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DENSITY DEPENDENCE AND DENSITY INDEPENDENCE IN THE DEMOGRAPHY AND DISPERSAL OF PIKE OVER FOUR DECADES

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Abstract. Quantifying the effects of density dependent and density-independent factors in demographic and dispersal processes remains a major challenge in population ecology. Based [illegible]pture (CMR) data (1949–2000) on pike (*Esox lucius*) provi[illegible]timates of density-dependent and density- [illegible]f individu[illegible] size and sex, on natural survival, fishing [illegible]al is expect[illegible]d to be related to the individual growth [illegible]arallelism b[illegible]tween the two processes by applying the best-supported survival model structure to indivi[illegible]ual growth data. The CMR data were analyzed using sex- and age-structured multistate m[illegible]odels (two lake basins: north and south) assuming no seasonal variation in survival and dispersal. Total survival and dispersal probabilities were insensitive to this assumption, a[illegible]d capture probability was shown to be robust to assumptions about intra-annual variati[illegible]n survival and dispersal. The analyses revealed that large pike (>55 cm) displayed marke[illegible] basin-specific differences in survival and dependent and density-independent factors affecting survival, dispersal, and individual growth of an aquatic top predator.

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Key words: cannibalism; capture–mark–recapture; demography; density dependence; Esox lucius; *growth; harvesting;* Perca fluviatilis; *predator–prey interaction; temperature; Windermere, United Kingdom.*

INTRODUCTION

Survival and dispersal are key elements in the determination of the overall dynamics of animal and plant populations. The rates of both survival and dispersal are typically affected by density-dependent (endogenous) and density-independent (exogenous) factors (Turchin 1995), and the effects of these ecological processes are commonly mediated by the size and state of the individuals involved (Lomnicki 1988). However, statistical modeling of such vital rates only rarely simultaneously consider both density-dependent and density-independent factors under the influence of individual status (but see Clobert et al. 1988, Leirs et al. 1997, Milner et al. 1999, Catchpole et al. 2000). Capture–mark–recapture (CMR) data retrieved from systems consisting of multiple sites offer a rare opportunity to study survival and dispersal processes (Altwegg et al. 2003, Schaub and Pradel 2004). Since most C[illegible] possibl[illegible] role o[illegible]