Which results have been obtained by ringing, which otherwise would have been beyond reach?

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Introduction

Our study began by choosing a study area of exactly defined limitations and of an extent suitable for the study and simultaneously appropriate to our personal capacities. Indeed, we had the choice: HORST WEITER (Göttingen) during the 20 preceding years in the regions southern Lower Saxony and northern Hesse systematically had stuffed three counties with nest boxes for barn owls. So from the beginning of our study on we had well defined working conditions, meaning: an area of about 500 km^2 with ca. 100 villages and 300 nest boxes.

Our results and those of other authors

We begin by naming the subjects of the biology of the Barn Owl stressed in the handbook (GLUTZ & BAUER 1994) and by MEBS & SCHERZINGER (2000), the results of which were obtained by ringing: Dispersial, mortality, sexual maturity, pair fidelity, and multiple breeding.

Who is surprised that among these subjects dispersal occupies the most greatest space, as ringing predominantly had been introduced for the study of migration? And concerning the barn owl very quickly, the latest after the solid work of ULRIKE SAUTER (1956), it was clear that the species does not migrate. Likewise our own, still ongoing analysis of the > 10.000 recoveries in the data stock of the Vogelwarte Helgoland has changed nothing in this knowledge. In these we could demonstrate that adult barn owls between the breeding season and the following winter and vice versa realize only very restricted movements, i.e. rarely >10 km (KNIPRATH & STIER 2009). Particular "Wanderjahre", which since SAUTER (1956) are established in the literature, obviously do not exist in northern Germany (KNIPRATH & STIER-KNIPRATH 2010).

Young barn owls, after having become independent, at least at nearer and middle distances disperse in all directions away from their birth-place. Most of them stay in an area of 50 km, sometimes even in one of only a few km. Extremely far going travels of up to > 2.000 km have been recorded. Indeed, the most interesting results are found looking at details. When dividing the recovery data into narrower geographic ringing areas as done by BAIRLEIN (1986), we find, as already did SCHIFFERLI (1939) for Switzerland, that during this dispersion predominantly wooded mountains, woods in general, and of course oceans are avoided. The greater distances more often are reached in directions, which lead into regions more suitable for barn owls, in our country SW.

How often in fact young barn owls settle very near to their birth place, became very evident to us, when we in 2010 controlled three sisters (siblings) as breeders. We consider it even more convincing that together with the descendants of these sisters we had found a series of eight generations in our study area (KNIPRATH & STIER-KNIPRATH 2011b).

Let's have a short look at the movements of the adult birds. We now mostly know the reasons for such movements. Females, which lost their mates, actively seek for a new partner. Thereby they mostly travel not more than 10 km (maximum 13,7; median 2,1 km). In the same situation males mostly stay. If they indeed move, then they do so over

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shorter distances (median 0,27 km). The best interpretation seems to be: The males merely seek a new and better territory, the females a mate with breeding site and a good territory.

Excluding some rather anecdotic statements from captivity, all data concerning mortality of barn owls originate from recoveries. More recent studies by ALTWEG et al. (2006) with elaborate statistical methods showed by the analysis of 22.709 recoveries of Swiss ring owls that extreme weather situations during winter indeed do have an influence on the breeding population. This influence in the owls ringed as nestlings is linear, in the adult ones not. In the former ones the winter-severity explains 17%, in the latter ones almost 49% of the survival probability. So the “Sterbewinter” of the literature have some real background.

Concerning sexual maturity SCHÖNFELD and co-workers (1977) from their recoveries had assumed that females were mature already at an age of 6-7 months, males only significantly later. Here we must mention that the authors only controlled about 10% of the breeding males. But for barn owls breeding freely in church-towers even this number is admirable. Indeed from the data of REINHARD ALTMÜLLER from the region Celle (KNIPRATH 2007), those of HORST SEELER / Wolfsburg (in litt.), and ours (KNIPRATH 1999) we exactly know that both sexes breed as yearlings, when some of them, hatched late in the year, only do have these 6-7 months of age.

In barn owls mate fidelity is the rule. We know pairs with 3-5 broods as pairs within 2-3 years. Nevertheless many partnerships only last for a single breeding period as at least one of the mates dies. But even if both survive, they not in all cases remain united. We almost every year find that the partners of the preceding year still are alive but breed with a new mate. They divorced. As mostly the males stay at their site, we assume that the females are the more active sex. Depending on the study area the part of divorces is different (KNIPRATH, SEELER & ALTMÜLLER 2002).

We shall introduce the term “pair-year”. It means the number of years for which both mates of the original pair again were controlled, whether as pair or not (BLACK 1966a). The part of divorces in the area of ALTMÜLLER was 5,6%, in our area 22.0%, and in that of SEELER following preliminary analysis, even distinctly more. These numbers are correlated with the extent of the study areas. We now by no means do believe in a direct causal connection. There may be a different cause: As the females after divorce mostly disperse, they often escape any control in the marginal parts of the study area. And so we certainly don’t have indications for their divorces. This is the lesser, the greater the area is (as the circumference diminishes in relation to the surface). The most extreme case for divorces we found was a female, which made five broods within three years and divorced for each brood from the actual male (KNIPRATH, SEELER & ALTMÜLLER 2002).

We still stay with the partnerships: A pair is the normal case. In a modest extent bigyny may be found, that is one male with two females. The polygyny of some literature (i.e. one mate with several or several with several ones) was not found. We likewise did not observe biandry, i.e. one female with two males. What was described in SCHÖNFELD and co-workers (1977) – a second male in a church tower above a brood with a normal pair – by us is interpreted perhaps being a helper, if he at all had any connection to the brood and not merely was someone on exploration.

In good years females sometimes leave their mates and their broods as long as the young are far from fledging to initiate a second brood with a new mate, which we call divorce-second-brood (KNIPRATH 2011). These events are known since the studies of ALTMÜLLER (1976) in the region Celle and also of those of ROULIN (2002) in Switzerland. So here too we meet with divorce. For these divorce-second-broods the females mostly disperse much farer than normally, i.e. in a “normal” divorce between two breeding seasons (KNIPRATH 2011). Nevertheless it happens – like in the year 2010 – that such a divorce-second-brood takes place close to the first brood. How such a search by the females for a new mate may go on, we could observe in the same year. It indeed may happen that the male follows the female to the definite breeding site (KNIPRATH & STIER-KNIPRATH 2011a).

Once we found that a female, which already had finished its own brood, assisted at providing a second one (KNIPRATH, SEELER & ALTMÜLLER 2002). So there are helpers, as was found as well for the long-eared owl (♂) (MARKS et al. 2002), for the great horned owl (♀) (MARTÍNEZ et al. 2005), and for the pygmy owl (2 ♀) (WIESNER 2010).

And now: rather two inserts than subjects for further investigation: Twice we found a mother-son-incest (KNIPRATH 2005). Then a normal second brood of Rottraut with it’s neighbour-♂ Ornatus, for whom this brood was a bigynic one, together with the divorce-second-brood of the other ♀, Rike, together with Robert, the first mate of Rottraut, resulted in a partner exchange (KNIPRATH & STIER 2008).

Concerning the efficiency of the owls in reproduction we do have detailed knowledge. In 1983 CURIO had written that yearlings generally, i.e. in the majority of avian species, were less successful than older birds. For barn owls in Lower Saxony (in the study area of ALTMÜLLER) this does not fit at all. Totally in contrast, the yearlings were evidently more successful. They had larger clutches and elevated more young until fledging. We should look more intensely to that. Now, first they laid considerably more eggs. Then, during incubation, the middle old birds (2-3 years old) were more successful, the prominence of the yearlings diminished slightly. And again during brooding and nourishing the chicks the yearlings were the lesser successful ones. Indeed their prominence from egg laying on was great enough to be save until fledging of the young (KNIPRATH 2007).

These facts do have quite a great significance after catastrophic years. Already one year after a crash of the population the part of yearlings is greater. And as these ones perform better in breeding than the older birds, the increase of the population succeeds more quickly than if it were otherwise.

We come back to the age-depending results in breeding. That as well may be judged from an economic point of view: The yearlings are forced to start with more eggs as their performance during the later stages of breeding is less. But they do learn with the result that the middle-aged owls need considerably fewer eggs to produce the same number of fledglings. Thus they breed more effectively (KNIPRATH 2007).

That indeed is valid generally but the relations are slightly different in the two sexes. It certainly is of great interest for partner-choice how successful the different age combinations perform during the phases of the breeding cycle. Or: Which age combination does need the fewest eggs to produce a certain number of descendants? The graphs 1-4 (from KNIPRATH 2007) show the breeding success of the different age combinations of ♂ and ♀.

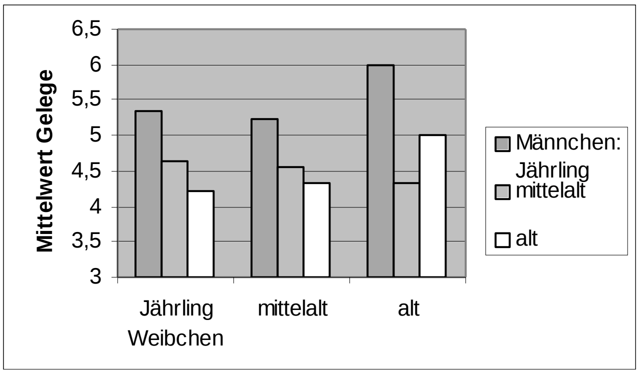

Figure 1: Success of pairs of different age combinations in egg production; n = 110 (from KNIPRATH 2007: fig. 50)

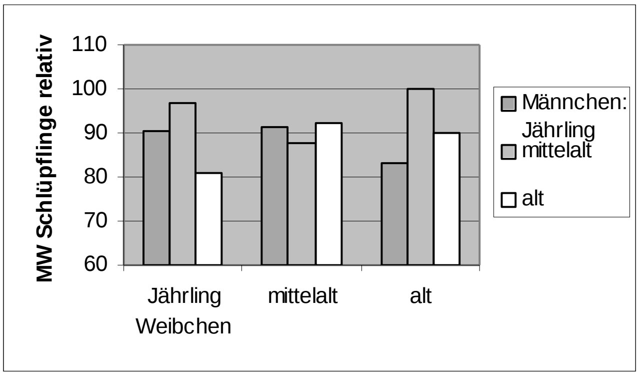

Figure 2: Success of pairs of different age combinations in incubation in relation to egg number (from KNIPRATH 2007: fig. 51)

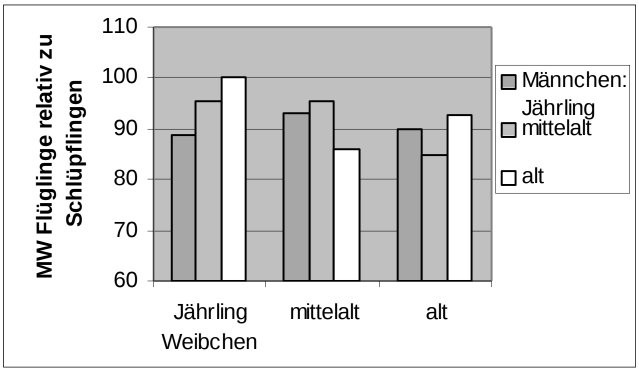

Figure 3: Success of pairs of different age combinations in fledglings in relation to number of hatchlings (from KNIPRATH 2007: fig. 52)

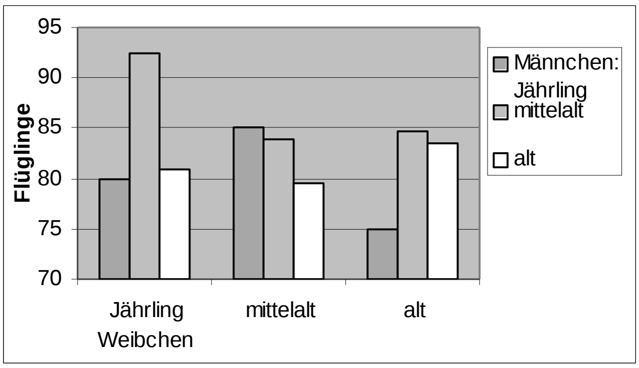

Figure 4: Success of pairs of different age combinations in incubating and elevating 100 eggs (from KNIPRATH 2007: fig. 54)

Among the owl species barn owls are the most prominent examples for second broods as a strategy to maximize offspring numbers, especially after a population crash. Insofar not new. Here again the details are new. First, as we know, until now there is no proof of a third brood. For such a proof we insist in the ring-control at least in the ♀ at two preceding, successful broods. Among the second broods we found three different categories: second brood of a pair, second brood of one mate with a new one after the end of the first brood, and the so called divorce-second-broods. The second brood of a pair is the normal case. These broods eventually may overlap, thus being intercalated. According to definition divorce-second-broods always overlap the first broods of the ♀. For discrimination in all cases both mates must be controlled (KNIPRATH 2007).
Who now performs these second broods – predominantly the younger owls or the older ones? When making the comparison between the yearlings and all other birds, we really found a difference: The yearlings more rarely make a second brood than the older owls (relation second breeders yearling-♂: older ♂ as 41:54%; in the ♀ the difference is still more evident: 42:67%). That the ♀ perform more second broods of course is due to the divorce-second-broods, in which the ♂ of the first broods are not involved. The readiness for second broods obviously increases by age, especially in the ♀ (KNIPRATH 2007).
In connection with second broods we had the idea, in barn owls there could be two different life strategies: either to stake every thing in one throw, meaning here to breed twice a year if possible, or to care in this context and to speculate to have another, perhaps even better opportunity for breeding. We compared the life-expectation of owls, which had only one brood a year, with that of others, which had a second brood. We were surprised to find that there are no such different strategies. Owls with second broods in addition had the greater life expectation. If we won't assume that breeding itself prolongs life, the interpretation only may be: The most vital birds make the second broods and live longer as well (KNIPRATH 2007).
We add some news, which we got during the year 2010 (KNIPRATH & STIER-KNIPRATH 2011a, b). In this year, which for Barn Owls in Central Europe generally was most adverse, we for the first time succeeded in controlling two ♀ between their first and second broods. In one case, we caught the ♀ together with a ♂ other than her first one some km apart. Later she nevertheless bred together with her first ♂. Our interpretation is that she tested her options and then decided.
The second ♀ likewise tested a new ♂ for an intended divorce-second-brood, as well at a distance of some km. She stayed with him but obviously convinced him that the breeding site he had offered or the prey stock around were not at best. She went back to her former breeding site (where her first ♂ still elevated the young) and made her second brood together with the new ♂ at a distance of only 40 m from her first brood. So he had followed her there. The two ♂ must have met again and again.

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