FEEDING HABITS AND TROPHIC STATUS OF MEDITERRANEAN MORAY EEL, *MURAENA HELENA* L. 1758 IN THE ADRIATIC SEA – PRELIMINARY APPROACH

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Abstract

The feeding habits of *Muraena helena* from Adriatic Sea were studied using frequency of occurrence, numeric and gravimetric percentage, an index of relative importance (IRI), main food index (MFI) and coefficient of nutritiveness (Q). *M. helena* is a carnivore, mainly piscivore with a trophic level of 4 and up. Diet composition including 14 different prey taxa was evidently homogenous among *M. helena* size groups. Principal prey items by decreasing importance were Pisces and Decapoda. The study will be completed by analysing dietary overlap among size groups and seasons.

Keywords: Adriatic Sea, Fishes, Diet

Species from Muraenidae family are relatively big group of fishes famous by their lurking in holes, and writhing snakelike through crevices, under rocks or corals and by ability to swallow very huge prey [1]. *M. helena* is common in eastern Atlantic and Mediterranean. Two moray species are found in Adriatic Sea: very rare *Gymnothorax unicolor* and more common *M. helena*, both with minor commercial importance.

While other morays are carnivores that feed on fish, crabs and octopus with a significant role in population dynamics of many demersal fish [2], very little is known about the biology of *M. helena* and of its ecological role in Adriatic coastal ichthyocommunities.

A total of 267 individuals of *M.helena* were caught in the Southern Adriatic (42°38' 51,72" N; 18° 02' 43,57"E) by bottom long-line. Prior to alimentary tract removal, fish were weighed and measured. The tracts were individually stored in 4% formaldehyde. The alimentary tracts were opened and prey items were separated using a binocular microscope (magnification 10-60x). The number of empty tracts was recorded. Prey items were counted, weighted and identified to the lowest possible level. The weight of items was obtained by wet weight method. Whenever fragments were found, the number of individuals was determined as the lowest possible number of individuals from which fragments could have originated.

Three indices were used to describe the diet, these were: the frequency of occurrence (%F), percent numbers (%N) and weight (%W) [3]. The index of relative importance IRI = (% N + % W) * %F was calculated for each prey category as proposed by [4]. For diet comparisons, the %IRI for each food category was applied after grouping prey taxa into categories based on their taxonomy and ecology. Main food Index (MFI) by [5] and coefficient of nutritiveness (Q) by [3] were also computed. Three size groups were determined: 25 - 50 cm; 50 - 75 cm; 75 -100 cm. In ecology, the trophic level is the position that an organism occupies in a food chain - what it eats, and what eats it. Each link in this chain of consumption is termed a trophic level. Because only a fraction of the energy used by a level is converted to biomass, less energy is available at higher levels. Primary producers often have trophic level 1. There is no in-principle limit to the number of levels in a trophic system, but as only a fraction of the energy of each level can be processed by the next (10%), trophic systems with more than five levels of consumption are exceptional.

The stomach contents of *M. helena* (total length 27.5 - 100.0 cm; total weight 116.1 - 2280.0 g), were examined of which all were full. Recognizable preys of 14 different taxa were identified and grouped in 6 classes and values of IRI, MFI and Q for them are presented in Table 1. Diet was evidently homogenous among *M. helena* size groups. The diet of *M. helena* consisted of a wide variety of macrobenthos. Pisces, occurring in 2/3 of all stomachs dominated in the diet. Crustacea and Mollusca followed this group in frequency of occurrence and weight. Decapoda represented 21.1% of occurrence in all stomachs. The principal prey found were Pisces (IRI=9755.8) with dominant species *Phycis phycis* (IRI=714.1) that was found in 11.54% of stomachs and Crustacea (IRI=913.0) including more important species as *Pilimnus hirtellus* (IRI=44.7) and *Galathea strigosa* (IRI=20.2). Besides Algae, other groups were represented with approximately 2% in total stomachs contents. It is evident that Pisces are most frequent as prey in numbers and weight, they have highest index of relative importance, and besides Crustacea they represented main type of food and have the highest nutritive value, while Algae, Gastropoda, Bivalvia and Remains were secondary or accidental food. Of total analyzed stomachs, 50% were those of which the content was not possible to identify, so we classified it as digested fish material remains. Due such results, *M. helena* have a trophic level 4.2 ± 0.61 (SE) by main prey types in nutrition, which were

fishes and crabs with trophic level 2.8 and up.

Tab. 1. Diet composition of *Muraena helena*, Adriatic Sea (F is frequency of occurrence; N is numerical composition; W is gravimetric composition; IRI is index of relative importance, MFI is main food index and Q is index of nutritiveness)

Food items	%F	%N	%W	IRI	MFI	Q
ALGAE	4	3.85	0.14	15.96	0.56	0.55
GASTROPODA	2	1.92	1.92	7.68	3.76	3.69
BIVALVIA	2	1.92	0.96	5.77	1.88	1.85
POLYCHAETA	2	1.92	10.36	24.58	20.33	19.93
CRUSTACEA	22	21.15	20.35	912.99	438.99	430.39
PISCES	72	69.23	66.27	9755.82	4679.46	4587.70

Only [6] reported results of *M. helena* feeding habits (zoobentos, nekton, benthic crabs, crustacean, squids and octopus) and its findings are in agree with our results in all except by non presence of cephalopods. But, at this preliminary degree, all our samples are not analyzed till this moment (only two seasons are processed and diet may strongly vary seasonally). Moreover, high percentage of unidentified prey was present and will be carefully examined once again in terms of finding structures which may belong to other animal components.

The index of relative importance (IRI) is a frequently used to estimate diet composition, but it has disadvantages due impact to its key components. Percent frequency of occurrence (%F) does not account number and weight of the prey item. Numeric percentage (%N) does not account weight and frequency of occurrence. Consequently, %N is highly influenced by very small, but numerous preys while very rare and large prey can underline % W. Also, the results in terms of relative importance of different prey groups should be treated with caution. Some prey items that are small, soft and rapidly digested may be underestimated, while large prey with durable hard parts may be given undue importance.

Piscivorius, agressive species as *M.helena* are less influenced by abundances of specific prey taxa then are for example more specialized feeders [1] [2]. The ecological importance of this species within the mediterranean coastal communities appears to be significant and further studies are needed to assess it. Those findings will lead to the implementation of multispecies approaches to the management of Mediterranean artisanal fisheries.

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