Consequences of EU expansion for farmland birds in eastern Europe

For some time conservationists have been warning of potentially grave environmental consequences of European Union (EU) expansion in the absence of reform of the Common Agricultural Policy (CAP). Now, Donald *et al.*[1] provide alarming evidence that, for farmland birds at least, such fears are well founded. Their study relates changes in bird populations, in EU and nonEU eastern European countries, to measures of agricultural intensity, such as cereal and milk yield, and numbers of tractors or workers per farm. A principal component analysis results in countries separating into clear categories along an axis representing a gradient of agricultural intensity. Not surprisingly, many eastern and southern European countries, such as Spain, Greece, Croatia, Latvia and Romania, fall at the low-intensity end of the scale with generally low agricultural yields, few tractors and/or harvesters and many workers, whereas mainly western EU countries, such as The Netherlands, Germany and UK, cluster at the opposite, intensive end of the scale.

More importantly, the bird populations in these different categories also exhibit distinct patterns of change. In general, populations in the low-intensity countries have exhibited the smallest declines, whereas those associated with the high-intensity countries have declined very rapidly in the past 25–30 years. In fact, cereal yield alone, a good measure of agricultural intensity, explained over 30% of the variation in bird population trends. The study is, of course, purely a correlative one and cannot provide evidence for a causative link between bird numbers and agricultural change. However, there is now overwhelming evidence that declines in farmland birds, in the UK in particular and elsewhere in the EU, have been caused by changes in agricultural practices.

This work suggests that agricultural change is a major threat to biodiversity at a continental scale. If EU agricultural policy does not shift towards 'greener' farming, then accession to the EU will almost certainly be followed by increasingly rapid loss of biodiversity in many Central and Eastern European Countries (CEEC). The work draws from the FAOSTAT database of the United Nations Food and Agriculture Organisation and the Birdlife International/European Bird Census Council European Bird Database. It clearly demonstrates the scientific and political value of such long-term, extensive data sets at a time when securing funding to maintain them is extremely difficult.

1 Donald, P.F. *et al.* (2001) Agricultural intensification and the collapse of Europe's farmland bird populations. *Proc. R. Soc. London B. Biol. Sci.* 268, 25–29

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Toxic nectar: one man's meat is another man's poison

The aim of a good review should be to clearly lay out current knowledge on an interesting subject, hopefully in a way that brings new insights, and to then identify areas for further work. To find an example of a good review is sometimes harder than it should be. To find one written about an intriguing situation that has received relatively little attention is even rarer – in a recent review of the ecological significance of toxic nectar[1], Lynn Adler clearly and concisely describes the current state of our knowledge of a fascinating topic, while, at the same time, highlighting an important gap in our understanding of the subject.

The existence of nectars that are toxic to potential pollinators seems paradoxical. However, several adaptive theories have been put forward: the toxic secondary compounds are variously postulated to: induce specialization of pollinators, reducing pollen loss; encourage pollinators to leave a plant quickly, increasing the chance of out-crossing; discourage nectar robbers; modify pollinator behaviour, so as to reduce grooming and consequent pollen removal; and to have antimicrobial properties. All of these hypotheses have received some empirical exploration. However, Adler's thesis is that this might be premature, as no one has explored (never mind found) whether plants gain any benefit from toxic nectar. It might be that the toxic nectar is a costly or cost-free pleiotropic effect. For example, secondary compounds might be present in nectar as a consequence of their presence in the phloem, where it plays a role in herbivore resistance. There has been no study of the relationship between compounds in phloem and nectar.

Adler emphasizes the need for phylogenetic studies to determine whether toxic nectar occurred concurrently with the evolution of novel secondary compounds, or whether it arose subsequently. Studies to address whether toxic nectar is adaptive are also urgently needed before it can even be stated that toxic nectar might have evolved in response to selective pressures exerted by ecological interactions in plant–pollinator–herbivore systems. Clearly, only if toxic nectar is found to benefit some plants, can the questions regarding how it produces this effect be addressed. However, if toxic nectar is not found to be adaptive, then we will have the beginnings of evidence for toxic nectar as a result of now ineffectual selective pressures, or a pleiotropic outcome owing to selection on other traits, such as resistance to herbivores.

To us, there is a general message from Adler's work: we should be wary of developing numerous hypotheses on adaptive functions before the evidence for any benefit of a trait is available.

1 Alder, L.S. (2000) The ecological significance of toxic nectar. *Oikos* 91, 409–420

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