Barn Owl *Tyto alba*: Underside coloration and breeding success

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Introduction

ROULIN et al. found in 2001 that in the Barn Owl studied in Switzerland the underside coloration (measured as number and magnitude of the spots) of the ♂ but not that of the ♀ is correlated with the breeding success: Those with the more intense spottiness on average had a little more fledged young. As in the population studied by the author the breeding success of >600 broods is known and in addition since 1997 the general underside coloration (not only the extent of the spottiness) of many adult owls has been documented, a comparison seemed to be interesting.

Material

In the county of Northeim (Lower Saxony, Germany), since 1996 the breeding population (nest box population) of the Barn Owls is controlled and ringed (KNIPRATH & STIER-KNIPRATH 2014). In addition since 1997 for the adult birds the coloration of the underside is documented following a scale described earlier (KNIPRATH & STIER 2006):

1 underside totally or nearly totally white, spottiness minimal or lacking
2 belly light with a few spots, breast a little darker
3 transitional
4 belly dark with distinct spottiness
5 belly very dark with prominent spottiness

The years after 2010 are not considered here, as the number of values is to small for comparison.

Results

The frequency of the colour gradations

In the study area the coloration of the underside has been documented for 192 ♂ and 235 ♀, for some of the owls multifold. Here we only use the first estimation. For both sexes the colour-type 1 was very rare and type 5 in the ♂ the most numerous and in the ♀ indeed the far most numerous (fig. 1). The more central colour-area in the ♂ was much more occupied than in the ♀. In these latter ones the partition of the darkest type was nearly double as high as in the ♂.

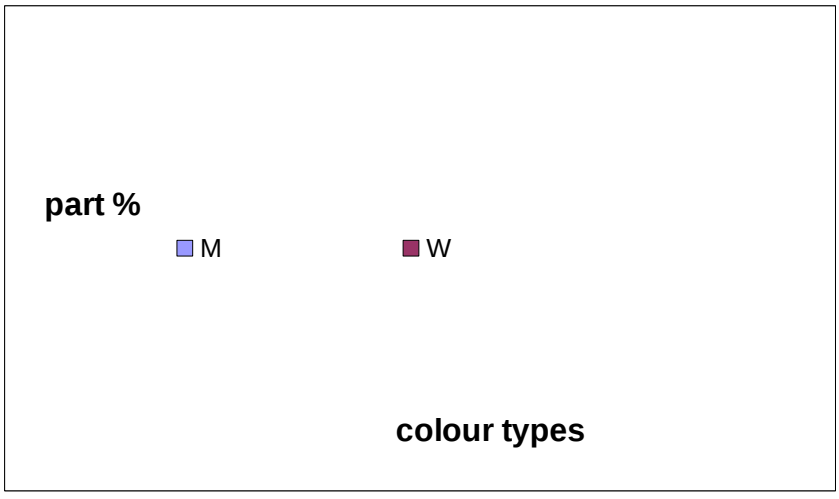

Figure 1: The underside coloration of the breeders in the study area (colour types see text; n=427)

In the population the colour types indeed are not similarly frequent in all years (figs. 2 & 3). Into the numbers per year (1997-2010) we included all ♂ and ♀ controlled in the respective year. Even if in nearly all years for both sexes the darker types predominate, even here we find clear differences. In the ♂ (fig. 2) their part rarely exceeds 60%, in the ♀ (fig. 3) instead it mostly is far higher, sometimes even reaches 100%. There are more conspicuousness's: In the ♂ (fig. 2) in 1997 the line begins with a very high part of very light birds. This one continuously decreases until about 2003. In parallel the part of the darker birds increases. Also that of the transition-type increases from 0% until 2002 to >20% and afterwards again decreases. In the ♀ (fig. 3) the part of the darker types discontinuously decreases from 100% in 1997 up to 2003. It then increases continuously until 2006 and increases since. For the lighter owls and as well for the transitional type the development consequently is reverse.

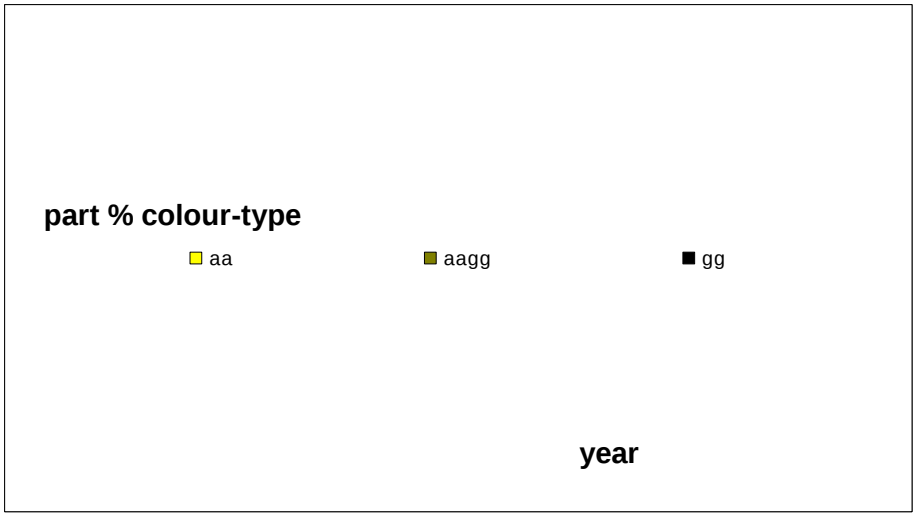

Figure 2: The part of the colour-types in the ♂ summed up to three (aa = colour types 1-2; aagg = 3; gg = 4-5), for the years 1997-2010 (n=395)

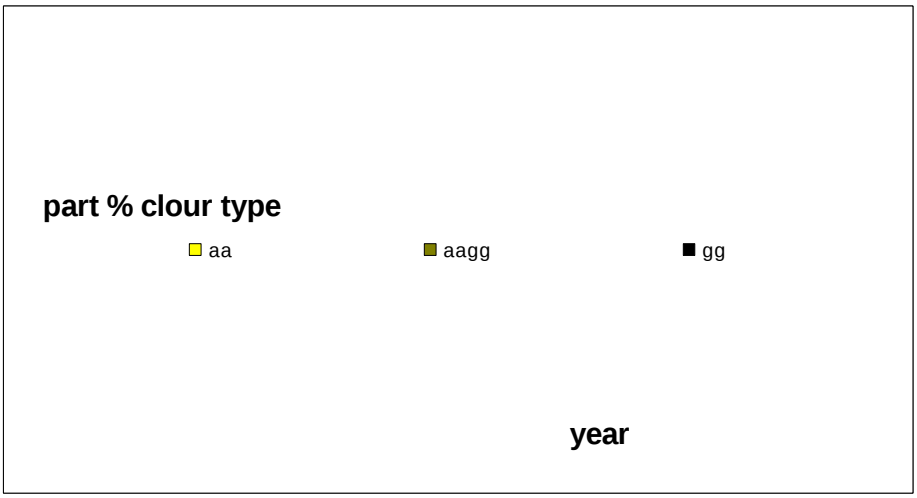

Figure 3: The part of the colour-types in the ♀ summed up to three (aa = colour types 1-2; aagg = 3; gg = 4-5), for the years 1997-2010 (n=366)

The values of breeding success

In an earlier publication (KNIPRATH & STIER-KNIPRATH 2014) the success of the pair partners had not only been measured as final success, the number of young fledged, but the influence of both partners has been studied by age and also by combination of the ages of the parent birds on number of eggs, hatching success, and number of fledging young. Here as well these three phases of the broods shall be considered separately.

For 372 broods of ♂ with known underside coloration the success values clutch size, hatching, and fledging numbers were known (fig. 4). For them there are no visible differences between the colour types concerning means of clutch size. The hatching numbers and those of fledging young slightly increase from the very light ones until about to the birds of type 2. Using ANOVA for none of the differences a significance (P>0.1) has been found. Concerning the smaller values of the very light owls for hatching and fledging we should mention that here the n are <10, all others indeed >30.

For 403 broods of ♀ with known underside coloration (fig. 5) we found a significant difference for clutch size by ANOVA (P>0.01). The values for hatching show no trend. At fledging indeed it looks as if the lighter owls were better. For the differences at hatching and fledging ANOVA gives no significance (P>0.1). Here as well the very light owls do have a n<10 and all others a n>30.

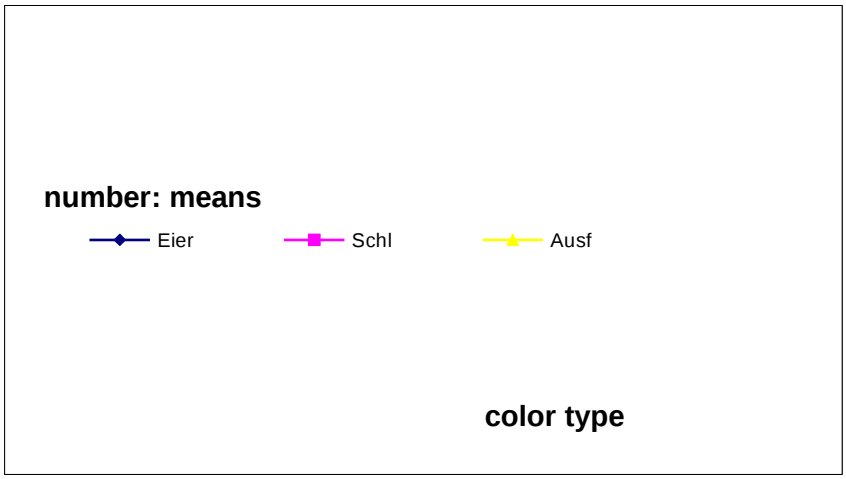

Figure 4: The success numbers of the ♂ by colour types (black: clutch size, pink: hatching, yellow: fledging) (n=372)

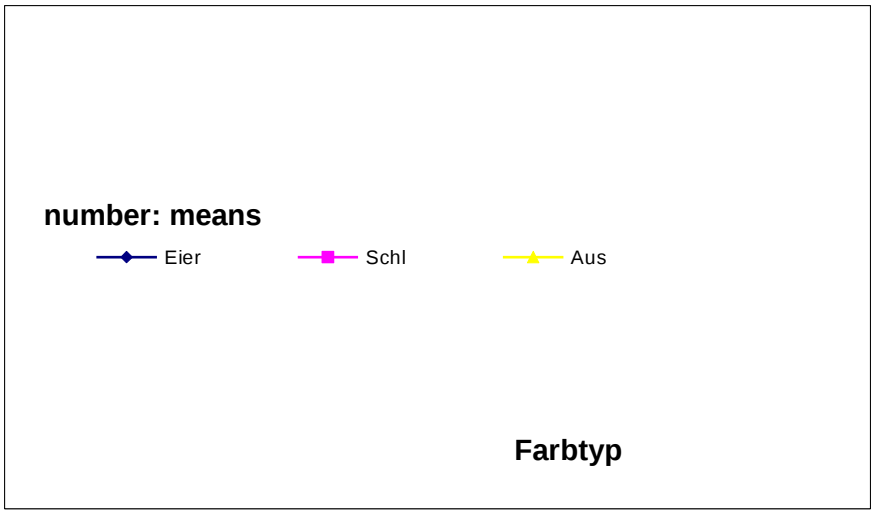

Figure 5: success numbers of the ♀ by colour types (black: clutch size, pink: hatching, yellow: fledging) (n=403)

Discussion

The experience in the field that in Barn Owls within a pair the ♀ mostly is darker than the ♂ again is confirmed. In the darkest category the part of the ♀ was nearly twice as high as that of the ♂. This corresponds to the result of an earlier study (KNIPRATH & STIER-KNIPRATH 2006). When comparing with the paper cited it is remarkable to see a clear decrease of the part of the very light ♂. The alterations of the respective parts over the years 1997-2003 (fig. 2) show exactly that. The earlier supposition, that there had happened at least one immigration-wave of very light owls (♂) in the younger past is supposed. It would be astonishing, if the environment-influence in the direction of a genetically fixed colouration would have made disappear the clear surplus of the light ♂ in such a short time (about 7 years). The assumption of VOOUS (1950) that the intermediately coloured Barn Owls are a mixed population, not yet seems to be disproven.

Concerning the second aspect, the higher breeding success of the darker ♀, as postulated by ROULIN (2001), we didn't find any indication. Indeed we could assume a conversion: The more light ♀ do have a greater fledging success. This eventual trend however is based on a to low n (<10) to attribute to it an importance.

Summary

KNIPRATH E 2016: Barn Owl *Tyto alba*: Underside colouration and breeding success. Eulen-Rundblick 66: mm-nn
This article describes the change that took place from 1997-2010 in the composition of a Barn Owl population in southern Lower Saxony according to underside colouration. The results appear to confirm the assumption of VOUS (1950) that a mixed population is involved, rather than supporting the conclusions of ROULIN et. al (2001) that environmental influence resulted in a genetic fixation of the colouring. It was not possible to substantiate any correlation of breeding success with the underside colouration.

Literature

(The publications of KNIPRATH may be downloaded in English and German as pdf under www.kniprath-barn-owl.de.)

KNIPRATH E & STIER S 2006: Zur Unterseitenfärbung eine Population der Schleiereule *Tyto alba „guttata*“ in Südniedersachsen. Vogelwarte 44: 233-234 KNIPRATH E & STIER-KNIPRATH S 2014: Schleiereule *Tyto alba*: Eigenschaften und Bruterfolg einer zweiten niedersächsischen (Meta-) Population. Eulen-Rundblick 64: 43-65
ROULIN A 2003: Geographic variation in sexual dimorphism in the barn owl *Tyto alba*: a role for direct selection or genetic correlation? J. Avian. Biol. 34: 251–258
ROULIN A 2004a: Covariation between plumage colour polymorphism and diet in the Barn Owl *Tyto alba*. Ibis 146: 509-517
ROULIN A 2004b: The evolution, maintenance and adaptive function of genetic colour polymorphism in birds. Biol. Rev. 79: 1-34
ROULIN A, DIJKSTRA C, RIOLS C & DUCREST A-L 2001: Female- and male-specific signals of quality in the barn owl. J. Evol. Biol. 14: 255-266
VOOUS KH 1950: On the distribution and genetic origin of the intermediate populations of the Barn Owl (*Tyto alba*) in Europe. In: von Jordans A & Peus F (Hrsg.): Syllegomena biologica: 429-443. Leipzig & Wittenberg.