Fatty acids and stable isotopes as tracers of food assimilation in fish-oyster-macroalgae integrated multitrophic aquaculture ponds

Sarah Nahon, Goncalo Villa de Brito, Hugo Quental-Ferreira, Joël Aubin, Maria Emilia Cunha

FATTY ACIDS AND STABLE ISOTOPES AS TRACERS OF FOOD ASSIMILATION IN FISH-OYSTER-MACROALGAE INTEGRATED MULTITROPHIC AQUACULTURE PONDS

Sarah Nahon*, Goncalo Villa de Brito, Hugo Quental-Ferreira, Joel Aubin, Maria Emilia Cunha

UMR 1419, Nutrition, Métabolisme et Aquaculture NuMéA, AquaPôle INRA
64310 Saint Pée-sur-Nivelle, France
sarah.nahon@inra.fr

Integrated MultiTrophic Aquaculture (IMTA) is based on the production of fed species (*e.g.*, finfish) along with extractive species which re-use the inorganic (*e.g.*, seaweeds) and organic (*e.g.*, suspension-feeders) nutrients excess. To increase the development of IMTA practices, it is important to understand the trophic relationship within the system. In Mediterranean earthen ponds, meagre (*Argyrosomus regius*), white seabream (*Diplodus sargus*) and mullet (*Mugil chepalus*) are three fish species of different trophic levels that are good candidates to be cultured with oysters (*Crassostrea gigas*) and sea lettuce (*Ulva flexuosa*) but their trophic behavior are not well known under polyculture. The aim of this study was to identify the food sources used by fish and oysters using fatty acids (FA) as well as carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$) stable isotopes.

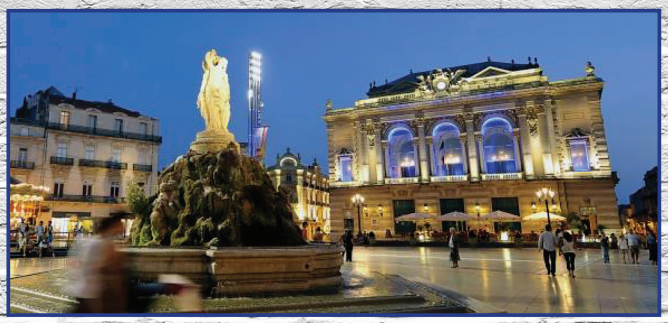
Within the Era Net COFASP project IMTA-Effect, experiments were conducted in 6 earthen ponds at IPMA´s Estação de Piscicultura de Olhão, south of Portugal. Similar biomass and proportions of meagre, white seabream and mullet were introduced in each pond and three different combinations of organisms were tested: fish-oysters, fish-macroalgae, fish-oysters-macroalgae. According to the combination, oyster spats were introduced while autochthonous macroalgae were let grown or removed from the ponds. Fish were fed daily with a commercial diet. At the end of the experiment, fish and oyster tissues were collected as well as all potential food sources present in ponds: commercial pellet, macroalgae, suspended particulate organic matter (SPOM) and polychetes. FA composition as well as $\delta^{13}C$ and $\delta^{15}N$ values of samples were determined.

The combinations of organisms had no effect on FA composition of fish and oysters. FA composition of fish were significantly different between species. FA composition of meagre and white seabream was close to those of feed. FA composition of mullet was farther than those of feed with lower proportion of C18:1□9 and C18:2□6 and higher proportion of C22:6□3. Compared to feed, polychetes also have lower proportion of C18:1□9 and C18:2□6 and higher proportion of C22:6□3. FA markers of macroalgae were not found in fish. FA composition of oysters was similar to those of SPOM and FA markers of commercial feed were not detected. The combinations of species had no effect on $\delta^{13}C$ and $\delta^{15}N$ values of fish. Meagre, white seabream and mullet were slightly enriched in ^{13}C and ^{15}N in respect to feed. However, mullet were more ^{13}C-enriched than the other fish species and closer to polychetes. Oysters cultured in the fish-oysters-macroalgae combination were ^{13}C and ^{15}N depleted compared to those from the fish-oysters combination. Similar results were found for SPOM.

Our results highlighted that meagre and white seabream only consumed commercial feed while mullets consumed feed and probably, some polychetes whatever the combination of organisms. Macroalgae were not consumed by fish but influenced inorganic C and N recycling in ponds. Oysters fed on SPOM but not on particulate feed. FA and stable isotope analysis are two complementary trophic tracers powerful to study trophic transfers between species co-cultivated in IMTA ponds.

AQUA 2018

eas
www.aquaeas.eu



WORLD AQUACULTURE Society

#We R Aquaculture

We are the producers, the investors, the suppliers, the processors, the vendors, the scientists, the educators, the students and the consumers of farmed aquatic products.

gold sponsor

BioMar

silver sponsor

AQUAFISH INNOVATION LAB

eas premium sponsor

EVONIK POWER TO CREATE

was premier sponsors

DARLING INGREDIENTS · BLUE AQUA · Tyson – TYSON INGREDIENT SOLUTIONS · ZEIGLER nutrition through innovation

conference sponsors

Montpellier Méditerranée Métropole · La Région Occitanie Pyrénées · Méditerranée · FFA · MUSE Montpellier University of Excellence · Investissements d'Avenir · Ifremer · cirad · INRA Science & Impact · IRD Institut de Recherche pour le Développement France

industry sponsors

FAIVRE · Pôle Technologique GREENSEA · INVE Aquaculture · Shaping Aquaculture Together · LALLEMAND Animal Nutrition · Phileo Lesaffre Animal Care