

Enhancing the breeding success of whinchats - first results with small-scale measures on organic farms in north-eastern Germany

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Whinchats belong to the main target species in the project 'Agriculture for Biodiversity'. On the organic farms cooperating in the project, the birds preferred linear structures such as field margins and ditches with fences for establishing territories and to use as nest sites. Breeding success could be significantly increased by leaving small areas adjacent to these structures unused until the middle of July.

Erhöhung des Bruterfolgs von Braunkehlchen - erste Ergebnisse von kleinflächigen Maßnahmen auf ökologisch bewirtschafteten Betrieben in Nordostdeutschland

Als typische Art von extensiv genutztem Grünland ist das Braunkehlchen von der Intensivierung der landwirtschaftlichen Produktion besonders betroffen und deshalb Zielart im Projekt „Landwirtschaft für Artenvielfalt“. Um Braunkehlchen wirksam zu fördern, wurden im Projekt eine Revierkartierung und eine Analyse der Habitatsprüche auf sechs Betrieben in Mecklenburg-Vorpommern durchgeführt. Es zeigte sich, dass im Grünland lineare Randstrukturen wie Säume, Grabenböschungen und Weidezäune eine zentrale Funktion haben. Nester wurden zu 45% innerhalb der Randstrukturen angelegt, wo sie vor den landwirtschaftlichen Arbeiten weitgehend geschützt waren. Nester auf betriebsüblich genutzten Wiesen und Weiden hatten nur geringen Bruterfolg.

Als Konsequenz aus der Habitatanalyse wurden kleinflächige Maßnahmen entwickelt und auf mehreren Betrieben umgesetzt. Wesentlich sind: a) Anlage und Erhalt von „überjährig“ ungemähten Saumstrukturen und b) Spätnutzung von unmittelbar angrenzenden Teilflächen auf Wiesen und Weiden. Auf Rinderweiden wurden Teilflächen am Schlagrand mit flexiblen Weidezäunen von Mai bis Juli ausgezäunt, auf Wiesen ließen die Landwirte Streifen am Schlagrand bei der ersten Mahd stehen. Ein Schlüsselfaktor für den Erfolg derartiger kleinflächiger Maßnahmen ist die Attraktivität der Flächen als Habitat im Vergleich zur betriebsüblich genutzten landwirtschaftlichen Fläche.

Der Bruterfolg wurde durch die Maßnahmen auf nahezu das Doppelte erhöht: 2014 bis 2016 wurden in 38 - 55% der Reviere mit Nestern ohne zusätzliche Maßnahmen flügge Jungvögel beobachtet. In Nestrevieren mit Umsetzung von Maßnahmen (2015 und 2016) waren es 83%.

Die Projektmaßnahmen haben somit zu einer wesentlichen Förderung des Braunkehlchens geführt. Eine wichtige Voraussetzung für den Erfolg der Maßnahmen sind die Rahmenbedingungen auf den ökologisch bewirtschafteten Betrieben: aufgrund der extensiven Weidetierhaltung mit geringer Düngungsintensität ist vermutlich ein gutes Nahrungsangebot vorhanden. Dies sollte Gegenstand weiterer Untersuchungen sein.

1 Introduction

The intensification of agricultural practices has caused a dramatic decline in whinchat populations in Germany and other European countries (BASTIAN & FEULNER 2015, HORCH et al 2008). Two main factors have been generally identified as reasons for this development: a) farming activities (mowing, grazing) during the breeding period (FISCHER et al 2013, GRÜEBLER et al 2012, 2015, HORCH et al 2008, MÜLLER et al 2005) and b) a reduction in food resources in context with the change from extensive grassland into high productive grassland (BASTIAN et al 1994, BRITSCHGI et al 2006, OPPERMANN 1999, OPPERMANN & SÜSSER 2015).

Due to their strong relationship with agriculturally used habitats, whinchats are an important

target species in the 'Agriculture for Biodiversity' project. This project was initiated by WWF Germany, the organic farmers association Biopark, and the Ministry of Agriculture in Mecklenburg-Western Pomerania, and is supported scientifically and implemented by ZALF (GOTTWALD & STEIN-BACHINGER 2016, STEIN-BACHINGER & GOTTWALD 2016, www.landwirtschaft-artenvielfalt.de). The project is additionally supported by the food retailer EDEKA. Participating organic farms can choose from more than 100 nature conservation measures in order to qualify for a nature conservation certificate. The various measures and nature conservation achievements are assessed by means of a credit point system (see GOTTWALD & STEIN-BACHINGER 2016 for details). The certified organic farms receive a special price for certain products from the retailer.

In the course of the project we analysed the habitats of whinchats and developed special measures for enhancing habitat quality and breeding success on the cooperating farms. This report presents the first results, in particular with respect to the measures established on the farms.

2 Study area

We studied whinchats at 12 separate grassland locations on six organic farms in north-eastern Germany between 2013 and 2016 (Fig. 1). The area comprised a total of 700 ha, but only 485 ha were inspected regularly in the years from 2014 to 2016, including the recording of nest sites.

The climate is characterized by low annual precipitation (520 - 580 mm). The landscape is flat or rolling. The grasslands are situated on moderately drained, organic fen soils, sometimes with mineral elevations. The classification of plant communities ranges from fresh pastures to moderate wet meadows with various stages of sedge reeds in lower areas. Farmyard manure was spread very sparsely on the grassland in multi-year intervals or there was no fertilisation at all.

Grassland was used as pasture or meadow, sometimes mown in spring and grazed afterwards.

The proportion differed between farms, as a whole approximately half of the area was grazed during the breeding period with suckler cows. Pastures were managed mostly using a „rotational grazing“ system (parts of the whole pasture are grazed consecutively in intervals of 4-6 weeks), one area was used as „permanent pasture“. This latter was grazed continuously with low stocking rates except in winter. On rotational grazing pastures, the start of grazing varied between the beginning of May and the beginning of June. June was the main month for grass cutting, with a few areas mown already at the end of May and some small areas not mown until the beginning of July. Usually, meadows were either mown two or three times or mown twice and grazed in autumn.

Single lots of the grassland are 5 to 40 ha in size and separated with solid fences or flexible electric fences. Likewise, most of the numerous ditches are segregated with fences on top of the banks (Fig. 3). The main ditch slopes were mown regularly once a year in summer or autumn, but some slopes remained untended for several years. Unused field margins and margins of ditches are generally small, ranging from 1 to 5m in width. Details from some of the study sites are given in WEIGELT (2014) and BÄTHGE (2014).



Fig. 1: Study sites for whinchats in north-eastern Germany. - Lage der Betriebe für die Braunkehlchen-Untersuchungen.

3 Methods

Data collection

The study sites were visited five times during the main breeding period between mid-May and mid-July at intervals of 10 - 14 days. During each visit, the exact location of whinchats, their behaviour, located nest sites and land use parameters were registered on field maps. Furthermore, in June the components of whinchat habitats (habitat type and structures) were recorded on a simple checklist, without taking note of the ratios of habitat elements. We classified habitat types as pasture, meadow or fallow land, and recorded structures such as fences, ditches, field margins with different widths, strips of reed, bushes, trees and electric wires. This was done within a radius of 50m of the located or supposed nest sites, thus representing a major part of whinchat territories (FISCHER et al 2013). For the specific nest habitat, we recorded certain special parameters such as the distance to border lines of adjacent habitats and the distance to fences.

Tab. 1: Classification of breeding status. - Klassifizierung des Brutstatus.

category	key
0	singing male
1	pair of whinchats residing in a specific location
2	nest-building or empty nest
3a	nest with eggs or breeding female estimated from behaviour of the birds
3b	nest with young or feeding adults
4	fledglings

For assessing breeding success, the current status of the breeding cycle in whinchat territories was classified according to Tab.1. We ranked a nest as successful if fledglings were observed or if their presence was highly probable (alarming adults with fledglings hiding on the ground, see TOME & DENAC 2012). Nests with young birds which had not yet fledged on the last visit in July were excluded from the nest success analysis.

Overall, data on breeding success and nest habitats were sampled from 143 breeding pairs (2014 - 2016). Statistical significance was checked with chi-square crosstabs using SPSS Statistics 17.0.

Development and implementation of measures

Measures should enhance the breeding success of whinchats. At the same time, the efforts and constraints for the farmers should be as small as

possible. After two years of collecting data the following strategy was adopted:

- The first step is to identify the preferred habitats of whinchats on the farms and to enhance the attractiveness of certain sites for the settlement of whinchats. These sites usually consist of small patches or strips of fallow land (field margins) with fences as perching places (see results).
- The farmers leave patches of meadows and pastures adjacent to the preferred settlement sites unused until mid-July. Borders of ditches within preferred settlement areas are not mown before the beginning of August.

The measures are documented by profiles as part of a wider catalogue of measures offered to the farmers in the context of the 'Agriculture for Biodiversity' project (GOTTWALD & STEIN-BACHINGER 2016).

4 Results

Abundance, habitats and location of nest sites

Between 2014 and 2016, we recorded a mean number of 53 territories on 485 ha. The abundance on the different plots varied between 0.1 and 2.2 territories/10ha. Overall the abundance was 1.1 territories/10ha (mean of separate plots: 1.3 territories/10ha).

Most territories were located along linear structures like ditches, fences and field margins (Fig. 3



Fig. 2: Whinchats using fences as perching places. - Braunkehlchen nutzen Zäune als Ansitzwarte (Photos: © Andreas MATTHEWS).



Fig. 3: Typical habitats of whinchats alongside ditches, field margins and fences. - Typische Habitate von Braunkehlchen entlang von Gräben, Säumen und Zäunen (Photos: © Frank GOTTWALD).

and Fig. 4), which are important for nest site selection: 45% of the nests ($n = 143$) were located in margins along linear structures. 6% were built on fallow land and 41% on grassland (pastures and meadows) (GOTTWALD et al 2017). Grassland currently being grazed is avoided for nest building. WEIGELT (2014) noted that 22 of 23 nests

in one of the study areas were on sites unused during the period of nest building. Fences are often used as perching places before birds approach the nest. 70% of the territories with nests contain fences ($n = 148$) and 30% of the nests in these territories were built within a distance of 1m from the fence.

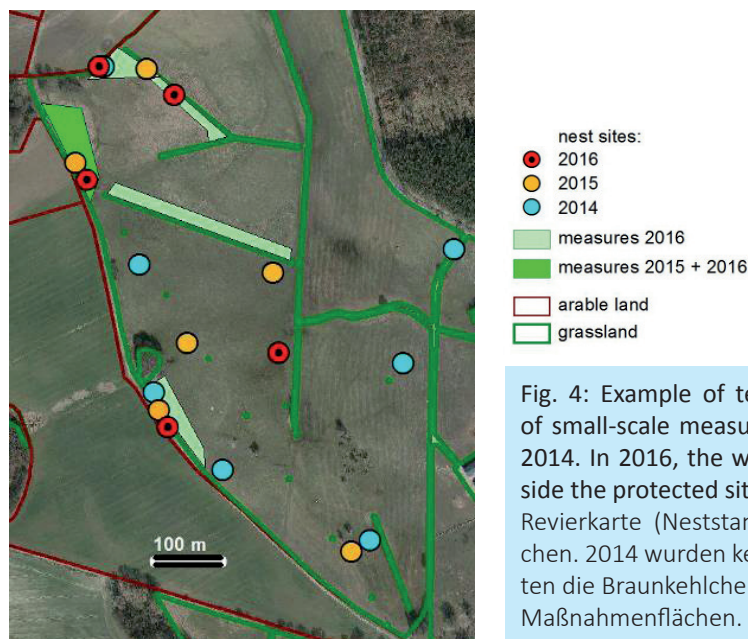


Fig. 4: Example of territory map (nest sites) and position of small-scale measures. No measures were established in 2014. In 2016, the whinchats built nests predominantly inside the protected sites.-

Revierkarte (Neststandorte) und Lage der Maßnahmenflächen. 2014 wurden keine Maßnahmen umgesetzt. 2016 bauten die Braunkehlchen ihre Nester vorwiegend innerhalb der Maßnahmenflächen.

Regarding the distance of the nests from border lines (e.g. field margin/grassland), 67% of the nests were built within a distance of 10m (n = 126, including the nests within field margins). 40% of nests within pastures and meadows were built within a distance of 10m from the field edges (n = 57).

Establishment of measures

The majority of measures affected small parts of the grasslands, where the first cut or the grazing period was delayed until mid-July. These segregated areas were located near to the preferred nesting sites of the whinchats, e.g. adjacent to ditches and field margins (Fig. 4). The farmers se-



Fig. 5: Segregated areas on pastures adjacent to ditches, field margins and fences. - Abgezaunte Maßnahmenflächen auf Rinderweiden angrenzend an Gräben, Säume und Zäune (Photos: © Andreas MATTHEWS).



Fig. 6: Late mown plots along the field edge. - Spät gemähte Teilflächen am Schlagrand (Photos: © Frank GOTTWALD).



Fig. 7: Nests situated at the edge of ditches have good chance to survive, if the slopes are not mown during the breeding season. - Nester an Grabenrändern haben gute Überlebenschancen, wenn die Böschungen in der Brutzeit nicht gemäht werden (Photos: © Frank GOTTWALD / Andreas MATTHEWS).

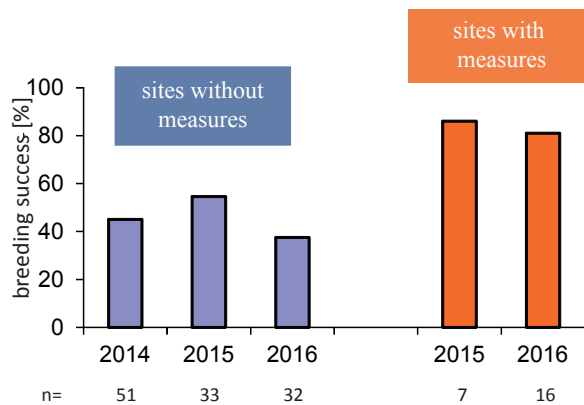


Fig. 8: Breeding success (ratio of nests with at least one fledgling) for nest sites with and without measures. - Bruterfolg (Anteil von Nestern mit mindestens einem flüggen Jungvogel) für Neststandorte mit und ohne Maßnahmen.

parated the plots on grazed grasslands by means of flexible electric fences (Fig. 5), on meadows the plots were omitted during the first cut (Fig. 6). At all sites which were located near ditches, the slopes were not mown until the beginning of August or were not mown at all for several years (see Gottwald & Stein-Bachinger 2016 for details of measures). On average the separated areas were 0.5 ha in size (0.02 - 2.2 ha).

A total of 40 sites with measures was established (2015: $n = 13$, 2016: $n = 27$) and 23 nests were identified. 63% of the sites employing measures were occupied by whinchats in 2016.

Breeding success

The breeding success, classified as the percentage of nests with fledglings, differed between nest habitats: nests on grassland (meadows and pastures) without special protective measures had the lowest success (37% with fledglings, $n = 52$). The success of nests in field margins (including the margins of ditches) reached 55% ($n = 49$, $p = 0.074$ compared to grassland) and 63% on fallow land ($n = 8$). The best performance, with 89% of nests successful ($n = 9$), was shown by those which were placed in protected sites in grassland ($p = 0.005$ compared to grassland without measures).

For all nests in a year, breeding success varied from 38% to 55% between 2014 and 2016 (mean 46%, Fig. 8). For nests in sites with protective measures, the success was nearly twice as high (2015: 86% ; 2016: 81%, $p = 0.003$ compared to nest sites without measures, years combined).

5 Discussion

Abundance and habitats

The abundance of 1.1 territories/10ha lies within the range of grassland habitats in Mecklenburg-Western Pomerania (KINTZEL 2006: 0.45 - 3.3 territories/10ha in the 1990s, HASELOFF 2016: 0.5 territories/10ha), but these are distinctly lower than abundances in supreme habitats (e.g. extensive meadows in Switzerland up to >5 territories/10ha, HORCH & SPAAR 2016, nutrient-poor sedge reeds in southern Germany 4 - 6 territories/10 ha, EINSTEIN 2006). The main reason for the rather medium to low densities of whinchats in the study area is the prevailing restriction of their territories to field edges. Because of the large size of the fields in north-eastern Germany, greater parts of the grassland are not used by whinchats at all.

The general habitat demands of whinchats have already been studied in depth in other regions (e.g. BASTIAN & BASTIAN 1996, FISCHER et al 2013, HOFFMANN 2015, OPPERMAN 1999, RICHTER 2015). Primarily, the birds require a good supply of perching places and food resources. These demands are met especially in species-rich and highly structured grasslands (EINSTEIN 2006, OPPERMAN 1999, OPPERMAN & SÜSSER 2015). In our study area, important requisites for whinchats are found predominantly along field edges. This explains the high percentage of nests placed within field margins, in the uncut borders of ditches and near fences.

Small-scale measures to protect the breeding sites

The concentration of adequate whinchat habitats along field edges and ditches facilitates the protection of nest sites using small-scale measures.

Leaving strips or patches of grassland adjacent to highly structured field edges uncut or ungrazed until mid-July turned out to be effective in protecting the nest sites of a large part of the whinchat population. The critical point for the success of small-scale measures, which are implemented or planned before the settlement of whinchats, is the attractiveness of specific locations which serve as an „attraction pole“. This could be improved still further by leaving field margins and ditch banks uncut for many years, but in many cases this was objected to by the farmers because of subsidies regulations. If the sites belong to farmland areas which receive subsidies, they must be managed at least once a year. Ditches are not usually managed by farmers, but special organizations (e.g. „water boards“) which have to be contacted. In some farmland areas it already has become normal practice that only one side of the slopes of ditches are mown for economic reasons, switching sides from one year to the next. This could create optimal perching habitats for whinchats providing reeds do not dominate. Reed stems are frequently used by whinchats for perching, but dense stands of reed are avoided. In the end, in most study areas we could identify a number of sites with exceedingly good condi-

tions for the settlement of whinchats. Nevertheless, it was helpful for the configuration of undisturbed areas to know the territories and nesting sites from previous years.

Sometimes the undisturbed sites could be implemented at short notice during the season by the farmers after the biologist had located the current territories. But in general this is not a practical option. Territory mapping and nest locating is too expensive to be carried out every year, and the farmers like to have clear presettings at the beginning of the season. The management of the large farms in north-eastern Germany is complex, and additional management efforts for nature conservation purposes must be small and easy to handle if the farmers are to carry them out on their own. This is possible if the farmers receive detailed advice and knowledge about the requirements of whinchats from the beginning, and they are able to replicate the measures and get used to them in the long run.

At the beginning of the study, we assumed that pastures are rather difficult to manage for whinchats because regular grazing already starts at the beginning of May. But this turned out to be useful in the context of the establishment of small-



Fig. 9: Male perching on a marking stake (left side) and singing on a fence post (right side). - Braunkehlchen Männchen auf Markierungsstange (l.) und singend auf Zaunpfahl (r.)
(Photos: © Frank GOTTWALD / Andreas MATTHEWS).



Fig. 10: Female perching on sorrel (*Rumex spec.*). - Weibchen auf Ampfer (*Rumex spec.*)
(Photo: © Frank GOTTWALD).

scale measures: if some parts of the pasture are not grazed and the vegetation of the main grassland area is low at the beginning of the breeding season, the whinchats are not inclined to build their nests on regularly used farmland. Instead, the probability is high that they will choose the protected sites. So, early grazing or cutting could be advantageous if accompanied by unused patches which are suitable habitats for whinchats. Furthermore, if the field edges are separated by extra flexible fences, these can serve as additional perching places.

Breeding success and the effect of measures

The different results of breeding success in our study areas with respect to the different types of nest sites are consistent with data from other studies. In general, breeding success varies especially with the intensity and timing of agricultural practices in breeding habitats. The date of the first cut or grazing is critical. Normally, less than 50% of the nests in agricultural areas are successful (FISCHER et al 2013, GLUTZ VON BLOTZHEIM & BAUER 1988, LABHARDT 1988). FISCHER et al (2013) calculated breeding success between 10% und 89% dependent on the timing of the

first agricultural use. In early cut meadows in Switzerland, less than 10% of the nests survived, in meadows with a late cut the rate was 70%, and on protected sites within early cut meadows, success reached 81% (GRÜEBLER et al. 2012).

A restriction with respect to the validity of our data comes from our method of determining breeding success. Due to the time intervals between consecutive controls of nest sites, the nestlings could have fledged and left the territory between two visits. Therefore breeding success might be higher in reality. However, for most nests we could retrace the destiny with high probability based on the condition of the empty nests and the history of agricultural processes.

6 Conclusions

To ensure a high breeding success for whinchats, late cutting or grazing after mid-July is recommended. On the studied farms in north-eastern Germany, which mainly keep suckler cows, this cannot be realized on a large scale, because fodder quality decreases too much (MÄHLREIN 1993, STEIN-BACHINGER & FUCHS 2012). Furthermore,

under the regional climate with low precipitation and soil quality, the greatest part of the fodder for winter time has to be harvested in spring during the first cut of meadows and legume-grass leys. Otherwise there might a shortage of fodder resources for cattle.

Existing agro-environmental schemes to encourage the late use of grassland are not attractive enough to compensate for these losses. As a consequence, we have developed measures for whinchats which are more easily acceptable for farmers, and at the same time ensure a high breeding success for a large part of the population. The basic points are:

- Choosing sites with high probability of whinchat settlement. In the study area we selected „attraction poles“ at the edge of fields and tried to improve their attractiveness, e.g. by means of uncut margins and ditch slopes and additional flexible fences.
- Leaving small-scale parts of the field uncut or ungrazed adjacent to these structures until the middle or even better the end of July. A prolonged period where areas are undisturbed is necessary to provide shelter for the fledglings (TOME & DENAC 2012) and to ensure the breeding success of late broods, which settle in protected areas after having lost their nests on other sites.

- The measures should be repeated every year at sites with successful nests. In this way the settlement rate of protected sites should increase after several years of adaptation.

Our results showed the breeding success of whinchats can be increased significantly using this method. Moreover, it is effective from the farmers' point of view. These measures were accepted by most farmers in the context of the „Agriculture for Biodiversity“ project. The attractiveness of the selected sites compared to the remaining area is crucial for the efficiency of the measures. Otherwise, much larger conservation areas are required for sustaining viable populations (GRÜEBLER et al 2015, HORCH et al 2008, HORCH & SPAAR 2015).

A precondition for the long-term success of these measures is a good food supply in whinchat habitats (OPPERMANN 1999). Several studies showed that the abundance of invertebrate species decrease with increasing intensification in grassland (BRITSCHGI et al 2006, VICKERY et al 2001). This applies also to organic farming systems (BRITSCHGI et al 2006, KRUSE et al 2016, WOLFRUM 2015). SORG et al (2013) reported a dramatic decline of flying insects in recent decades, probably due to intensification in agriculturally used areas (SORG 2016). On the other hand, organic farming generally promotes higher level of species biodiversity



Fig. 11: Female Whinchat using a fence as perching place. - Weibliches Braunkehlchen nutzt einen Weidezaun als Ansitzwarte (Photo: © Frank GOTTWALD).

(e.g. RAHMANN 2011, TUCK et al 2014) and especially extensive grazing of grasslands with suckler cows and low input of manure is considered sustainable agricultural practice, promoting high levels of biodiversity (VICKERY et al 2001). Therefore we assume that the food supply in our study areas is good, but this remains to be investigated.

Literature

- Bastian A, Bastian H-V 1996: Das Braunkehlchen: Opfer der ausgeräumten Kulturlandschaft. AULA-Verlag, Wiesbaden.
- Bastian A, Bastian H-V, Sternberg H-E 1994: Ist das Nahrungsangebot für die Brutrevierwahl von Braunkehlchen *Saxicola rubetra* entscheidend? Vogelwelt 115, 103-114.
- Bastian H-V, Feulner J (eds.) 2015: Living on the edge of extinction in Europe. Proc. 1st European Whinchat Symposium. LBV Hof, Helmbrechts.
- Bäthge K 2014: Habitatwahl und Brutverlauf des Braunkehlchens (*Saxicola rubetra*) auf Grünflächen eines ökologisch wirtschaftenden Betriebes in Vorpommern. Bachelorarbeit Ernst-Moritz-Arndt-Universität Greifswald, Studiengang Landschaftsökologie und Naturschutz, 62p.
- Britschgi A, Spaar R, Arlettaz R. (2006): Impact of grassland farming intensification on the breeding ecology of an indicator insectivorous passerine, the Whinchat *Saxicola rubetra*: Lessons for overall Alpine meadowland management. Biol. Conservation 130, 193-205.
- Einstein J 2006: Bestandsentwicklung, Habitat und Schutz des Braunkehlchens (*Saxicola rubetra*) am Federsee. Ornitholog. Jh. Bad.-Württ. 22, 175-188.
- Fischer K, Busch R, Fahl G, Kunz M, Knopf M 2013: Habitat preferences and breeding success of Whinchats (*Saxicola rubetra*) in the Westerwald mountain range. J. Ornithol. 154, 339-349.
- Gottwald F, Stein-Bachinger K 2016: Landwirtschaft für Artenvielfalt - Ein Naturschutzstandard für ökologisch bewirtschaftete Betriebe. 2. Auflage, Hrsg. WWF-Deutschland, www.landwirtschaft-artenvielfalt.de, 208p.
- Gottwald F, Matthews A, Matthews A, Weigelt J, Bäthge K, Stein-Bachinger K 2017: Berichte aus dem Projekt ‚Landwirtschaft für Artenvielfalt‘ - Zwischenergebnisse Braunkehlchen 2013-2016. Hrsg. WWF-Deutschland, www.landwirtschaft-artenvielfalt.de/veroeffentlichungen/ 22p.
- Glutz von Blotzheim UN, Bauer KM 1988: Handbuch der Vögel Mitteleuropas. Band 11/I - Passeriformes (2.Teil). AULA, Wiesbaden.
- Grüebler MU, Schuler H, Horch P, Spaar R 2012: The effectiveness of conservation measures to enhance nest survival in a meadow bird suffering from anthropogenic nest loss. Biol. Conservation 146, 197-203.
- Grüebler MU, Horch P, Spaar R 2015: Whinchats impacted by changes in alpine grassland management: research results from Switzerland. In: Bastian H-V, Feulner J (Eds.): Living on the Edge of Extinction in Europe. Proc. 1st European Whinchat Symposium, 263-273. LBV Hof, Helmbrechts.
- Haseloff EM 2016: Habitatausstattung der Brutreviere von Braunkehlchen (*Saxicola rubetra*) und Schwarzkühlchen (*Saxicola torquata*) - ein Vergleich. Masterarbeit an der Ernst Moritz Arndt Universität Greifswald, 52p.
- Hoffmann J 2015: Braunkehlchen (*Saxicola rubetra*) in Ackerbaugebieten im östlichen Brandenburg: Flächenkonfiguration und Lebensraumbedarf. In: Bastian H-V, Feulner J (Eds.): Living on the Edge of Extinction in Europe. Proc. 1st European Whinchat Symposium, 191-200. LBV Hof, Helmbrechts.
- Horch P, Rehsteiner U, Berger-Flückiger A, Müller M, Schuler H, Spaar R 2008: Bestandsrückgang des Braunkehlchens *Saxicola rubetra* in der Schweiz, mögliche Ursachen und Evaluation von Fördermassnahmen. Ornithologischer Beobachter 105, 267-298.
- Horch P, Spaar R 2015: Die Situation des Braunkehlchens in der Schweiz, getestete Fördermassnahmen und Ergebnisse. In: Bastian H-V, Feulner J (Eds.): Living on the Edge of Extinction in Europe. Proc. 1st European Whinchat Symposium, 285-292. LBV Hof, Helmbrechts.
- Kintzel W 2006: Braunkehlchen (*Saxicola rubetra*) - Braunkehlchen. In: Eichstädt et al: Atlas der Brutvögel in Mecklenburg-Vorpommern. Steffen-Verlag, Friedland/Meckl., 387.
- Körner S 2005: Siedlungsdichte und Bruterfolg verschiedener Feldvogelarten auf Ackerfutterflächen mit überjährigen Streifen als naturschutzfachliche Optimierungsmaßnahme - Untersuchung 2005 von Braunkehlchen, Schafstelzen und Grauammern auf Anbauflächen des Demeter-Landwirtschaftsbetriebes Ökodorf Brodowin, 21p, unveröff.
- Kruse M, Stein-Bachinger K, Gottwald F, Heinken T 2016: Influence of grassland management on the biodiversity of plants and butterflies on organic suckler cow farms. Tuexenia 36, 97-119.
- Labhardt A 1988: Zum Bruterfolg des Braunkehlchens (*Saxicola rubetra*) in Abhängigkeit von der Grünlandbewirtschaftung in den Westschweizer Voralpen. Beih. Veröff. Naturschutz Landschaftspflege Bad.-Württ. 51, 159-178.

- Mählrein, A. 1993: Kalkulationsdaten für die Grünlandbewirtschaftung unter Naturschutzaufgaben. KTBL (Kuratorium für Technik und Bauwesen in der Landwirtschaft). Schriften-Vertrieb im Landwirtschaftsverlag GmbH, Münster. 115p.
- Müller M, Spaar R, Schifferli L, Jenni L 2005: Effects of changes in farming of subalpine meadows on a grassland bird, the whinchat (*Saxicola rubetra*). J. Ornithol. 146, 14-23.
- Oppermann R 1999: Nahrungsökologische Grundlagen und Habitatansprüche des Braunkehlchens *Saxicola rubetra*. Vogelwelt 120, 7-25.
- Oppermann R, Hoffmann J, Weinhold U, Kleemann J 2012: Farmland as habitat for populations of species of conservation interest. In: Oppermann et al. (eds.): High Nature Value Farming in Europe. Verlag Regionalkultur, 97-109.
- Oppermann R, Süsser M 2015: Abhängigkeit des Braunkehlchens (*Saxicola rubetra*) von der Artenvielfalt im bewirtschafteten Grünland. In: Bastian H-V, Feulner J (Eds.): Living on the Edge of Extinction in Europe. Proc. 1st European Whinchat Symposium, 171-190. LBV Hof, Helmbrechts.
- Rahmann G 2011: Biodiversity and Organic farming: What do we know? Agriculture and Forestry Research 3, 189-208.
- Richter M 2015: Verbreitung, Bestandsentwicklung und Habitatwahl des Braunkehlchens *Saxicola rubetra* in Niedersachsen. In: Bastian H-V, Feulner J (Eds.): Living on the Edge of Extinction in Europe. Proc. 1st European Whinchat Symposium, 55-62. LBV Hof, Helmbrechts.
- Richter M, Düttmann H 2004: Die Bedeutung von Randstrukturen für den Nahrungserwerb des Braunkehlchens *Saxicola rubetra* in Grünlandgebieten der Dümmer-niederung (Niedersachsen, Deutschland). Die Vogelwelt 125, 89-98.
- Sorg M, Schwan H, Stenmans W, Müller A 2013: Ermittlung der Biomassen flugaktiver Insekten im Naturschutzgebiet Orbroicher Bruch mit Malaise-Fallen in den Jahren 1989 und 2013. – Mitt. Entomolog. Verein Krefeld 1: 1–5.
- Sorg M 2016: Bestandsrückgänge von Fluginsekten in Offenlandbiotopen der Kulturlandschaft - Methoden, Biomassen, Artenspektren. Vortrag Tagung „Natura 2000 und Artenschutz in der Agrarlandschaft“. Int. Naturschutzakademie des BfN, Vilm 7.-10. Nov. 2016.
- Stein-Bachinger K, Fuchs S 2012: Protection strategies for farmland birds in legume-grass leys as trade-offs between nature conservation and farmers' needs. Springer, Org. Agr. 2, 145–162
- Stein-Bachinger K, Gottwald F 2016: Diversity of nature conservation performances on organic farms. 14th ESA Congress – Edinburgh: 5-6.
- Tome D, Denac D 2012: Survival and development of predator avoidance in the post-fledging period of the Whinchat (*Saxicola rubetra*): consequences for conservation measures. J. Ornithol. 153, 131-138.
- Tuck SL, Winqvist C, Mota F, Anström J, Turnbull LA, Bengtsson J 2014: Land-use intensity and the effects of organic farming on biodiversity: a hierarchical meta-analysis. J Appl Ecol. 51, 746-755.
- Wahrenberg TA 2015: Aktuelle Situation des Braunkehlchens (*Saxicola rubetra*) in Brandenburg. In: Bastian H-V, Feulner J (Eds.): Living on the Edge of Extinction in Europe. Proc. 1st European Whinchat Symposium, 117-118. LBV Hof, Helmbrechts.
- Weigelt J 2014: Habitatanalyse und Bruterfolg des Braunkehlchens *Saxicola rubetra* auf ökologisch bewirtschaftetem Grünland und Klee-gras im Raum Gnoien (Mecklenburg-Vorpommern). Universität Greifswald, Vogelwarte - Zoolog. Institut und Museum, Studiengang Landschaftsökologie und Naturschutz, 77p.
- Wolfrum S 2015: Can the Whinchat benefit from organic agriculture? In: Bastian H-V, Feulner J (Eds.): Living on the Edge of Extinction in Europe. Proc. 1st European Whinchat Symposium, 295-296. LBV Hof, Helmbrechts.
- Vickery JA, Tallowin JR, Feber RE, Asteraki EJ, Atkinson PW, Fuller RJ, Brown VK 2001: The management of lowland neutral grasslands in Britain: effects of agricultural practices on birds and their food resources. Journal of Applied Ecology 38, 647–664.

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