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Short Communication

Y-O-Y fish species richness in the littoral shallows of the meso-saline coastal lagoon (Mar Menor, Mediterranean coast of the Iberian Peninsula)

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Various studies on the ichthyofauna of many estuaries and coastal lagoons in Europe and the Mediterranean areas emphasize that these systems act as important nursery areas for marine fish, thereby supporting important fisheries (Elliott and Hemingway, 2002). The high productivity of these areas enable young-of-the-year fish (Y-O-Y; fish produced from the current year's spawnings) to be supported at high densities while mainly occupying shallow waters (Thiel et al., 2003). The establishment of the role of very shallow waters in littoral areas as recruitment areas and larval refuge for some fish species is an important objective for management purpose and fisheries enhancement (Pihl et al., 2002).

The Mar Menor is an originally hyper-saline coastal lagoon located in a semi-arid region at the south-eastern coast of the Iberian Peninsula. It is one of the largest coastal lagoons in the Mediterranean region, with a surface area of 135 km^2 and an average depth of 3–4 m. The lagoon shows a salinity range of 39–45‰ while temperatures vary seasonally from 10°C (winter) to 32°C (summer). Its bottom is principally covered by dense meadows of the invasive macroalga *Caulerpa prolifera*, althought shallow areas are covered by meadows of *Cymodocea* and *Acetabularia*.

This coastal lagoon supports important comercial fisheries (Andreu et al., 2003) and exhibits a rich ichthyoplankton community (Pérez-Ruzafa et al., 2004). Since the 1980s it has suffered strong environmental changes due to the enlargement of the connecting channels that caused a decrease from a hyper-saline 50–52‰ to the currently still high but meso-saline levels (according to Hammer, 1986). Moreover, watercourses flow into the lagoon, draining a large intensive agricultural area and leading to an important input of agrochemicals (Pérez-Ruzafa et al., 2000). Despite the economic importance and the consequential great impact, no documentation has at yet been published on the Y-O-Y fish community composition and structure. The objective of this study, therefore, is to provide a status list on Y-O-Y species richness in the lagoon that can be used as a comparative documentation in future studies while further changes in the community structure are anticipated in the future.

Materials and methods

As part of a larger study to examine the effects of human activities on fish communities of the coastal lagoon, Y-O-Y catches were carried out from January 2002 to March 2004 (seasonal sampling periods, eight samplings per site). A total of 45 sampling sites (per sampling period) was selected on the perimeter coastal shallow areas. At each site captures were collected using three types of sampling methods: (i) quantitative sampling using 10 m-long bag seine net and 0.5 mm mesh size by parallel 20 m reaches of shoreline in water < 1.0 m deep (three replicates); (ii) qualitative sampling using a quadrangular (40×40 cm) hand net along the shoreline; (iii) quantitative sampling using minnow-traps (Harrison et al., 1986; 0.5 m length, 0.03 m diameter entrance) set for roughly 22–24 h. The area covered at each sampling site was approximately 500–600 m^2. An attempt was made to sample all shoreline habitats to detect in an appropriate manner the complete species richness at a given sampling site. The sampled habitat types mainly comprised very shallow areas with relatively high water transparency, with seagrass meadows not occurring in very dense patches while displaying soft dominant substrate (muddy–sandy sediments).

Young-of-the-Year individuals (no larvae, only fish after yolk absorption) were identified to species level in the laboratory as fresh (non-preserved specimens; Whitehead et al., 1986; Arias and Drake, 1990; Fernández-Delgado et al., 2000) although large specimens (total length > 50 mm) were identified *in situ* and released thereafter. Fish older than 1 year were excluded from the results. Some individuals of each species were preserved and deposited in the ichthyological collection of the Zoology Department of the University of Murcia.

Results and discussion

Young-of-the-Year in the littoral zone comprises a highly diverse fish community composed of 45 species representing 30 genera and 19 families (Table 1). Sparidae represent the most diverse family followed by Syngnathidae, Gobiidae and Mugilidae. The taxonomic composition is similar to species composition of adult fish assemblages reported in several Mediterranean coastal lagoons (Mariani, 2001).

Young-of-the-Year of 27 species (60%) caught in this study are not included in the ichthyoplankton composition which was recently determined (Pérez-Ruzafa et al., 2004). Their occurrence in the lagoon, however, reflects the importance of the very shallow littoral areas as potential recruitment areas and juvenile refuges for some of these species which usually quickly settle out of the plankton once they have entered the lagoon. Moreover, not $< 53.3\%$ (24 species) of the Y-O-Y

Table 1
List of taxa collected from 45 sampling sites (eight sampling seasons) in littoral shallow areas of the Mar Menor coastal lagoon from January 2002 to March 2004

Taxonomic list		Conservation status IUCN (2004)
Cyprinodontidae	*Aphanius iberus* (Valenciennes, 1846)	DD
Poeciliidae	*Gambusia holbrooki* (Girard, 1859)	NE
Atherinidae	*Atherina boyeri* (Risso, 1810)	DD
Belonidae	*Belone belone* (L., 1761)	NE
Syngnathidae	*Syngnathus typhle* (L., 1758)	NE
	Syngnathus acus (L., 1758)	NE
	Syngnathus abaster (Risso, 1827)	DD
	Hippocampus guttulatus (Cuvier, 1829) = *H. ramulosus* (Leach, 1814)	DD
	Nerophis ophidion (L., 1758)	NE
Gobiidae	*Pomatoschistus* sp.	NE
	Gobius niger (L., 1758)	NE
	Gobius paganellus (L., 1758)	NE
	Gobius bucchichi (Steindachner, 1870)	NE
	Gobius cobitis (Pallas, 1814)	NE
Blenniidae	*Salaria pavo* (Risso, 1810) = *Lipophrys pavo* (Risso, 1810)	NE
	Lipophrys dalmatinus (Steindachner and Kolombatovic, 1883)	NE
	Parablennius sanguinolentus (Pallas, 1814)	NE
Callionymidae	*Callionymus pusillus* (Delaroche, 1809)	NE
Mullidae	*Mullus barbatus* (L., 1758)	NE
Labridae	*Symphodus cinereus* (Bonnaterre, 1788)	NE
	Symphodus ocellatus (Forsskal, 1775)	NE
Mugilidae	*Liza aurata* (Risso, 1810)	NE
	Liza saliens (Risso, 1810)	NE
	Liza ramada (Risso, 1810)	NE
	Chelon labrosus (Risso, 1827)	NE
	Mugil cephalus (L., 1758)	NE
Sparidae	*Diplodus annularis* (L., 1758)	NE
	Diplodus sargus (L., 1758)	NE
	Diplodus vulgaris (Geoffroy St. Hilarie, 1817)	NE
	Diplodus puntazzo (Cetti, 1777)	NE
	Diplodus cervinus (Lowe, 1838)	NE
	Sarpa salpa (L., 1758)	NE
	Sparus auratus (L. 1758)	NE
	Boops boops (L., 1758)	NE
Moronidae	*Dicentrarchus punctatus* (Bloch, 1792)	NE
	Dicentrarchus labrax (L. 1758)	NE
Carangidae	*Trachinotus ovatus* (L. 1758)	NE
Soleidae	*Solea solea* (L., 1758)	NE
	Solea impar (Bennett, 1831)	NE
	Solea senegalensis (Kaup, 1858)	NE
Clupeidae	*Sardina pilchardus* (Walbaum, 1792)	NE
	Sardinella aurita (Valencciennes, 1847)	NE
Engraulidae	*Engraulis encrasicolus* (L., 1758)	NE
Pomatomidae	*Pomatomus saltatrix* (L., 1766)	NE
Anguillidae	*Anguilla anguilla* (L., 1758)	NE

NE, not evaluated; DD, deficient data.

species caught are among the species that form the main targets for commercial fisheries in the Mar Menor, or represent species that are legally protected. This again emphasises the importance of the shallow water habitats. There is an urgent need to gain quantitative information on abundance, growth and survival of Y-O-Y from this coastal lagoon in order to derive appropriate evaluations and recommendations for potential recovery management programmes and – in the long run – assist in the decision of whether fisheries enhancement measures make sense or if environmental quality control of pollutional input will have to be dealt with as a management priority. The present study may serve as a comparative species richness index against which future accounts may be assessed.

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