

Study of the microbial flora of freshwater and seawater fish filets in different packaging conditions by metagenomic analysis targeted on the 16S ribosomal DNA

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Introduction

With the development of the high throughput sequencing and bioinformatics, metagenomic analysis has become a powerful tool to study the microbiota of food samples.

Objectives

Description of the bacterial flora in order to validate the shelf life of:

- two fish filets : pangasius (freshwater) et haddock (seawater),
- at the day of receipt and at the end of the shelf life,
- under atmospheric or modified atmospheric conditions (40% N₂/40% CO₂/20% O₂).

Results and discussions

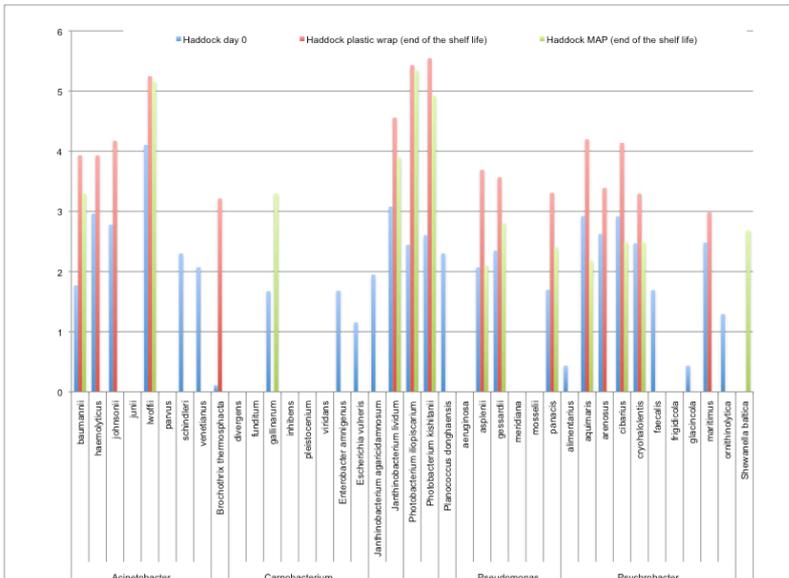
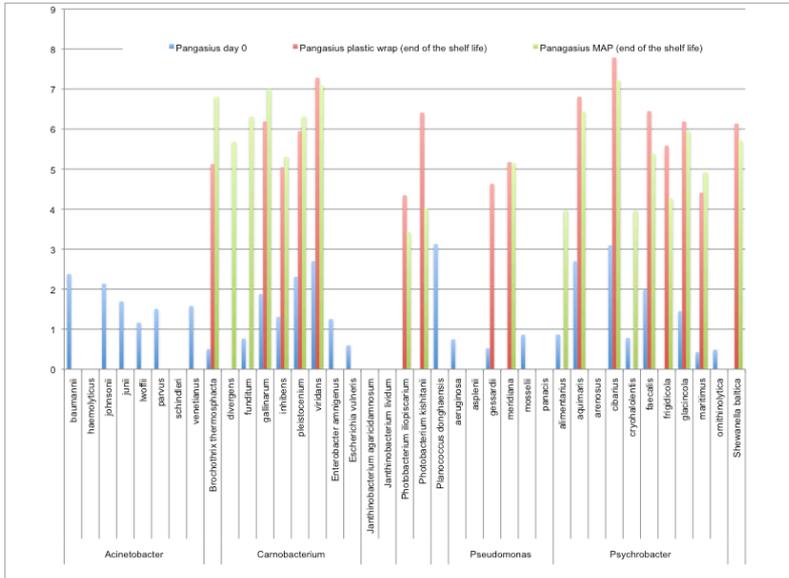


Fig. 2 & 3: Results of the metagenomic analysis, respectively, for the pangasius and the haddock filets at the day of receipt and at the end of shelf life under different packaging conditions

Materials et methods

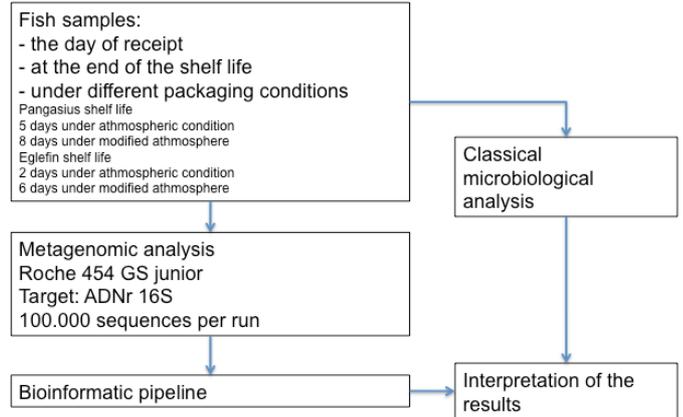


Fig. 1: Description of a metagenomic analysis

- A total of 40 bacterial strains were identified in the two fish filets.
- Variations in the initial flora were observed depending on the packaging conditions and the fish species. Some bacterial strains are over the acceptable limit of spoilage (6 log) at the end of the shelf life.
- Gram-negative bacteria are always predominant in the initial flora and at the end of the shelf life in all samples. These bacteria are well known to spoil fish filets (*Moraxellaceae* and *Pseudomonadaceae*)
- *Shewanella baltica* is a H₂S producing strain giving foul odours. *Brochothrix thermosphacta* produces undesired volatile compounds such as acetoin, diacetyl (aerobic growth), or lactic acid and ethanol (anaerobic growth).
- Some *Lactobacillaceae* were described for their protective effects against pathogen and spoilage bacteria. However they are present in low concentration.
- For the pangasius, *Planococcus donghaensis* is present before the fish packaging. His presence could provide a freshness indicator.

Conclusions

The metagenomic analysis is a powerful tool to identify and to measure the relative proportions of bacterial species in the fish filets over the time in different packaging conditions.

The growth of some Gram-negative species could be an indicator of spoilage. Therefore, metagenomic analysis could be an additional tool to adequately determine the shelf life of foods.