The nursery role of the Guadalquivir estuary for marine fish. A long-term ecological research

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Most fish species have complex life-cycles, in which they pass through different levels of the food web and occupy different habitats. In that sense, estuaries have long been postulated as nursery areas which naturally support high densities and production levels of juvenile marine fish. A long-term ecological research program, which has been carried out monthly in the Guadalquivir estuary since 1997 onwards, has pointed out the essential role of the estuary in the Gulf of Cadiz (SW Spain). It is a well-mixed temperate estuary with a gradual horizontal change in salinity and a clear seasonal trend in water temperature. Around 30 marine fish species, some with high commercial value such as *Engraulis encrasicolus*, *Sardina pilchardus*, *Dicentrarchus labrax* and *Argyrosomus regius*, regularly use the estuary as a nursery in spring and summer. Some species are estuarine spawners but most enter the estuary as larvae, accumulate biomass, and migrate offshore. Temperature and salinity are the dominant factors structuring the nursery function. During warm periods, the stretch of estuary seaward from the 5 isohaline position is used mostly as a nursery ground. At the same time, warm water and food availability (high secondary production of copepods and mysids) in the estuary promote juveniles to grow faster than in the open ocean. Moreover, moderate turbidity and fluctuating salinity encourage juveniles to avoid predation more successfully. Nevertheless, high inter-annual fluctuations have been detected. This time series represents an effort to resolve the influence of natural (climate) and anthropogenic (freshwater management) factors on the ecological role of the estuary.