

THESIS FOR A TRADE-OFF WITH BREEDING SUCCESS

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According to the most recent studies, breeding success in several waterfowl species (geese, ducks, coots, shorebirds) has been correlated with nutrient reserves (mostly lipids, but also proteins) stored at the end of the winter season whilst birds are still on their winter quarters. Wintering strategies suggest that body condition of birds at the end of the winter season is controlled by body condition at the beginning of the winter season. Wintering strategies analysed on several duck species in Camargue, south France on the mediterranean shore, allow birds to optimize daily allocation of time and energy. Considered as a model to be realised at the individual level, they rely on ecological links between three successive periods.

1) Restoring period. When birds arrive at the winter quarter, they must refuel after migration till optimum weights are reached. Daily feeding times are long and the period lasts 2-3 months. 2) Pairing period. Birds have enough stored energy to reduce daily feeding and sleeping duration. This is the only period in the winter season when they have some extra time and they take advantage it for courtship and pairing. 3) Fattening period. From January onwards, environmental conditions become worst, food is scarce and birds must store energy for spring migration and breeding. During this period, daily feeding durations are the longest and a strong intraspecific competition for food occurs where paired birds are hierarchically dominant.

According to this hypothesis, it is a selective advantage for a duck to be paired before the end of the season in order to have a priority access to food during the last months of the winter season, hence to have a better body condition before leaving for spring migration and a better fitness in terms of feeding success. Autumn pairing, an unusual timing characteristic of most waterfowl species as compared to other bird species and families, appears as a full component of wintering strategies for these species in Camargue. We suspect the existence of a trade-off between early pairing as a part of a wintering strategy, and breeding success. The cost

(or one of the costs) of this early pairing is to maintain pair bonds for a longer time than if birds were paired just before laying. The benefits are 1) to increase the ability of paired females to store nutrients during the late winter fattening period, but also 2) to increase fitness because pair formation is very time consuming and pairing later (that is during the fattening period) would be hindered by lack of available time and energy. From this point of view, pairing does not only concern females, but both males and females.

This wintering strategy hypothesis is a model based on observational data from species which winter in mild temperate zone. It is supposed to differ from one population, species and winter quarter to another, respectively. It has to be tested at the individual level to be validated.