

TROPHIC OVERLAP BETWEEN EUROPEAN EEL AND COMMERCIAL FISHES COMMUNITY OF THE LAKE ICHKEUL USING STABLE ISOTOPE ANALYSES

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Abstract

Spatial and temporal variability of European eel *Anguilla anguilla* diet and its trophic overlap were studied and compared with five species of fish community in the Ichkeul Lake using stable isotopes ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$). *Anguilla anguilla* showed the smallest isotopic niche followed by *Dicentrarchus labrax*. The eel showed significant trophic overlap mainly with *Mugil cephalus* and *Barbus callensis*. Seasonal variability of stable isotopic compositions reveals a change in eating behavior. Variable prey sources with lacustrine and continental origins are used by *Mugil cephalus* and *Barbus callensis*, while *Liza aurata* and *Liza saliens* use mainly preys with lacustrine and marine origins.

Keywords: Fishes, Food webs, Estuaries, Stable isotopes, Mediterranean Sea

Material and Methods: Fish samples were conducted monthly between March 2011 and April 2012 to obtain seasonal sampling from 11 lacustrine sites using several fishing techniques. This work targeted commercial fish species (Anguillidae, Mugilidae, Moronidae), which were collected principally from the "Société Tunisie Lagunes" catches. Fish muscle samples is used to examine the isotopic composition for $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ [1, 2]. Stomach content analysis completed the isotopic stable analysis according volumetric analysis approach. This latest was consisted of by points method [3, 4].

Result and discussion: A total of 57 fish specimens belonging to 6 species among them the eel *Anguilla anguilla* were analysed for stable isotopes compositions (Table 1). These fish are benthic feeders species, with detritivorous diet for barb and Mugilidae and carnivorous diet for eel and seabass. The fish assemblages showed a clear seasonal variability and a benthic feeder food affinity among fishes (Figure 1). Isotopic characterizations of trophic web allowed defining the fish isotopic niche and isotopic index. The Hierarchical Cluster Analysis (HCA) of fish classification according diet similarities (after stomach content analysis) [5] revealed 4 trophic groups which 3 were mono-specific. The main findings relative to the Ichkeul ecosystem functioning are related to kind of fishes and diet behavior, preys, trophic link and organic matter supplies. Zoobenthic invertebrates constitute the majority of prey ingested by higher levels consumers mainly by fishes (secondary and tertiary consumers).

Tab. 1. Mean values \pm standard deviation (SD) of $\delta^{13}\text{C}$, $\delta^{15}\text{N}$ and trophic categories of Ichkeul lake fishes during wet and dry seasons (*Dicentrarchus labrax* in the wet season were juvenile, when it was adult in dry season).

Wet season (December to May)				
Species	n	$\delta^{13}\text{C} \pm \text{SD} (\text{‰})$	$\delta^{15}\text{N} \pm \text{SD} (\text{‰})$	C/N \pm SD
<i>Anguilla anguilla</i>	8	-23.64 \pm 0.33	16.03 \pm 0.33	7.81 \pm 0.83
<i>Dicentrarchus labrax</i>	2	-19.90	9.80	3.96
<i>Liza ramada</i>	3	-22.98 \pm 2.11	12.41 \pm 0.46	3.36 \pm 0.03
<i>Liza aurata</i>	2	-21.26	17.32	3.41
<i>Mugil cephalus</i>	3	-28.86 \pm 3.22	17.65 \pm 0.60	3.35 \pm 0.21
<i>Barbus callensis</i>	6	-25.19 \pm 1.09	16.42 \pm 1.41	3.31 \pm 0.06
Dry season (June to November)				
<i>Anguilla anguilla</i>	7	-23.14 \pm 1.02	16.24 \pm 0.62	6.74 \pm 1.02
<i>Dicentrarchus labrax</i>	6	-18.46 \pm 0.22	15.68 \pm 0.06	3.26 \pm 0.10
<i>Liza ramada</i>	4	-20.15 \pm 0.75	13.53 \pm 2.21	3.15 \pm 0.01
<i>Liza aurata</i>	5	-18.18 \pm 3.67	14.80 \pm 2.74	3.32 \pm 0.20
<i>Mugil cephalus</i>	8	-20.74 \pm 0.91	14.71 \pm 0.56	3.45 \pm 0.11
<i>Barbus callensis</i>	3	-21.30 \pm 0.17	14.47 \pm 0.35	3.32 \pm 0.05

Those invertebrates preys have a major role to ensure transfer of organic matter (POM and SOM) and energy flows from the bottom to the top food web for several fishes alimentary chains. Eel appear as a key-species supporting food web functioning of the Lake Ichkeul (Figure 1). Trophic overlapping, low specific diversity index, overfishing, anthropization impacts on ecosystems, hydrobiological parameter changes and hydrological fragmentation were a real menaces which greatly influenced ecological position, stocks, functional role of *Anguilla anguilla*.

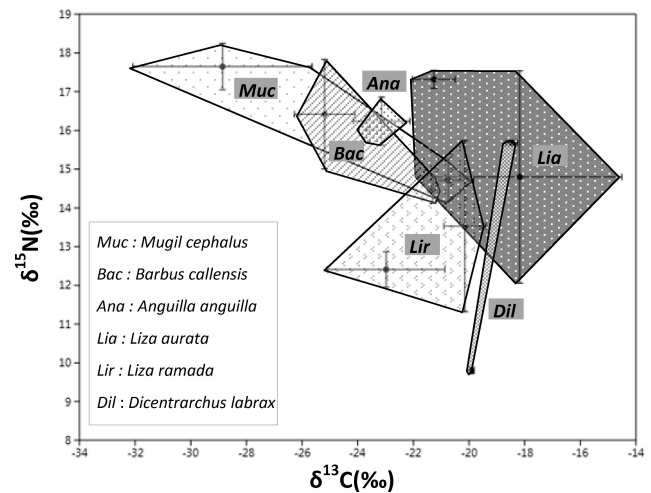


Fig. 1. Fish isotopic niches under δ -space ($\delta^{13}\text{C}$ - $\delta^{15}\text{N}$) from Ichkeul Lake.

References

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