

Oat fields for the benefit of Ortolan Buntings *Emberiza hortulana*? An experiment in the Upper Rhône valley (Valais, Switzerland)



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Summary

The Ortolan Bunting in an isolated population breeding in the Valais, a dry alpine valley in southern Switzerland, has declined considerably (16 – 33 territories in 2004 - 2007) over the past three decades. Two thirds of the birds occur on the slopes along the Upper Rhone valley in a very dry, Mediterranean-like steppe habitat. Several factors may be responsible for the population crash, ranging from changes in vegetation cover (at ground layer and at the tree level), to the introduction of new farming management such as abandoning of oat field cultivation. In order to determine the significance of this cereal plant, ten oat fields were sown in close proximity to the remaining Ortolan Buntings in late April, 2005 - 2007, the period during which the birds arrive in Switzerland. The birds were indeed observed feeding on grain in some of the oat plots. Single, or groups of 2 to 10 birds, were recorded feeding from late April to early June and during late August. During the three year period when oat fields were available, local numbers did not increase; outside the area where the experiment was made numbers continued to drop however.

We tentatively conclude that oats, a protein rich cereal plant, might be an important source of nutrients in two periods of the annual cycle: the arrival at the breeding grounds and during preparation for reproduction and, later in the year, during the post-breeding moult and preparation for migration. However, the cultivation of oats might not be enough to improve feeding conditions for the Ortolan Bunting, as it does not apparently increase the insect biomass, an important component of the nestling diet. In at least parts of the Valais, access to insect prey might be limited by the dense growth of the vegetation in the herbaceous layer. Effective conservation of the species might be achieved by applying a combination of measures which improve ecological conditions during the different stages of the life cycle.

Zusammenfassung:

Der Ortolanbestand ist in der Schweiz in den letzten drei Jahrzehnten stark zurückgegangen (16 - 33 Reviere zwischen 2004 - 2007). Die Art kommt heutzutage nur noch im Wallis (oberes Rhonetal; sommer-trockenes Klima, zentralalpine Lage, Südschweiz) vor. Zwei Drittel des kleinen Restbestands besiedelt die Felsensteppen im Mittelwallis. Verschiedene Faktoren haben zum Bestandseinbruch geführt, von Veränderungen in der Vegetation (Änderung der Bodenbedeckung, Einwachsen von Bäumen) bis hin zu Bewirtschaftungsänderungen, u. a. die Aufgabe des Haferanbaus. Seit 2005 werden im Wallis im Sinne eines Experiments wieder Haferfelder in der Nähe der letzten Reviere angepflanzt. Hafer ist nachgewiesenermaßen eine wichtige Proteinquelle bei Ankunft der Ortolane im Frühling und zur Zeit der Herbstmauser. Diese Felder wurden von Einzelvögeln und Gruppen bis zu 10 Individuen zwischen der letzten Dekade April und der zweiten Maidekade sowie in der letzten Augustdekade genutzt. Der Bestandsrückgang ließ sich trotz Maßnahmen nicht aufhalten. Der Anbau einzelner Haferfelder reicht anscheinend nicht aus, um die generelle Nahrungssituation für die Art zu verbessern. Insbesondere wird dadurch nicht das

Insektenangebot gesteigert, welches für die Jungenaufzucht benötigt wird. An gewissen Orten könnte auch die Erreichbarkeit der Insektennahrung wegen zu dichter Bodenvegetation ein Problem darstellen. Um den Ortolan erfolgreich zu fördern, scheint eine Kombination verschiedener Maßnahmen nötig, welche die ökologischen Bedürfnisse des Ortolans in den verschiedenen Brutstadien berücksichtigt.

The Ortolan Bunting in Switzerland

The European distribution of the Ortolan Bunting falls in two parts; Switzerland is on the northern edge of the Mediterranean range (HAGEMEIJER & BLAIR 1997, GLUTZ VON BLOTZ-HEIM & BAUER 1997). The status of the Swiss population is very critical, as it dropped from some 200 singing males in 1978 - 1979 (BIBER 1984), to 30 to 35 territories in 2004. This is a dramatic decrease in numbers by more than 80 % in 25 years (REVAZ et al. 2005) and a clear decline in the breeding range (Fig. 1). The nearest neighbouring population breeds some 70 km further south in the Aosta valley in northern Italy and this is also in a critical status (MAFFEI & BOCCA 2001). In Switzerland, the Ortolan Bunting is one of 50 bird species identified as priority species for national recovery programmes (BOLLMANN et al. 2002, KELLER & BOLLMANN 2004, REHSTEINER et al. 2004).

Today, the last strongholds of the remnant population of the Ortolan Bunting in Switzerland are confined to the Valais, a very dry inner-alpine valley south of the Alps (mean precipitation 600 mm/year). Two thirds of the territories are on the south facing slopes in the Upper Rhone valley (Fig. 1). The habitat type (steppes, dry pastures) is similar to that in the Mediterranean region and clearly differs from the breeding habitat (arable farm land) in the north and east of Europe (Fig. 2).

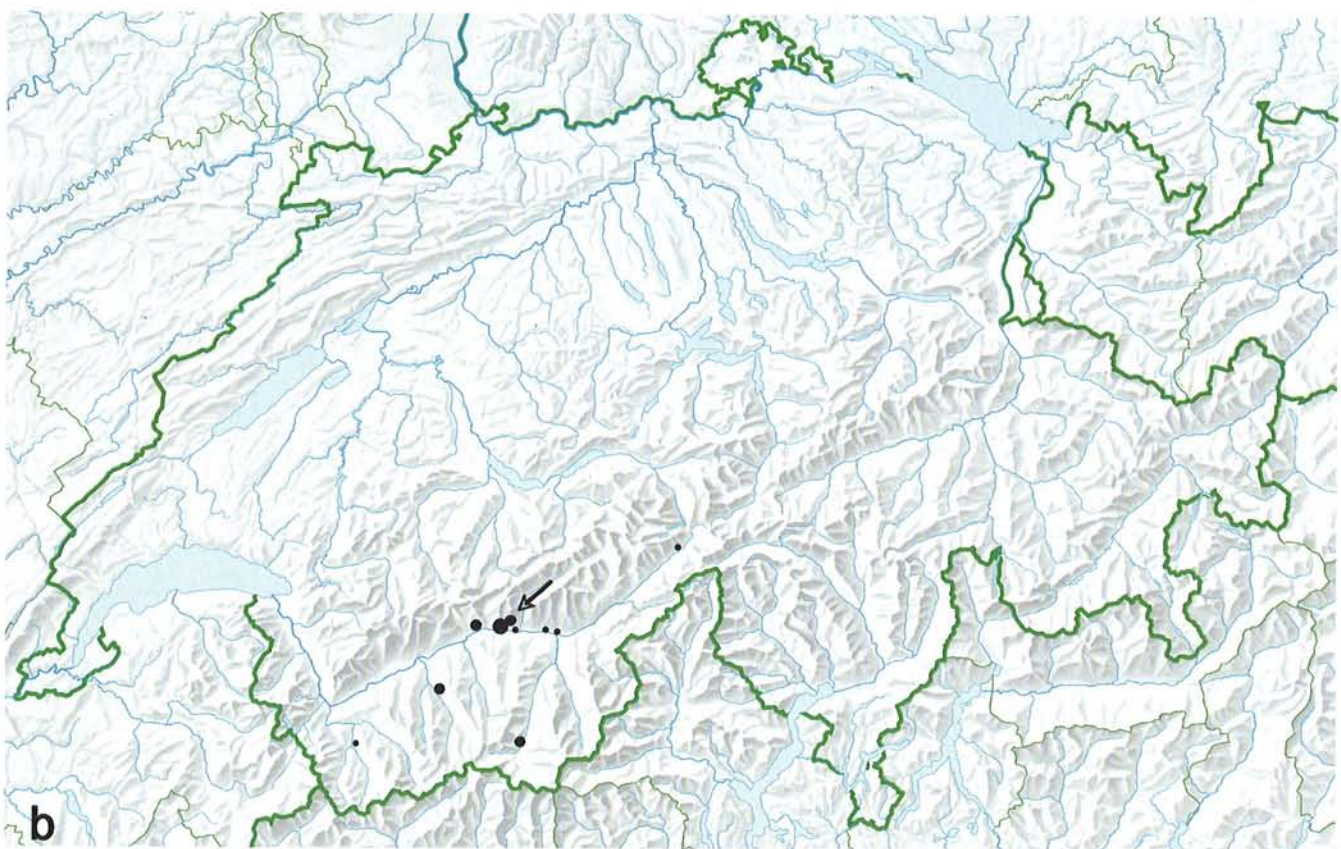
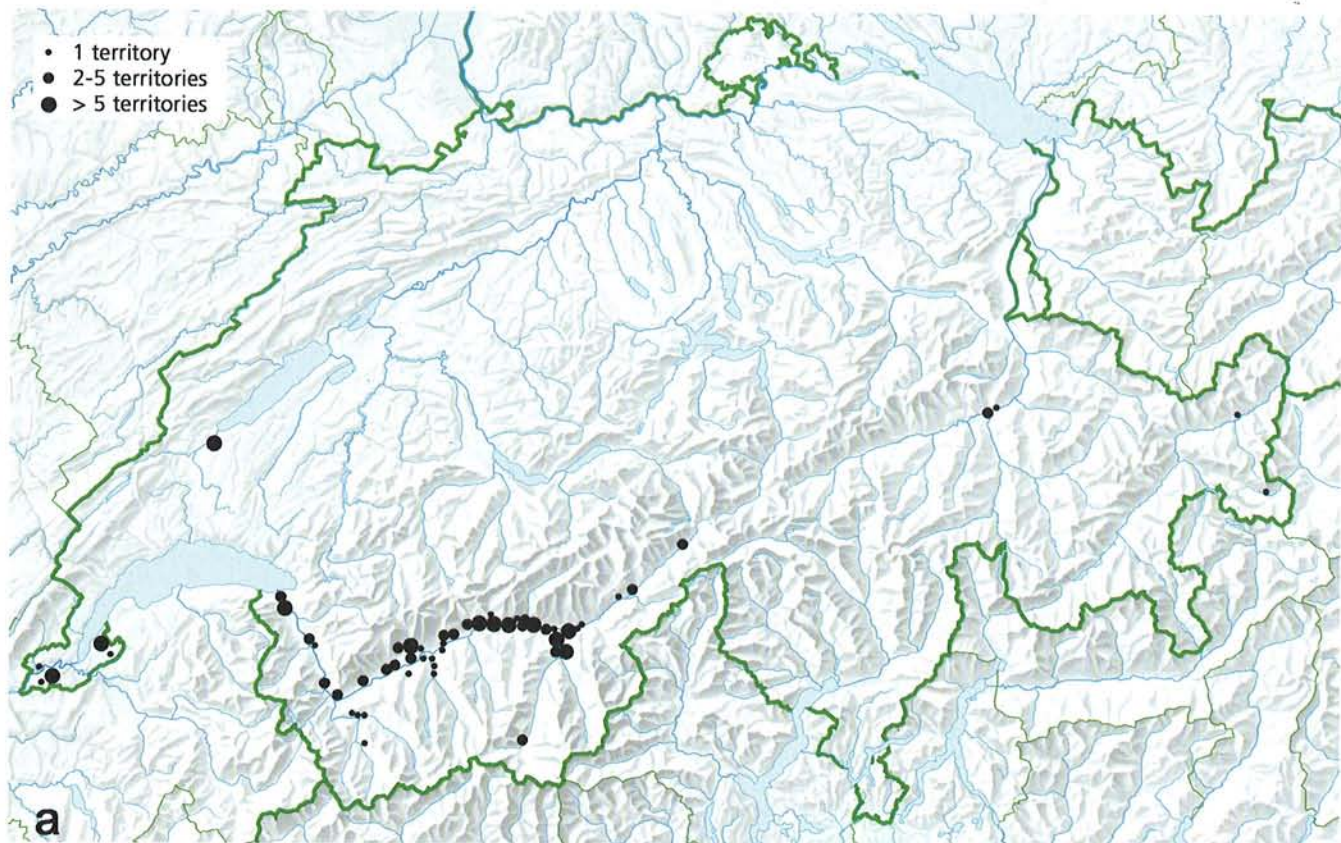


Figure 1: Breeding distribution of the Ortolan Bunting in Switzerland, (a) in 1978 - 79 (from BIBER 1984) and (b) in 2006. The arrow indicates the local population in the Upper Valais considered in this study.



Figure 2: Habitats of the Ortolan Bunting in the Rhone valley of the Upper Valais. The bottom of the valley is farmed intensively. The steppes on the slopes of the hillside with the breeding sites of the Ortolan Buntings are at higher elevations.

Causes of decline

On a regional level (Upper Rhone valley), possible reasons for the decrease of the Ortolan Bunting are most likely related to the dynamic processes of the vegetation in the semi-natural habitats. Additionally, changes in agriculture during the past decades on the pastures or the adjacent farmland could be co-responsible for the negative trend.

The development of this primary habitat is illustrated best by the example of the xerothermophile slopes of Leuk (Upper Valais). Originally covered by an open pine parkland, it faced a fire in 1979. This transferred the area to a vast rocky steppe which became densely colonised by Ortolan Buntings in subsequent years. On a surface of 85 ha, there were 20 - 30 territories in 1982 - 1988 (KEUSCH 1991). However, in the course of the succession, woody vegetation and also the herbaceous layer grew more densely (MAUMARY et al. 1995). By 2003, Ortolan Buntings had dropped to merely 4 singing males (REVAZ et al. 2005). The progression of pine and oak woodlands modified the structure of the area to become unsuitable for Ortolan Buntings, as they prefer open savanna-like habitats. Elsewhere in Europe, e.g. in the Massif Central, France, several authors have pointed out the negative effects of bushes taking over pastures kept open by sheep, when grazing was abandoned (LOVATY 1991; FONDERFLICK & THÉVENOT 2002; FONDERFLICK 2003). The herbaceous layer becomes more dense and access to insect food, which is vital for the Ortolan Buntings while feeding the nestlings, might be reduced. Open ground and patchy vegetation are very important feeding grounds also for other insectivorous and endangered bird species in Switzerland such as the Eurasian Hoopoe *Upupa epops*, the Eurasian Wryneck *Jynx torquilla* and the Woodlark *Lullula arborea* (IOSET 2007; WEISSHAUPT 2007; MAURER 2006).

Intensification of farming practices can alter natural vegetation dynamics and often leads to a dense overgrowth. Traditional habitat management such as burning the borders of drainage canals or fallow land in vineyards, nowadays illegal because of the emission of fine particles, are no longer in practice and this locally accentuated the problem of dense over-

growth. Irrigation by sprinkling, becoming more and more in use on dry steppes or prairie has the same effects. Finally, abandonment of sheep pasturing on large areas also leads to an increased overgrowth by woody vegetation. In the surrounding farmland, cereals as feed grain traditionally grown on large areas of the Valais are nowadays cultivated on only a small scale (Fig. 3). On the slopes and hillsides, this reduction is due to the conversion of arable to grassland, or the result of giving up farming on terraced parcels formerly cultivated. In the plain of the Rhone valley, cereals, an important food source of seed eaters as the Ortolan Bunting, are replaced by maize fields or meadows sown for food. For economic reasons, the cultivation of oats has virtually stopped.

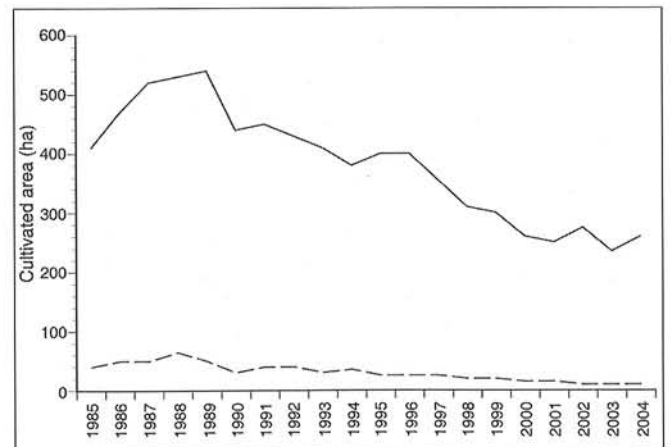


Figure 3: Area covered by feed grain cereals (ha, solid line) and oats (ha, broken line) in the Valais.

Protein rich oat grain is apparently important food sources especially for Ortolan Buntings returning from their winter quarters in spring and starting to breed. Moreover, oat fields might be vital foraging grounds on migration at least for some populations from central, northern and eastern Europe (GLUTZ VON BLOTZHEIM 1989; KEUSCH 1991; DALE 2000; DALE & OLSEN 2002; GOLAWSKI & DOMBROWSKI 2002; HÄNEL 2004). In the 1980s, when oats were still grown in the Upper Valais, Ortolan Buntings were recorded regularly before the start of breeding in April - May, during moult and autumn migration in August - September. In 1982-1983, 220 Ortolan Buntings were caught for ringing during 3 campaigns during migration as they were feeding on two of the remaining oat fields (KEUSCH & MOSIMANN 1984).

Experimental measures - methods

In response to the population crash observed in 2004, the Swiss Ornithological Institute initiated in 2005 experimental measures in favour of the Ortolan Bunting. As a pragmatic shortterm solution, priority was given to a change in the most obvious negative factor that could be altered most easily. Oat fields were sown in the plain in close proximity of the last breeding sites of the Ortolan Buntings along the dry slopes of the Upper Valais.

In cooperation with the cantonal authorities, contracts were signed with the farmers who were paid subsidies for sowing oats. Two parcels were planted in 2005 (P1, P2; total 1.2 ha) and 2006 (P1, P3; total 1.7 ha), 100 to 400 m from the hillsides occupied by the Ortolan Buntings (Fig. 4). In 2007, the measures were extended upwards in the valley to a site abandoned by the Ortolan Buntings some years ago. Overall, eight parcels were planted with oats, most often as belts, with a total surface of 4.2 ha, at distances of 50 to 850 m of the hillside. However, five of them (P6 - P10) were 2.5 - 7 km east of the actual breeding site.

Oats were sown between the second half of April and early May, i. e. the arrival time of the early Ortolan Buntings in Switzerland (WINKLER 1999). Harvest was in the first half of August, i. e. the dispersal time of the juveniles and the postnuptial moult. We looked for Ortolan Buntings in the oat fields of the valley bottom twice a week, in the first part of the day, from 20 April to 15 June, 2005 - 2007 (end of migration, beginning of breeding) and from 11 August to 21 September, 2006 - 2007 (moult, autumn migration). The

Ortolan Bunting population on the hillsides were surveyed 3 times per season in the centres of the distribution, twice on the marginal zones.

Preliminary results

The attendance of Ortolan Buntings on the oat-parcels in spring is shown in Tab. 1. In the 3 years of study, presence was recorded between 27 April (5-day-period/pentade 24) and 2 June (pentade 31). Single and isolated birds or small groups of up to 10 were observed on 6 of the 10 experimental fields. Parcel P1 planted with oats in each of the 3 years was visited by Ortolan Buntings in each spring.

In the cases where sexing was possible, males dominated in the order of 4 to 1. In a third of them we recorded singing in the surrounding of the oat fields, but there was no permanent settling in the plane. Most Ortolan Buntings seen were on the ground, feeding on grain not yet germinating or on fresh sprouts.

Tab. 2 shows the use of oat stubble fields after the breeding season. The presence of Ortolan Buntings in groups of 1 to 7 was very concentrated to the last decade of August. In two years, 70 % of the oat stubble fields available have been visited by Ortolan Buntings at least once after the breeding season.



Figure 4: Experimental measures in the Upper Valais. Oats were sown on a parcel in the plain (on the right side). Steppes with the breeding sites on the left.

Table 1: Presence (black boxes) and absence (grey boxes) of Ortolan Buntings on ten experimental oat fields (P1 to P10) in spring (5-day-period/pentade 22, 16 - 20 April, to pentade 34, 15 - 19 June). 2005 to 2007.

Year	Parcel	Pentads with controls												
		22	23	24	25	26	27	28	29	30	31	32	33	34
2005	P1													
	P2													
2006	P1													
	P3													
2007	P1													
	P4													
	P5													
	P6													
	P7													
	P8													
	P9													
	P10													

Year	Parcel	Pentads with controls									
		45	46	47	48	49	50	51	52	53	
2006	P1				■			■	■		
	P2										
2007	P1				■			■			
	P4										
	P5			■							
	P6							■	■		
	P7										
	P8							■	■		
	P9			■							
	P10			■	■						

Table 2: Presence (black boxes) and absence (grey boxes) of Ortolan Buntings on ten experimental oat fields (P1 to P10) in autumn (pentade 45, 9 - 13 August, to pentade 53, 18 - 22 September). 2005 to 2007.

Up to date, the measures taken have not lead to a comeback of the Ortolan Bunting on the hillside adjacent to the oat plantations (Fig. 5). Within the test zone in the Upper Valais, the number of territories increased from 2004 to 2006, but dropped back to 11 territories in 2007. At the same time, numbers crashed outside the test zone from 18 in 2004 to 5 in 2007.

Discussion

Our experiments clearly demonstrate that oat fields are important foraging sites just prior to and after reproduction: at the time of spring arrival and territory establishment (end of April to early June), as well as during the postnuptial moult and the departure to the winter quarters (late August to early September). These are two short, but crucial periods in the life cycle when the birds have to recover from migration and breeding and build up body reserves for breeding and migration, respectively. It is therefore not surprising that they use sites with nutrient rich food (especially proteins) such as oat grain and seedlings. During the breeding season and especially while feeding young, protein rich insect prey, in the Upper Valais mainly Orthoptera, is essential for nestling growth (KEUSCH & MOSIMANN 1984). The experimental oat fields have therefore improved the feeding conditions on a local scale and during a limited period outside the breeding season. In particular, insects available to the birds breeding in the steppes on the hillsides, but not in the fields of the plane, has not been modified by our experiments. Food supply within the home range and particularly access of the Ortolan Buntings to insect prey depend on the herbaceous layer. Its cover has become more dense, due to natural plant succession and/or due to changes in farming practice. Dense vegetation is likely to reduce the efficiency of foraging parent birds and it is known that this is critical (IOSET 2007; WEISSHAUPT 2007; MAURER 2006).

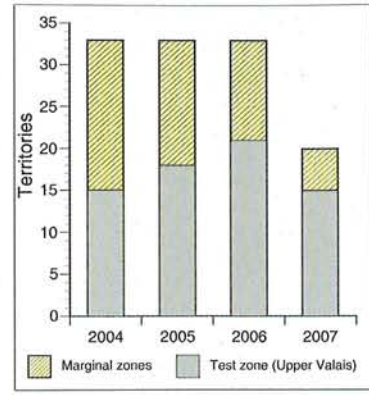


Figure 5: Number of Ortolan Bunting territories in the test zone where oats was sown in some parcels in 2005 - 2007 (black) and in the marginal zones where no measures were applied (hatched).

We do not know which Ortolan Buntings fed on the oat fields. They might have been migrants using the oat fields as a stop-over site. However, the time laps between the presence in spring and autumn (Tab. 1, Tab. 2), and the timing of migration in Switzerland according to Fig. 6 suggest that local birds of the adjacent breeding sites might have been involved.

To conclude, resuming the cultivation of oats in close proximity of the last breeding sites of the Ortolan Buntings is a step in the right direction, but it is probably not sufficient to halt or even reverse the decline of the local population. Ideally, various measures in the breeding habitats to open up the herbaceous layer and to reverse the overgrowth by trees should be combined (e. g. fire, grazing, clearing bushes and trees). However, the perspectives of the Swiss population are doubtful and the effect of conservation measures is limited as the Swiss numbers are very small and isolated. Moreover, the sex ratio is unbalanced in favour of males (M. MENZ, pers. obs.). It is known that these factors have a negative effect on the species (STEIFETTEN & DALE 2006).

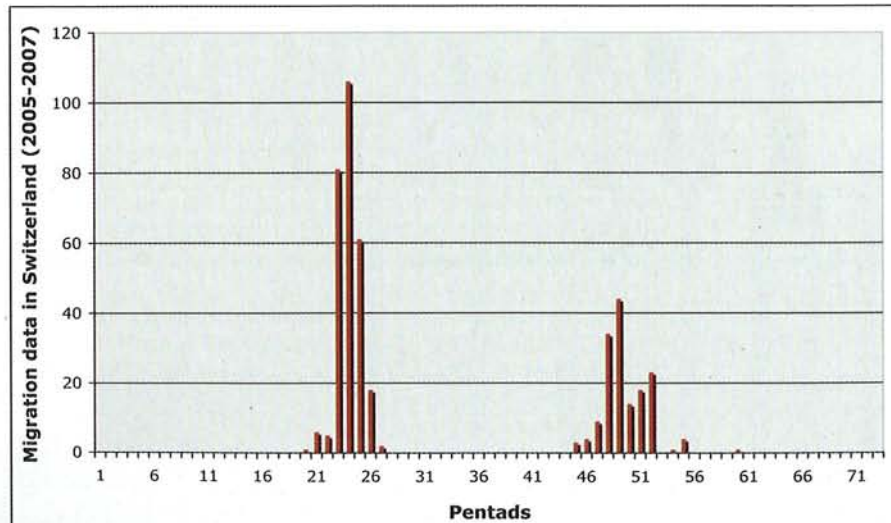


Figure 6: Number of Ortolan Buntings recorded per 5-day-period (maxima per pentade) in 2005 to 2007 (records: Swiss Ornithological Institute).

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