MERCURY BIOACCUMULATION IN THE EUROPEAN HAKE (MERLUCCIUS MERLUCCIUS) FROM THE GULF OF LIONS AND THE BAY OF BISCAY

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Abstract
Total (HgT) and methylmercury (MeHg) concentrations were measured in the muscle tissues of European hakes (*Merluccius merluccius*) from the Gulf of Lions (Northwestern Mediterranean) and the Bay of Biscay (Northeastern Atlantic). Similar chemical measurements have been performed on plankton samples and fish preys sampled in the same areas. Relationships between HgT and MeHg concentrations and the size, sex, δ15N (indicator of food web structure), growth rate and habitat of the fish were examined. Difference in growth rate between the two environments and change in feeding habits when the fish is entering adulhood seem to be the major factors governing the mercury bioaccumulation.
Keywords: Fishes, Mercury

Introduction
Mercury biomagnification in aquatic food webs is well established (Luoma and Rainbow, 2008). This process results from high efficiency of uptake and slow excretion of methylmercury (MeHg) in biota. In this context, differences in the Hg bioaccumulation in the same fish species caught from different environments can be due to factors such as mercury bioavailability, fish growth rate and specific food web structure of the fish habitat. Here, we document the bioaccumulation of HgT and MeHg in the muscle of the hake (Merluccius merluccius) from the Gulf of Lions (NW Mediterranean) and the Bay of Biscay (NE Atlantic); the aim of this study was to improve our understanding of mercury bioaccumulation pathways in marine fish.

Studied sites
The samples were collected along the shelves and continental slopes of the Bay of Biscay (BB) and Gulf of Lions (GL) in 2002 and between 2004 and 2006 respectively.

Methylmercury in the water column
The vertical distributions of MeHg in the water column near the fish sampling stations exhibit similar patterns in the two studied areas: concentrations were low in the photic zone and they increased downward within the organic matter mineralization zone; this is consistent with recent observations made in the open waters of the Mediterranean Sea (Cossa et al., 2009). L

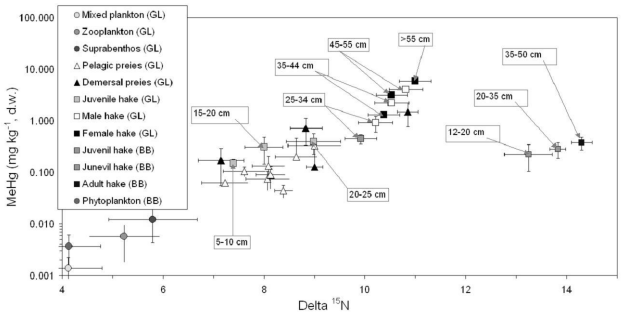

Fig. 1. Methylmercury *versus* delta 15N in the muscle of hakes and their preys from the Atlantic and Mediterranean

Effect of trophic position
The bioaccumulation and biomagnification of MeHg in the hake muscle, and in plankton, suprabenthos and other components of the food web are illustrated on figure 1 using δ15N as a proxy of the trophic level. The increase of the MeHg concentration with the trophic level agrees with the current paradigms (Hoffman et al., 2003). However, we observed two special features: (i) a shift toward higher δ15N for hakes from BB compared to similar size individuals from the GL, and (ii) higher MeHg concentrations in the muscle of the Mediterranean hake (GL), in spite of their lower δ15N. In fact, the shift for high δ15N concerns not only the Atlantic hake but also its whole food web since similar δ15N (4.1 %0) are found for plankton mixture from GL and phytoplankton from BB. It is also noteworthy that the slope of the relationship MeHg vs δ15N is steepest for adult hake from GL. This last observation is probably related to the changes in feeding habits when the fish is entering adulthood, i.e., 25 cm for GL hake and 40 cm for BB. These changes go with the differences in the growth rates of the hake between the two studied environments (Fig. 2).

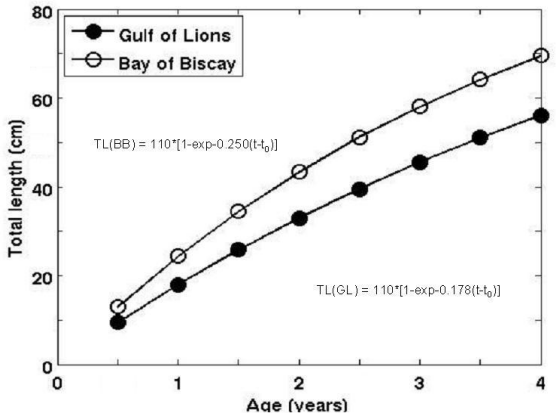

Fig. 2. Total length *versus* age of hakes from the Atlantic and Mediterranean

Effect of fish growth rates
The higher growth rate of hakes from the Bay of Biscay relative to those of the Gulf of Lions (Mellon-Duval, in press) may produce a biological dilution of the MeHg mercury absorbed by the fish and accumulated in the muscle tissue. Individuals enter adulhood when they reach 2 years in both areas.

References
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