Geophysical Research Abstracts
Vol. 17, EGU2015-13986-1, 2015
EGU General Assembly 2015

The impacts of climate and land-use change scenarios on river ecology: the case of Margaritifera margaritifera

Regina Santos (1), Luís Fernandes (1), Simone Varandas (1), Mário Pereira (1,2), Ronaldo Sousa (3,4), Amilcar Teixeira (5), Manuel Lopes-Lima (4), Rui Cortes (1), and Fernando Pacheco (6)

(1) Centre for the Research and Technology of Agro-Environmental and Biological Sciences, CITAB, University of Trás-os-Montes and Alto Douro, UTAD, Quinta de Prados, Ap. 1013, 5001-801 Vila Real, Portugal (rsantos@utad.pt, lfilipe@utad.pt, simonev@utad.pt, gp, (2) Dom Luiz Institute, University of Lisbon, Campo Grande, 1749-016 Lisbon, Portugal (gpereira@utad.pt), (3) CBMA - Centre of Molecular and Environmental Biology, University of Minho, Campus de Gualtar, 4710-057 Braga, Portugal (rg.eco.sousa@gmail.com), (4) Interdisciplinary Centre of Marine and Environmental Research (CIIMAR/CIMAR), University of Porto, Rua dos Bragas 289, P 4050-123 Porto, Portugal (rg.eco.sousa@gmail.com, lopeslima.ciimar@gmail.com), (5) Mountain Research Centre, School of Agriculture, Polytechnic Institute of Bragança, Campus de Santa Apolónia, Ap. 1172, 5301-854 Bragança, Portugal (amilt@ipb.pt), (6) Chemistry Research Centre, University of Trás-os-Montes and Alto Douro, UTAD, Quinta de Prados, Ap. 1013, 5000-801 Vila Real, Portugal (fpacheco@utad.pt)

Climate change is one of the most important causes of biodiversity loss in freshwater ecosystems and it is expected to cause extinctions in many species in the future. Freshwater ecosystems are also highly affected by anthropogenic pressures such as land use/land cover changes, water abstractions and impoundments. The aim of this study is to assess the impacts of future climate and land-use in the Beça River (northern Portugal) namely on the conservation status of the endangered pearl mussel Margaritifera margaritifera (Linnaeus, 1758). This is an environmental indicator and endangered species currently present in several stretches of the Beça River that still hold adequate ecological conditions. However, the species is threatened by the precipitation decrease projected for the 21st century and the deviation of a significant portion of the river water to an adjacent watershed (since 1998). This decrease in river water can be especially acute during the summer months, forming small pools dispersed along the water course where M. margaritifera, and its host (Salmo trutta), barely find biological conditions for survival.
The materials and methods used in this study include; (i) the assessment of water quality based on minimum, maximum and average values of relevant physicochemical parameters within the period 2000–2009; (ii) assessment of future climate change settings based on air temperature and precipitation projected by Regional and Global Circulation Models for recent past (1961 – 1990) and future climate scenarios (2071 – 2099); (iii) data processing to remove the model biases; and, (iv) integrated watershed modelling with river-planning (Mike Basin) and broad GIS (ArcMap) computer packages.
Our findings comprise: (i); a good relationship between current wildfire incidence and river water quality; (ii) an increase in the future air temperature throughout the year; (iii) increases in future precipitations during winter and decreases during the other seasons; (iv) major runoff decrease more likely to occur between April and June and in October (<-30% in both future scenarios) which may reach –50%; (v) a decrease in the simulated average water depth in most river sections leading to habitat fragmentation by loss of connectivity during the summer season (water depth < 10 cm) with reverberating effects on the mobility of Salmo trutta, which may impair the reproduction and recruitment of pearl mussels.
In addition, human-related threats mostly associated with the presence of dams and wildfires are expected to increase in the future. The presence of dams contribute to an additional decrease in the connectivity and river flow while the forest fires are a major threat, related to the wash out of burned areas during storms, eventually causing the disappearance of the mussels, especially the juveniles. In view of future climate and land-use change scenarios, conservation strategies are proposed to maintain good status and enable recovery, including the negotiation of ecological flows with the river board authorities, the replanting of riparian vegetation along the water course and the reintroduction of native tree species throughout the catchment.

This work was supported by national funds by FCT - Portuguese Foundation for Science and Technology, under the project PEst-OE/AGR/UI4033/2014 and by the project SUSTAINSYS: Environmental Sustainable Agro-Forestry Systems (NORTE-07-0124-FEDER-000044), financed by the North Portugal Regional Operational Programme (ON.2 – O Novo Norte), under the National Strategic Reference Framework (QREN), through the

European Regional Development Fund (FEDER), as well as by National Funds (PIDDAC) through the Portuguese Foundation for Science and Technology (FCT/MEC).