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Title

Life history variation, population processes and priorities in species conservation: towards a reunion of research paradigms

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We argue that a relationship between life history variation and population processes may form the foundation for developing a theory for variation in population growth rate. An examination of the distribution of 104 European bird species in relation to their clutch size and adult survival rate showed three different clusters. First, there is a large group of species which lay a large number of eggs and have low adult survival rate. The second cluster consists of species with very high survival rates and a clutch size of only one egg. The third group is characterized by species with high survival rates but still a relatively large clutch size. From these clusters of life history characteristics we argue that the species can be classified according to the quality of their survival and breeding habitats, respectively. *The high-reproductive species* live in favourable breeding habitats, but poor survival habitat. In contrast, the survival habitat of *the survivorship species* are very good, but the breeding habitats are poor. *The bet-hedging species* live in favourable breeding and survival habitats, but the annua! variation in the quality of the breeding habitats is very large, favouring the evolution of a larger clutch size than in the survivorship species.

In order to examine the effects of these patterns of covariation between life history traits on population dynamics we calculated the sensitivity and elasticity of popula-tion growth rate to a change in age-specific fecundity or mortality rates for one species from each of the three life history types. These analyses showed that population growth rates of high-reproductive species were more sensitive and elastic to changes in the fecundity among the younger age-classes, compared to the species from the two other groups. Furthermore, elasticity to variation in mortality rates was higher than to variation in fecundity rates in all three species.

To provide a further link between life history variation and population dynamics the results from key-factor analyses of population fluctuations in birds and mammals were reviewed. In most altricial birds, the key-factor appears during the non-breeding season. In contrast, in precocial birds key-factors from the breeding season explained a higher proportion of the variance in the total losses than the losses during the non-breeding season. In the majority of the cases density-dependence was found in the losses during the non-breeding season.

According to the Allee-effect, we would expect that the population growth rate should decrease with density at low population sizes. No evidence was found for the presence of an Allee-effect in the studies of 11 bird species which were reduced to very low population levels during the study period. We suggest however that such an Allee-effect still may be important due to a reduction in the defence efficiency among predators or parasites, reduction in mating efficiency, or reduction in the foraging efficiency at low population densities.

These results may have some important implications for overall priorities in the development of strategies for conserving species diversity. In particular, we focus on the securing of survival habitats for especially longlived species outside the breeding season.

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