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Using river channel geomorphology to identify the spatial distribution of dippers (*Cinclus cinclus*) in regulated and unregulated rivers: a GIS based study with examples from central and north east Scotland

K.A. Donald, C.N. Gibbins, D. Tetzlaff and C. Soulsby

Department of Geography and Environment, University of Aberdeen, St Mary's, Elphinstone Road, Aberdeen, Scotland, AB24 3UF (k.donald@abdn.ac.uk / Phone: +44 1224 273696)

The physical characteristics of a bird's environment and how it interacts with this environment are important influences on its spatial distribution and abundance. Whilst birds have long been recognised as good indicators of environmental change, very little work has been carried out on specialist riverine species in relation to physical habitats or habitat change. Changes to river discharge regimes, resulting from climate change or flow regulation, could impact riverine birds because of the importance of these regimes for processes of sediment transport and deposition, processes that determine channel geomorphic characteristics. This paper examines the abundance of a specialist riverine bird, the dipper (*Cinclus cinclus*), in relation to river channel geomorphology; it aims to assess whether dippers occur predominantly in reaches with particular geomorphic characteristics.

The study was undertaken along 108 km of river in one regulated and two unregulated Scottish catchments. Channel geomorphology was surveyed in the field and classified according to the process based typology developed by Montgomery and Buffington (1997). The typology categorises channel reaches according to the relative balance between sediment supply and transport capacity, a balance that is determined by reach gradient and discharge. Dippers were located by direct observation and their positions recorded in relation to channel reach type. Data were mapped and interrogated using a Geographic Information System (GIS). Data on the availability and use of different reach types by dippers were used to construct reach type electivity indices which quantified selection or avoidance.

Indices suggested that dippers select reaches with plane bed and transitional plane bed/step-pool morphologies. These morphologies were characteristic of reaches with gradients of approximately 2-5 %. Results thus provide a process-based explanation for the previously observed correlation between dipper density and channel gradient. More specifically, results suggest that alterations to flow regimes which lead to changes in channel geomorphic characteristics may affect the suitability of river reaches for dippers.