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Abstract

Biology and Ecology of Two Anadromous Species of the Genus *Alosa* (*A. alosa* and *A. fallax*) in the Galician Coastal Marine Environment Based on Bycatch Individuals: Proposals for the Improvement of Their Protection and Management †

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Abstract: The Allis shad, *Alosa alosa* (Linnaeus, 1758) and the Twaite shad, *Alosa fallax* (Lacépède, 1803) are two anadromous and congeneric Clupeidae species, i.e., closely related, even hybridising with each other, which makes it very difficult to differentiate between them. The marine phase represents the major part of the life cycle of these species, yet there are still large gaps in the knowledge of the biology, ecology and distribution during this phase. To overcome this lack of data, this study analysed the biometric characteristics, as well as different tissues and organs, of specimens of the genus *Alosa*, caught as bycatch by inshore fisheries on the continental shelf of the coastal region of Galicia, NW Iberian Peninsula. Specimens of the genus *Alosa* (N = 345) were acquired on daily first sale notes between January and March 2021 at the fish markets of A Guarda, Malpica and A Coruña, three of the most important landing sites for bycatches of these species in Galicia, whose fleet operates mainly on the continental shelf. Analysis of gill rakers revealed a slightly higher percentage of *A. fallax* than *A. alosa*, as well as the presence of probable F1 hybrids. At the demographic level, although there were significant differences, with *A. alosa* having the highest mean age, the results showed a typical age class distribution of the adult contingent, at the age of sexual maturity, for the three taxa. Condition index results clearly reflected the size differences between the parental species and the intermediate character of the hybrids, with *A. alosa* having the highest value for this index, the hybrids intermediate values and *A. fallax* the lowest values. Trophic spectrum was common to all three taxa, including fish, plankton, benthos and cephalopods; however, *A. fallax* showed more pronounced ichthyophagous behaviour than *A. alosa* and the hybrids. Both species and hybrids share habitat, simultaneously occupying both shallow coastal areas and deeper, more distant areas. Part of the occupied habitat is in Natura 2000 areas. Two new areas are proposed to increase the protection of these species, while fulfilling the EU's obligations towards them.

Keywords: anadromous species; bycatch; European shads; congeneric species; Natura 2000 network; hybridisation; onset of spawning migration; feeding behaviour

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