

Physical and Chemical Limnology of the Abegondo-Cecebre reservoir, A Coruña, NW Spain

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The Abegondo-Cecebre reservoir was commissioned in 1976. It has a nominal capacity of ~ 23 hm³ and an actual regulation capacity of 20.6 hm³ (12.9 hm³ in rainy periods, when flood control is necessary). This reservoir constitutes the only source of drinking water for the city of A Coruña and its metropolitan area (~ 400.000 inhabitants). The reservoir, which is two-tailed, is located downstream the Barcés and Mero rivers (~ 250 km²) and belongs to the so-called Galician-Coast River Basin district (16,372 km²). The increasing water demand for human consumption and industrial purposes challenges the supply capacity of the system and this is especially acute when, in hydric-stress situations, the availability of water becomes reduced and the water quality is adversely affected by a number of hypolimnetic processes (anoxia, increased metal concentration, etc.) or by episodic algal blooms. Between May 2010 and May 2012, within the context of the LIFE07 ENV/E/000826 Aqua Plann Project, an in-depth study was commissioned by the local water supply managers (EMALCSA). The study encompassed a bathymetry and colmatation characterization as well as a systematic physico-chemical survey via monthly sampling and measurement in selected stations a series of relevant limnological parameters. Surface and bottom reservoir water was sampled in seven representative locations of the system while three of them were used for depth profiling. In addition, five stations were considered for collecting the top layer of the sediments of the reservoir (~ 20 cm) in two surveys developed in the spring and summer of 2012. The parameters determined, complemented with meteorological information and discharge flows, included temperature, Secchi's depth transparency, PAR radiation, pH, electrical conductivity, redox, dissolved oxygen, turbidity, alkalinity, chlorophyll, phycocyanin, Na, K, Ca, Mg, F, Cl, SO₄, NH₄, NO₃, NO₂, PO₄, DIC, DOC, particulated organic carbon, Fe, Mn, Al, As, Ba, Be, B, Cd, Co, Cr, Cu, Hg, Ni, Pb, Se, Zn, total P and N, BOD₅, 27 plagiocides, 8 HPAs, 23 COVs, 18 PCBs, phenols, detergents, and a 4 indicators of microbial water quality. Based on the previous studies, some relevant morphometric parameters are the following: maximum length: 3627 m; maximum width: 1525 m; maximum depth: 17.2 m; mean depth: 5.9 m; catchment to lake ratio: 64. Based on the bathymetric survey, the reservoir volume lost by sedimentation in its 35 years is about 9.3%. The Abegondo-Cecebre reservoir presents a mesotrophic-eutrophic state. Thermal stratification starts in March and an annual overturn occur in November (monomictic system). Hypolimnetic oxygen depletion is nearly complete (i.e. anoxia) from the beginning of June to mid-end October. Along this period, a number of redox reactions take place in the bottom waters that tend to increase metal and NH₄ concentrations, reduce NO₃ (and partly SO₄) and release P from the sediments.