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Preliminary data on feeding behaviour of young-of-the-year (YOY) twaite shad, *Alosa fallax* (Lacépède, 1803), during their downstream migration in two rivers of the NW of the Iberian Peninsula

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Twaite shad, *Alosa fallax* (Lacépède, 1803), is an anadromous member of the family Clupeidae that has a pelagic sea life, primarily inshore along the coast, and that migrates to river for spawning (Aprahamian *et al.*, 2003). Young-of-the-year (YOY) seaward migration takes place in schools, during summer and autumn, and before the 1st year of age (Taverny, 1991). Very little information is available concerning to the feeding behaviour during this phase of the life cycle and come from the north areas of twaite shad distribution (Aprahamian *et al*., 2003). Therefore, in the present work we perform a preliminary study on the diet composition of YOY during their downstream migration in the Ulla and Miño rivers (NW Iberian Peninsula).

YOY of *A. fallax* were captured during their seaward migration, employing a beach seine net in the upper estuary, at 18 km and 14 km far from the sea in the Ulla and Miño rivers, respectively (October 2012). Individuals were measured for total length (TL in cm), wet weighed (WW in g) and the condition index [$K=100*(WW/TL^3)$] was calculated. After that, fishes were dissected and their stomachs were removed. Food was then transferred to 70º ethanol. Food items were identified to the lowest taxonomic level possible, data are offered on relative abundance and frequency of occurrence of prey. Diet quality, in terms of energy budget (kJ/g), proteins, lipids and carbohydrates (in %), was also analysed. Coefficients for the calculation of energy budget, protein, lipids and carbohydrates were obtained from the literature (Cobo *et al*., 1999; Mera *et al*., 1999; Cobo *et al*., 2000; and references therein among others) and from our own unpublished data. Correlation analysis, Spearman's rho (r_s), between different biometric factors and diet quality indices were performed using IBM SPSS Statistics 20.0 software.

In the River Ulla a total of 560 preys, spread over 14 foodcategories, were identified in the 20 stomachs analysed (Table 1). The diet composition was [mean ± *SE* (range)]: number of prey consumed = 28 ± 8.21 (1-108) and number of food categories = 2.5 ± 0.27 (1-5). In the River Miño 304 preys corresponding to 20 food categories were identified in the 14 stomachs analysed (Table 1). The diet composition was [mean ± *SE* (range)]: number of prey consumed = 22.8 ± 6.6 (0-82.9); number of food categories = 4.6 ± 0.27 (3-6).

In the River Ulla the quality of diet was [mean ± *SE* (range)]: energy = 12.14 ± 2.57 kJ/g (1.47-37.27 kJ/g); proteins = 51.83 ± 8.44 % (3.94-144.48 %); lipids = 8.83 ± 1.42 % (0.07-21.73 %) and carbohydrates = 2.93 ± 0.46 % (0.31-7.24 %). In the River Miño the quality of diet was [mean ± *SE* (range)]: energy = 8.61 ± 1.78 kJ/g (1.31-22.29 kJ/g); proteins = 22.37 ± 4.83 % (1.76-58.32 %); lipids = 3.49 ± 0.89 % (0.10-12.02 %) and carbohydrates = 2.28 ± 0.42 % (0.14-4.7 %). A close relationship between the condition factor and amounts of energy consumed (r_s= 0.561, $p < 0.01$ bilateral) and proteins (r_s= 0.505, $p < 0.01$ bilateral) was detected.

In the River Miño, YOY were captured in a high depth area (approximately 7 m; Mota & Antunes, 2012), located under a bridge with permanent nocturnal illumination. In the River Ulla, YOY were captured in an estuarine area with lower depth (maximum of 4 m) during high tide (Prego *et al*., 2008) and that is mostly exposed during low tide. These differences in the physical environment could lead to a different faunistic composition, providing different trophic niches. Thus, the attraction effect of illumination in River Miño could increase the abundance of aerial invertebrates on the water surface. This could be the main reason why aerial invertebrates are more consumed by YOY in River Miño than in River Ulla. The lower depth in the River Ulla could influence the feeding behavioural of YOY, as they prey on epibenthos more frequently (individuals of genus *Corophium* or small fish of the genus *Pomatoschistus*). This could reflect an active feeding close to the bottom on epibenthic items (Sabatié, 1993). Thus, the composition of feeding regimes could be determined by the availability of potential prey present in the feeding areas (Sabatié, 1993; Taverny *et al*., 2000), related in turn to the morphological and behavioural adaptations of *A. fallax* for predation, as proposed Taverny & Elie (2001). Despite these slight differences in feeding patterns, crustaceans (amphipods of the genus *Corophium*) were the preferred prey in YOY diet, a phenomenon already observed (Aprahamian, 1989; Sabatié, 1993; Assis *et al*., 1992; Oesmann & Thiel, 2001).

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TABLE 1. Diet composition of YOY *A. fallax* in the Ulla and Miño rivers. Abundance (*Ai* %) and frequency of ocurrence (*Fi* %).

		River Ulla			River Miño		
Prey categories	**Family**	**N**	**A_i (%)**	**F_i (%)**	**N**	**A_i (%)**	**F_i (%)**
Aquatic invertebrates							
Amphipoda	Gammaridae	2	0.4	10.0	17	5.6	57.1
	Corophium sp.	403	72.0	65.0	146	48.0	78.6
Isopoda	Gnathiidae	114	20.4	35.0	17	5.6	50
Copepoda	Calanoida	1	0.2	5.0	8	2.6	7.1
	Caligus sp.	1	0.2	5.0	-	-	-
Decapoda	*Crangon* sp.	8	1.4	15.0	-	-	-
	Atyaephyra desmaresti	-	-	-	1	0.3	7.1
	Not identified	8	1.4	30.0	28	9.2	42.9
Crustacea	Not identified	2	0.4	10.0	1	0.3	7.1
Ephemeroptera	Not identified	0	0.0	0.0	-	-	-
Diptera	Chironomidae (pupae)	-	-	-	11	3.6	21.4
	Chironomidae (larvae)	-	-	-	2	0.7	14.3
Terrestial invertebrates							
Diptera	Chironomidae	-	-	-	16	5.3	28.6
Hemiptera	Cicadellidae	-	-	-	3	1.0	14.3
Hymenoptera	Not identified	-	-	-	5	1.6	21.4
Collembola	Not identified	-	-	-	1	0.3	7.1
Thysanoptera	Not identified	-	-	-	5	1.6	7.1
Coleoptera	Not identified	-	-	-	1	0.3	7.1
Not identified		4	0.7	20.0	35	11.5	42.9
Other prey							
Fish	*Pomatoschistus* sp.	3	0.5	10.0	-	-	-
	Not identified	10	1.8	25.0	-	-	-
	Scales	0	-	10.0	-	-	-
Sand		-	-	5.0	-	-	7.1
Vegetal remains		-	-	10.0	-	-	7.1
Unidentified remains		4	0.7	20.0	7	2.3	50

CITED REFERENCES

Aprahamian, M. W. (1989). The diet of juvenile and adult twaite shad *Alosa fallax fallax* (Lacépède) from the Rivers Severn and Wye (Britain). *Hydrobiologia*, 179: 173-182.

Aprahamian, M. W., Baglinière, J. L., Sabatié, R., *et al.* (2003). Biology, status, and conservation of the anadromous Atlantic twaite shad *Alosa fallax fallax*. *American Fisheries Society Symposium*, 35: 103-124.

Assis, C. A., Almeida, P. R., Moreira, F., Costa, J. L. & Costa, M. J. (1992). Diet of the twaite shad *Alosa fallax* (Lacépède) (Clupeidae) in the River Tagus Estuary, Portugal. *Journal of Fish Biology*, 41: 1049-1050.

Cobo, F., Mera, A. & González, M. A. (1999). Análisis químico y valor energético de algunas familias de insectos heterometábolos dulceacuícolas. *Boletín de la Asociación Española de Entomología*, 23: 213-221.

Cobo, F., Mera, A. & González, M. A. (2000). Análisis químico y contenido energético de algunas familias de insectos holometábolos dulceacuícolas. *Nova Acta Científica Compostelana (Bioloxía)*, 10: 1-12.

Mera, A., Cobo, F. & González, M. A. (1999). Valor nutritivo y energético de algunas familias de macroinvertebrados dulceacuícolas pertenecientes a la base trófica del Salmón Atlántico (*Salmo salar* L., 1758) en estadios juveniles. *In*: Real Asociación Asturiana de Pesca Fluvial-INDUROT (Eds.), *El Salmón Atlántico en la Península Ibérica: un reto del siglo XXI*: 155-162. Universidad de Oviedo, Oviedo.

Mota, M. & Antunes, C. (2012). A preliminary characterization of the habitat use and feeding of Allis shad (*Alosa alosa*) juveniles in the Minho River tidal freshwater wetlands. *Limnetica*, 31(1): 165-172.

Oesmann, S. & Thiel, R. (2001). Feeding of juvenile twaite shad (*Alosa fallax* Lacépède, 1803) in the Elbe estuary. *Bulletin Français de la Pêche et de la Pisciculture*, 362/363: 785-800.

Prego, R., Belzunce, M. J., Cobelo, A. & Helios-Rybicka, E. (2008). Particulate metal in the Ulla River estuary: State and sources of contamination (Arosa Ria, NW Iberian Peninsula). *Ciencias Marinas*, 34: 381-388.

Sabatié, M. R. (1993). *Recherches sur l´écologie et la biologie des aloses au Maroc (*Alosa alosa *Linné, 1758 et* Alosa fallax *Lacépède, 1803): exploitation et taxonomie des populations atlantiques, bioécologie des aloses de l´oued Sebou*. Thèse de Doctorat, Université de Bregtane Occidentale, Brest, France.

Taverny, C. (1991). *Contribution à la connaisance de la dynamique des populations d´aloses (*Alosa alosa *L. et* Alosa fallax *Lacépède), dans le système fluvio-estuarien de la Gironde: pêche, biologie et écologie. Étude particulière de la dévalaison et de l´impact des activités humaines*. Thèse de Doctorat, Université de Bordeaux 1, Bordeaux, France.

Taverny, C., Cassou-Leins, J. J., Cassou-Leins, F. & Elie, P. (2000). De l´oeuf à l´adulte en mer. *In*: Baglinière, J. L. & Elie, P. (Eds.), *Les aloses (*Alosa alosa *et* Alosa fallax *spp.). Écobiologie et variabilité des populations*: 93-124. INRA-CEMAGREF, Paris.

Taverny, C. & Elie, P. (2001). Régime alimentaire de la grande alose *Alosa alosa* (Linné, 1766) et de l´alose feinte *Alosa fallax* (Lacépède, 1803) dans le Golfe de Gascogne. *Bulletin Français de la Pêche et de la Pisciculture*, 362/363: 837-852.