Evidence for the cause of the decline in the whinchat (*Saxicola rubetra*).

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Agricultural intensification has been implicated in the declines of farmland birds across Europe (e.g. Donald et al. 2001). As with many farmland bird species in Europe, the whinchat *Saxicola rubetra* has declined by 55% between 1980 and 2008 (Klvaňová et al. 2010). However establishing the proximate and ultimate causes of population decline of any farmland species is complicated by the fact that agricultural intensification is not a single process and that these processes have occurred simultaneously and interdependently (Newton 2004). A variety of studies have investigated the role of agricultural intensification in underpinning declines in the whinchat . These studies have focused on i) the impact of agricultural change in relation to breeding phenology, success and adult survival (Grubler et al. 2008; Muller et al. 2005) and ii) the impact of changing arthropod prey abundance on breeding success in areas that differ in their farming intensity (Britschgi et al. 2006).

The whinchat nests on the ground in open grasslands, and is therefore susceptible to agricultural operations associated with grassland management such as mowing for the production of hay or silage (Muller et al. 2005). Muller et al. (2005) studied the changes in agriculture and the breeding population of whinchats for 15 years in two contrasting plots, one in the valley bottom (min. alt.1120m) and one on the valley slope (min. alt. 1400m). A number of significant changes in farming practise were shown to be important for whinchats. Management of pastures was intensified through increased irrigation and fertilisation, field sizes were increased and first mowing dates advanced by about 20 days and the shift was much more pronounced in the valley bottom site. Whinchat breeding phenology did not change in response to earlier mowing and consequently, the proportion of successful broods was higher on the valley slopes and nest losses to mowing were much lower compared to the valley bottom. Models to explore the reasons for variation in breeding success found that 32% of the variation was explained by the date in which 50% of the area was mown in the valley bottom. In contrast, on the valley slopes, late mowing and high May temperatures explained 72% of the variation in breeding success. Recent work has shown it is not only the nests that suffer mowing mortality. Grubler et al. (2008) studied adult mortality during the breeding season and found that mowing related mortality in female whinchats had increased in recent years and only 68.4% of females survived the breeding season compared to 80.6% of males. Modelling how female survival rate would have changed in relation to the known changes in agriculture over a 20-year period, the authors clearly show that female mowing mortality has driven changes in the sex ratio of the population. Population modelling showed that including the additional effect of female mowing mortality results in a population that declines 1.73 times faster than one with simple nest destruction. Thus, increased female mortality due to advanced mowing is an important factor in the decline of whinchat populations in Alpine Switzerland.

The whinchat is an insectivorous farmland passerine therefore changes in the abundance or size distribution of arthropod prey could also be important in the declines. Britschgi et al. (2006) undertook a comparative study between intensively and traditionally managed meadows, to understand how management effects the arthropod prey of whinchats and the implications for breeding success. Arthropods were more abundant, diverse and larger in traditionally managed meadows and this resulted in higher arthropod biomass fed to young and lower incidence of partial brood loss and therefore higher overall fledging success in the traditional meadows.

These studies provide compelling evidence that the decline of whinchats, at least in Switzerland, has been driven by three factors related to agricultural intensification:

1. Advancement in mowing date increased nest destruction rates and therefore lowered productivity (Muller et al. 2005).
2. Agricultural intensification lead to a decrease in the availability of grassland invertebrates reducing parent foraging efficiency and success again reducing productivity (Britschgi et al. 2006).
3. Further advancement of mowing dates increases the number of nests destroyed and females killed, lowering female survival, producing a male biased population and reducing the future number of pairs in the population (Grubler et al. 2008).

While the Britschgi et al. (2006) study point quite clearly to the role that reduced arthropod prey may have in the declines of whinchats in Switzerland, no link is made between arthropod declines and increased use of insecticides of any kind. The differences between intensively and traditionally managed meadows were ascribed to three factors; i) the number of cuts per year (5-year mean), ii) date when 50% of the area was mown and iii) mean flower diversity at the end of May. It may be that the mechanisms for reduced arthropod abundance in whinchats could be very similar to that described in relation to black-tailed godwits in the Netherlands (Kleijn et al. 2010 also see J. Smart review of the evidence for black-tailed godwit declines). It is entirely feasible that advancement of mowing results in reduced availability of high quality foraging areas because it has been mown before the peak chick rearing phase or that un-mown meadows are now poorer quality foraging areas because fertiliser use and climate related changes result in uniform tall swards where prey are less available.

Tennekes (2010) report does little more than highlight trends in whinchat numbers in relation to the difference in arthropod abundance between areas in the Britschgi et al. 2006 study which does not consider differences in insecticide use between meadow types. Nowhere does Tennekes discuss alternative interpretations to his main theses and his report overlooks the peer-reviewed literature, that provides strong evidence for the role of mowing related mortality in the declines of whinchats. Furthermore, whinchats

breed across a range of habitats, lowland and upland grasslands, heathland and mooorland fringe that are very likely to be those with low insecticide burdens.

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