{cd}83 ± 15	^{d}64 ± 13



Isotopic calculation

Total C or N at the end of experiment

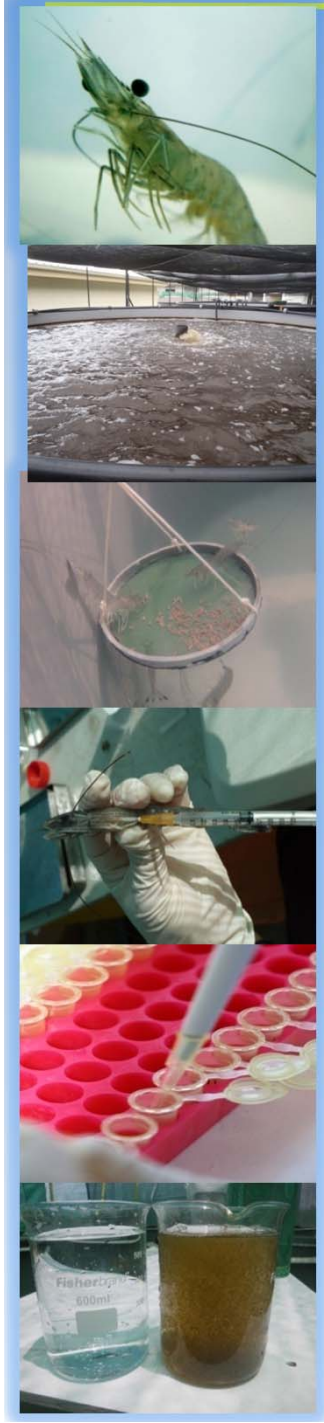
−

C or N initially present in the animal

=

C or N accumulated during the growth of the animal

δ13C and δ15N used to calculate
(Model of Anderson et al. 1987)



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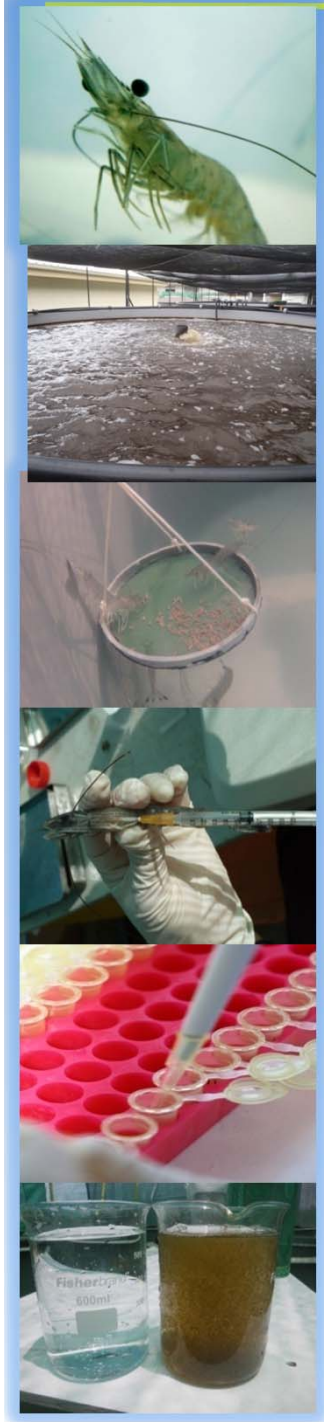


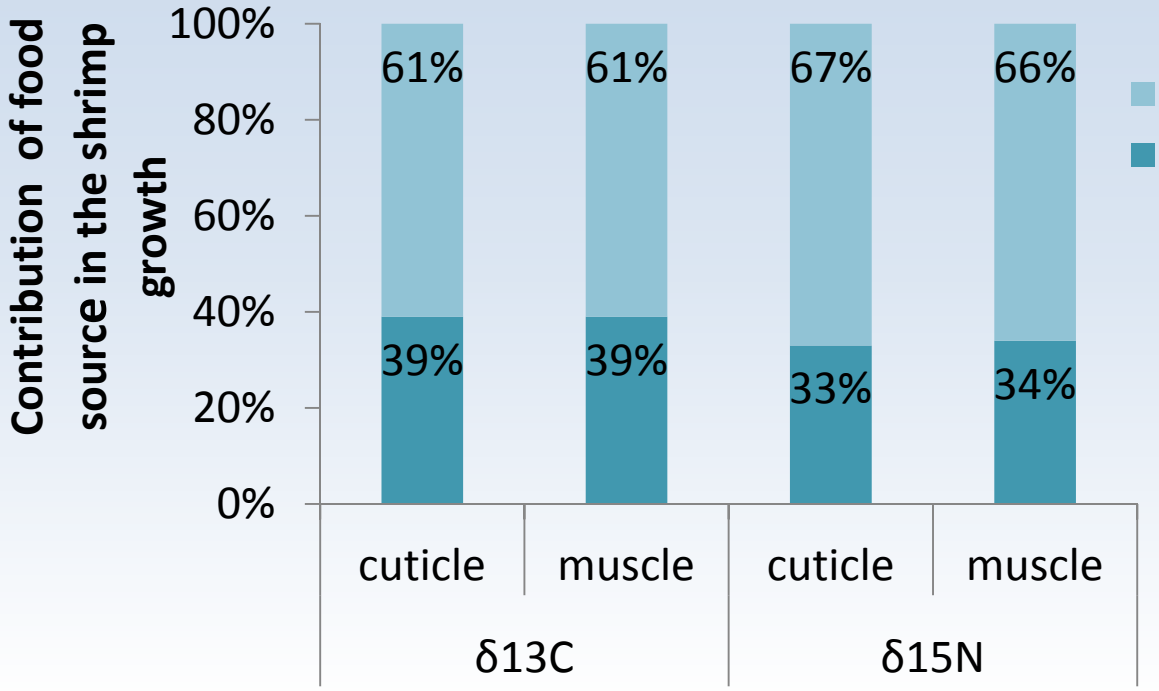
Isotopic calculation

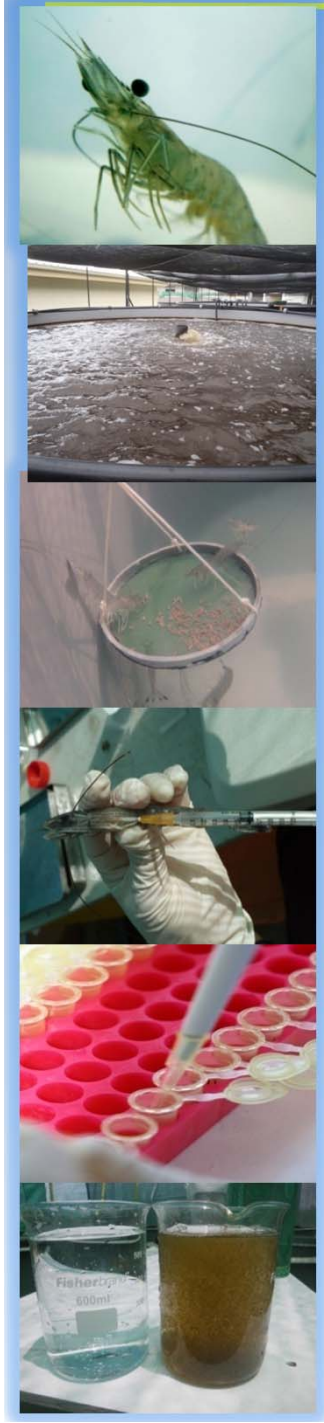
Part of each food source in the mixed treatment : natural productivity (NP) + pellets (P)

$$\delta(NP+P) = X\,\delta(P) + Y\,\delta(NP)$$

100 % =  + 

X Y





Conclusion

In the conditions of our experiment:

- Biofloc stimulate the growth of shrimps
- Biofloc improve the survival rate
- Biofloc has a major contribution in shrimp food (61-67%)

Experiment has been carried out where isotopic signatures have been switched which confirm our present results.

Thank you for your attention