

SUMMARY

Musilová, Z. & Musil, P. Nest site selection in the Reed Bunting *Emberiza schoeniclus* in fishpond habitats. *submitted*

Nest site selection was analysed using variation in timing of breeding, nesting success and age of females in the Reed Bunting in fishpond habitats in mosaic Central European landscape. An example of habitat generalist using variable types of littoral vegetation is the Reed Bunting *Emberiza schoeniclus*, which occupies a wide scale of wetlands habitats (Blümel 1989, Cramp & Perrins 1994, Glutz von Blotzheim & Bauer 1997, Báldi & Kisbenedek 1999). Nevertheless, habitats generalists are supposed to be capable of not only occupying a wider range of habitats, but also exploring a wider range of resources (Brown 1984) including nest sites.

We predicted that individuals with higher fitness are able to occupy optimal nest sites (Benett & Owens 2005). Survival and probability of recruitment are usually higher for early-hatched fledglings than for those hatched later (Lack 1968, Perrins 1970, Benett & Owens 2005). Reproductive success of older birds is generally higher than of the young ones (Curio 1983, Geslin *et al.* 2004). We can identify individual fitness using the following parameters: timing of breeding, nesting success and age of individuals. We evaluate habitat preference and optimal breeding habitat using differences in timing of breeding, nesting success and experience of breeding females. Moreover, we try to assess the possible impact of habitat degradation on occurrence of the Reed Bunting in South Bohemian fishpond area.

According to our study, Reed Bunting females tend to occupy nest sites with similar environmental parameters (except maximal height of vegetation) during the whole breeding season. Furthermore, we did not confirm any significant effect of timing of breeding on breeding success as well as on daily nest survival. This is in contrast with the general expectation that timing of breeding is a critical parameter for reproductive success due to food supply, re-nesting or prompt development of nestlings (e.g. Perrins 1969, Perrins 1970, Owen & Black 1990, Gjerdrum *et al.* 2005). Nevertheless, no effect of timing on reproduction success as well as daily nest survival support the finding of female's effort to minimise this impact (see above) due to extended breeding season. Older females locate their nests in lower vegetation, which could indicate higher importance of lower vegetation due to previous experiences of older birds. Moreover, we can emphasise the importance of unchanging proportion of previous year vegetation and mean height of vegetation despite quick grow up of wetland plants. This fact could confirm a necessity of female's view from the nest and her possible escape from potential predator or potential nest defence decision (Curio 1978, Halupka & Halupka

1997). Moreover, short-lived open nesting passerines like Reed Bunting can usually produce several breeding attempts in a year, but predation on the eggs and chicks is often heavy and many nests fail. Individual breeding outcome is therefore highly variable (Newton 1992). Therefore, we assume that reproduction success is unpredictable in this study habitat.

For the Reed Buntings in our study, older females laid their eggs earlier than young ones. Earlier breeding outset of experienced passerine females was confirmed in several studies (Harvey *et al.* 1985, Dhont 1989, Geslin *et al.* 2004) and our findings seem to follow this general pattern. We expected that older Reed Bunting females tend to breed earlier due to the higher possibility of re-nesting. This species, open nesting on the ground, could be associated with 'fast' life-histories, which mean fast development, high fecundity and following low survivorship of the birds (Lack 1968, Rowe *et al.* 1994, Bennett & Owens 2002). Moreover, life history theory predicts that the cost of reproduction has important effects on subsequent performance reducing female fitness. Older females also avoided sedge, as a native vegetation species more frequently flooded, probably due to protecting nest against flooding. Preference of less native vegetation species in experienced females could indicate better sense of direction across suitable microhabitat of the nest site.

Females use unchanging microhabitat of the nest site despite the relative wide range of habitat requirements. Our study indicate that Reed Bunting could be less sensitive to habitat changes and degradation in contrast to more specialised reed-nesting passerines due to plasticity of female's nest site selection across various vegetation type. Moreover, we can find connection with trend in numbers of this wetland species. There is a stable population trend in the Czech Republic in contrast to decreasing warbler (*Acrocephalus* and *Locustella*) (Musil 1999, Musil 2000, Št'astný *et al.* 2006). On the contrary, decreasing trend of this species was recorded in some Western European countries, e.g. Great Britain, Belgium and France (BirdLife International 2004), where Reed Buntings are apparently related to agricultural landscape more than to natural wetland habitats (Gregory & Baillie 1998, Siriwardena *et al.* 2000).

Musilová, Z., Musil, P., Fuchs, R. & Poláková, S. Territory settlement and site fidelity in the Reed Bunting *Emberiza schoeniclus* in a patchy environment of fishpond. *submitted after revision*

We investigated the importance of highly fragmented fishpond landscape in South Bohemia for Reed Buntings *Emberiza schoeniclus* using territory settlement and site fidelity of this species. Site fidelity is widespread in passerine birds, with adults returning to the same area to breed, presumably for as long as they survive (Greenwood & Harvey 1982, Berthold 2001, Klemp 2003, Newton

2008). In general, species with high site-fidelity to the breeding areas show low hatching-site fidelity, presumably because the juveniles are forced to disperse far afield by the dominant adults (Berthold 2001). It seems, that the Reed Bunting follows this general pattern (Musilová 2008).

There are obvious benefits to a bird returning to the same breeding territory each year, providing conditions permit. Individuals can benefit from local knowledge or familiarity that might give a bird an advantage in a competitive interaction with other individuals. This behaviour makes the birds better able to defend its feeding and breeding sites against potential intruders. Birds may also profit from previous knowledge of food availability and refuges (Greenwood 1980, Berthold 2001, Newton 2008).

Individuals are under pressure to return to breeding sites early, in order to gain precedence in competition for them (Hopp *et al.* 1999, Klemp 2003, Sergio & Newton 2003, Tryjanowski *et al.* 2004, Sergio *et al.* 2007, Newton 2008). Generally, later arriving species seem to settle directly in their territories, especially those returning to territories of the previous year. Conversely, among the early-arriving species, individuals tend to concentrate in particular places where food is available on arrival. Their numbers are probably higher than the number of potentially suitable territories available in the area. These pre-breeding sites are important in improving the birds body condition (Newton 2008). We investigated patterns in territory settlement and site fidelity in the Reed Bunting *Emberiza schoeniclus*, as an example of early-arriving species forming flocks in the pre-breeding season (Blümel 1989, Cramp & Perrins 1994, Glutz von Blotzheim and Bauer 1997) using apparent survival and recapture probabilities. Among investigated variables associated with territory settlement, we predicted lower effect of body weight due to intensive feeding of migrants during pre-breeding period. Furthermore, we assume that the probability of territory settlement and site fidelity in individual birds is correlated. The best quality individuals, who are able to occupied a territory at optimal breeding sites (Sergio & Newton 2003, Sergio *et al.* 2007), can show higher probability of site fidelity in subsequent years. In addition, we examined site fidelity in relation to breeding performance in a sample of birds with known nests. We expected lower site fidelity in subsequent years, when individuals fail to fledge their young.

We found out that, site fidelity correlated with territory settlement, whereas, this difference is more pronounced in males than in females. Moreover, we found support for sex-dependent variation in apparent survival with stronger probabilities for males remaining alive and available for re-capture. Male biased return rates were defined in many European open landscape migratory passerines (Solonen 1979, Pratt & Peach 1991, Krištín *et al.* 2007, Sedláček & Fuchs 2008, Vadasz C. *et al.* 2008). Greater parental investment and extended breeding season in the Reed Bunting

(Blümel 1982, Hudec 1983, Dyrzc 1984, Okulewicz 1989) results in a higher rate of mortality in females and a lower return rate of them. Reproduction is costly and therefore reduces subsequent survival (Lack 1954). Moreover, there was shown negative relationship between reproduction effort and subsequent survival (Benett & Owens 2005).

The effect of body measurements and body weight on territory settlement using apparent survival modelling was not confirmed, thus supporting the theory of the importance of the formation of pre-breeding flocks in early arriving species (Newton 2008). The Reed Buntings improve their body condition due to intensive feeding after arrival. Moreover, we found that age plays an important role in the likelihood of apparent survival (resp. re-sighting) of birds banded in the pre-breeding season and consecutively controlled the same year. Older males were more frequently re-sighted. The effect of age in territory settlement, especially in males, could confirm the advantage of local knowledge, experience and age-related social dominance to occupied territories (Harvey *et al.* 1984, Sedgwick 2004, Winkler *et al.* 2004, Newton 2008, Sergio *et al.* 2009) and simultaneously high competition in the study area with a higher proportion of former residents. We showed no significant effect of breeding success to apparent survival probabilities of parents in subsequent years. This is not in accordance with general patterns where breeding outcomes (success vs. failure) affect site fidelity and thereby successful birds are more likely to return to the same breeding site in the following year to that of those that fail to fledge their young (e.g. Harvey *et al.* 1979, Howlett *et al.* 2003, Wesolowski 2006, Johnson & Walters 2008, Berkunsky & Reboreda 2009). We suggest that there is a lack of suitable breeding sites in the study area and probably due to high competition between males, the effect of previous breeding outcome on site fidelity in males couldn't be expressed.

If we take into an account that females express lower survival and males need experience for territory acquisition, we can assume there are differences in female and male life-histories due to different age at first time breeding (Benett & Owens 2005). High male competition and lack of suitable breeding habitats occupied by older residents in the study area support high importance of these fragmented wetlands (fishponds) for Reed Bunting in Central European fishpond landscape.

Musilová, Z., Musil, P. & Poláková, S. Males try to attract neighbouring females during incubation in the Reed Bunting *Emberiza schoeniclus*. *submitted*

In the Reed Bunting *Emberiza schoeniclus* was shown that males use different singing styles related to male mating status. Unpaired males sing a rapid song (type I) and paired males sing slow one (type II) (Nemeth 1996). Type III was classified as continuous song of the type II, which is mainly

produced during the dawn chorus and it is a honest signal of quality (Suter *et al.* 2009). Moreover, song expressed as “all-clear” signal, an example of a non-sexually function in acoustic communication between male and female, was investigated during incubation and feeding of nestlings, without song analysis. This signal shows that there is no risk of predation and it is safe for female to exit the nest or feed the young (Wingelmaier *et al.* 2007). The three types of songs were defined using sonograms analysis, except the “all-clear” signal (Nemeth 1996, Wingelmaier *et al.* 2007, Suter *et al.* 2009).

The main aim of this study is to assess seasonal timing of different song types in the Reed Bunting *Emberiza schoeniclus* and its relation to various stages of the breeding cycle. We predicted increase of song type III, as an honest signal of male’s quality, during fertile stage of female and conversely the decrease of this song type during incubation and feeding of nestlings. We assume, that the “all-clear” signal to incubating and feeding female likely belong to the type II. In addition, we try to evaluate the effect of different song types on success of the singer’s nest.

There was no trend in the timing of different song types during the whole breeding season. Nevertheless, Reed Bunting shows extended breeding season with little synchronization of the breeding pairs in the study area and re-nesting usually follows an unsuccessful breeding attempt (pers. obs). We found out that Reed Bunting males use different song types in different stages of their breeding cycle. The distribution of song type I during the breeding cycle confirmed the Nemeth’ (1996) definition of the song type I which belongs to unpaired male. We recorded song type I in a pre-breeding stage (possible absence of singer’s female) or more than a two weeks after nestlings’ abandonment and in a case of predation or an abandonment of the clutch (possible death of singer’s female). Conversely, we did not confirm any significant differences in proportion of song type II and III in fertile period of singer’s female and successive incubation and feeding of nestlings. This is in contrast with assumption that male tends to communicate with his female using “all-clear” signal during incubation in aim to minimize the risk of predation of the clutch (Wingelmaier *et al.* 2007).

Furthermore, Reed Bunting shows one of the highest levels of EPP within passerines (Dixon *et al.* 1994, Bowmann & Komdeur 2005, Kleven & Lifjeld 2005). According to our findings, we can assume that males of Reed Bunting seek extra-pair mates during incubation period of their own nests. High level of EPP could be also connected with increasing song type III on more populated localities (see above). Moreover, Hofstad *et al.* (2002) showed that extended breeding season could lead to a better option for the male to attract a second female or to practice extra-pair copulation (EPC).