



# Agricultural land use, barn owl diet, and vertebrate pest control implications



Sara M. Kross\*, Ryan P. Bourbour, Breanna L. Martinico

Department of Wildlife, Fish & Conservation Biology, University of California, Davis, One Shields Avenue, Davis, CA 95616, United States

## ARTICLE INFO

### Article history:

Received 27 October 2015

Received in revised form 18 February 2016

Accepted 1 March 2016

Available online 9 March 2016

### Keywords:

*Tyto alba*

Pest-control

Land use change

Raptor

Ecosystem services

## ABSTRACT

Barn owls (*Tyto alba*) are the most widespread raptor species on Earth, and because they are thought to provide natural vertebrate pest control services, farmers in some agricultural regions have encouraged barn owls to breed and hunt on their farms by installing artificial nest boxes. However, barn owl populations are declining in some agricultural regions, which may be a result of changes in land use and agricultural intensification. We studied barn owl diet and nest box occupancy in an intensive agricultural landscape in the Central Valley of California to measure whether agricultural land use affected barn owl diet. We collected 415 viable pellets from 25 active nest boxes over two breeding seasons and compared these results with agricultural land use types within a 1-km radius of each nest. Mice (*Mus musculus* and *Reithrodontomys megalotis*) were the most numerous prey and the most important by biomass, but their importance in barn owl diet declined with higher proportions of perennial crops in the surrounding landscape. California voles (*Microtus californicus*) were less important by number, but still represented a significant proportion of the biomass consumed by owls in our study area. Pocket gophers (*Thomomys* spp.) were consumed less often but were also an important source of biomass. Furthermore, barn owls nesting in areas with higher proportions of perennial crops consumed more gophers and fewer voles, many of which were juveniles, suggesting that gophers are more abundant and a more important part of barn owl diet in perennial crop areas. Over 99.5% of prey items in barn owl diet were agricultural pests and owls are therefore likely to provide valuable pest control services for growers in our area, although the species consumed may vary with crop types with implications for pest-control.

© 2016 Elsevier B.V. All rights reserved.

## 1. Introduction

Globally, agricultural intensification produces higher yields, but is also associated with a loss of natural habitat, expansion of field sizes, simplification of the overall landscape, loss of crop diversity across large areas, and increased chemical inputs (Foley et al., 2005). Agricultural expansion and intensification has been linked with biodiversity losses worldwide and is an especially significant threat to birds (Green et al., 2005). Some avian species, however, are capable of thriving in agricultural systems. Barn owls (*Tyto alba*), the most widespread owl species on Earth (Taylor, 1994), are likely to be one such species. Barn owls display an astonishing breadth of habitat associations and are capable of nesting in buildings and other areas where human and agricultural activity is high (Marti et al., 2005). Raptors, including barn owls, are not only ecologically important as top predators (Sergio et al., 2006), but may also provide farmers with a natural source of pest control by

consuming many vertebrate pest species that cause damage to crops and reduce yields (Smal et al., 1990; Hafidzi and Mohd, 2003; Whelan et al., 2015).

By provisioning nest boxes in areas that have lost significant wildlife habitat due to human activity, barn owl populations can persist where there is abundant prey, yet limited natural nest sites (Taylor, 1994). There is some concern that increasingly industrialized and intensive agricultural practices may be causing regional declines of barn owls in farming areas where they were once abundant (Colvin, 1985; Taylor, 1994; Newton, 2004). Declines in barn owl populations have also been attributed to increased vehicle-collisions due to more roads with higher volumes of traffic (Borda-de-Agua et al., 2014).

There has been contrasting evidence from studies examining the effects of agricultural land use change on barn owl populations. For example, barn owl breeding success was not linked with agricultural land use in England (Meek et al., 2009) or Switzerland (Frey et al., 2011), whereas Leech et al. (2009) found that across the United Kingdom, barn owls breeding in semi-natural habitat and extensive grazing systems had higher breeding success compared

\* Corresponding author.

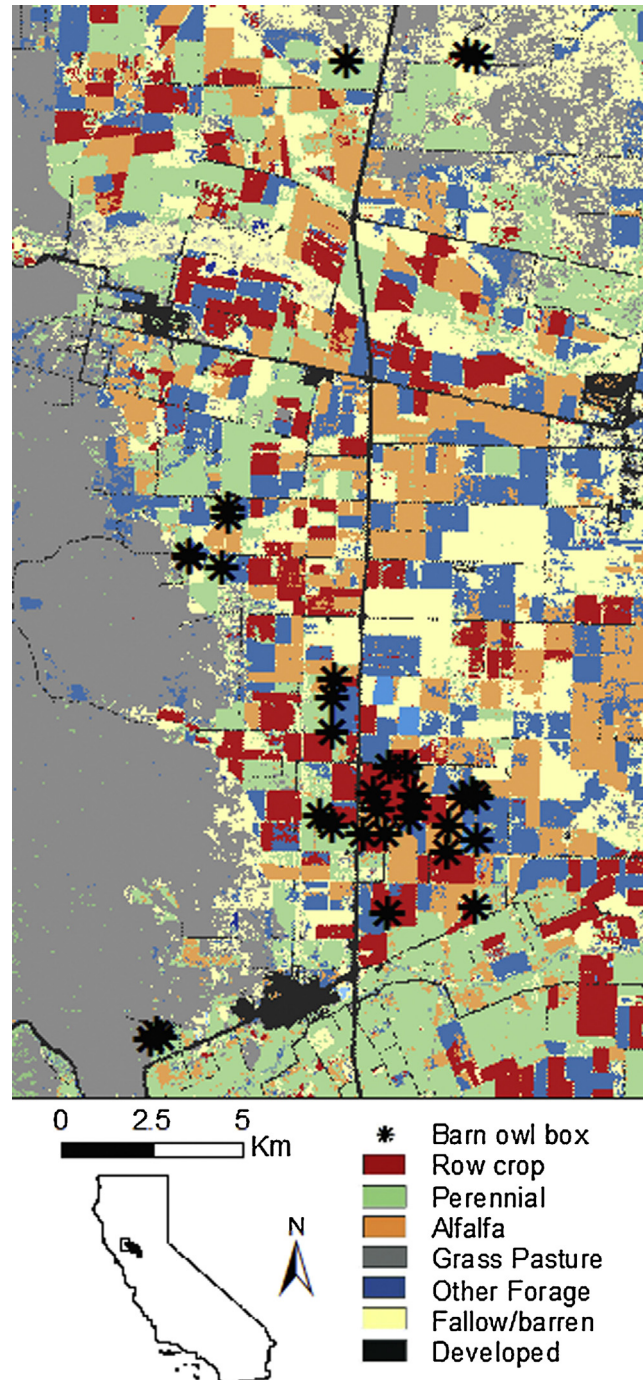
E-mail address: [Saramaekross@gmail.com](mailto:Saramaekross@gmail.com) (S.M. Kross).

to those nesting in arable fields. In Israel, nest box occupancy was higher when boxes were surrounded by a higher proportion of arable fields compared with sites with more natural fields, villages or date plantations, but these landscape factors did not affect breeding success (Charter et al., 2012). To our knowledge, no studies thus far have examined differences between the diets of owls nesting in different types of intensive agriculture in the same region.

Barn owls are natural predators of many rodents, especially species considered agricultural pests (Marti et al., 2005). Barn owls therefore have strong potential to provide farmers with economically valuable vertebrate-pest control services (Whelan et al., 2015). Barn owl populations are relatively cheap to establish:

requiring the initial construction and installation of nest boxes and a low annual maintenance. Rodenticides, on the other hand, may have decreasing efficacy as rodents become resistant to certain compounds (Salmon and Lawrence, 2006; Horak et al., 2015), and are likely to cause secondary poisoning to non-target wildlife species (e.g. Erickson and Urban, 2004; Elliott et al., 2014; Thomas et al., 2011). Trapping to control rodents requires continued effort and associated staffing costs in addition to the high initial inputs for purchasing traps.

Despite the widespread use of artificial nest boxes to attract barn owls into agricultural areas for pest control, very few field studies have been able to correlate these actions with long-term or economically viable control of rodent populations (e.g. Smal et al.,



**Fig. 1.** Map of our study area indicating locations of active barn owl boxes and crop types used for land-use analysis.

Download English Version:

<https://daneshyari.com/en/article/2413495>

Download Persian Version:

<https://daneshyari.com/article/2413495>

[Daneshyari.com](https://daneshyari.com)