



Effects of flush floods on nutrient loads to a semiarid coastal lagoon: Mar Menor (Murcia, Spain)

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The Mar Menor, located in the Murcia Region, is the largest hyper-salt lagoon in the Western Mediterranean and one of the most important wetlands in Spain. The Mar Menor and its catchment area combines important environmental values (species diversity) with relevant socio-economic activities and human pressures such as tourism, traditional fishing, agriculture, salt extraction and aquaculture. The decline of water quality in the Mar Menor has been attributed to increased nutrients inputs from diffuse agricultural sources. Also, from the 1960s, a growing tourist population, mainly during summer periods, produces an increasing discharge of point-source urban waste water. The area draining to the Mar Menor is a semiarid basin with several ephemeral channels. The hydrological response of this basin is mainly driven by episodic, high-intensity storm events which generate surface runoff and mobilise the sediments accumulated in the channels.

A study to evaluate the Mar Menor contamination source and the contribution of the several flood events to the total loads to the lagoon is presented. The study was conducted in the Albujón catchment. This is the main channel ('rambla') draining into the Mar Menor and the only channel with a permanent water flow, due, in part, to increases in the irrigated land surface. Two sampling points across the watershed have been selected to carry out the study: the baseflow which is located at the beginning of permanent flow reach; and the outlet, which drains directly to Mar Menor. During fourteen months (February 2003 to April 2004) the water has been sampled, twice per month, for nutrients and chemical characteristics determination. In addition, three significant flood events occurred during the study period were intensively manually

sampled during the rising and falling limb of the hydrograph. All water samples and sediments during the flush events were also analysed for nutrients. The event rainfall characteristics (rainfall depth and intensity) have been collected from six gauge station distributed across the catchment

The hydrological response seems to be driven more by rainfall intensities and distributions than by the total rainfall depth. The evolution of nutrient load in time is closely related to the hydrograph shape for the three flood events. While the total nitrogen (TN) and total phosphorus (TP) loads in sediment are negligible compared to the load of these nutrients dissolved in the runoff water, the total organic carbon (TOC) loads in the sediment are much higher than the dissolved load. TN and TP loads coming from the flood events to the lagoon are much lower than those coming from the continuous flow. Thus, the loads at the outlet point are 80 times higher for TN and 37 times higher in TP than those from the flood events. Lower differences in the contribution to the total load to the lagoon, between the flood events and the outlet, are given for TOC and total suspended solids (TSS) these being only four times higher in the outlet than for the flood events.

Although, TN and TP dissolved in runoff water represent the 99% of the total nutrient load contribution from the flood events to Mar Menor, the TOC in the sediment represents 80% of the total load suggesting the importance of sediment re-mobilization in this area. The three flood events carried about 20% of the total TOC and TSS load draining into the Mar Menor during a fourteen months period, suggesting the importance of controlling erosion in the catchment to minimise non-point source pollution of the lagoon.

The knowledge of the different sources of runoff and sediment production and its geographical distribution is therefore a key aspect for overall pollution control.