What may derived from the population numbers of single study areas for the development of the Barn Owl population[1]

Lecture at the 30. Annual meeting of the AG Eulen 2013 at Waren/Müritz

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Basing on a great lot of data UBBO MAMMEN in 2008 has shown the development of the Barn Owl population in Germany (fig 1). There was presented in 2008 a rather constant upward development, included the known, sometimes violent oscillations, have been presented. The actualized figure still shows an upward development. Already from the 2008 figure questions arose: Which information concerning the actual population trend and the eventual reasons may we deduce from this graph? Does the image look likewise in smaller areas, i.e. the study areas of single students?

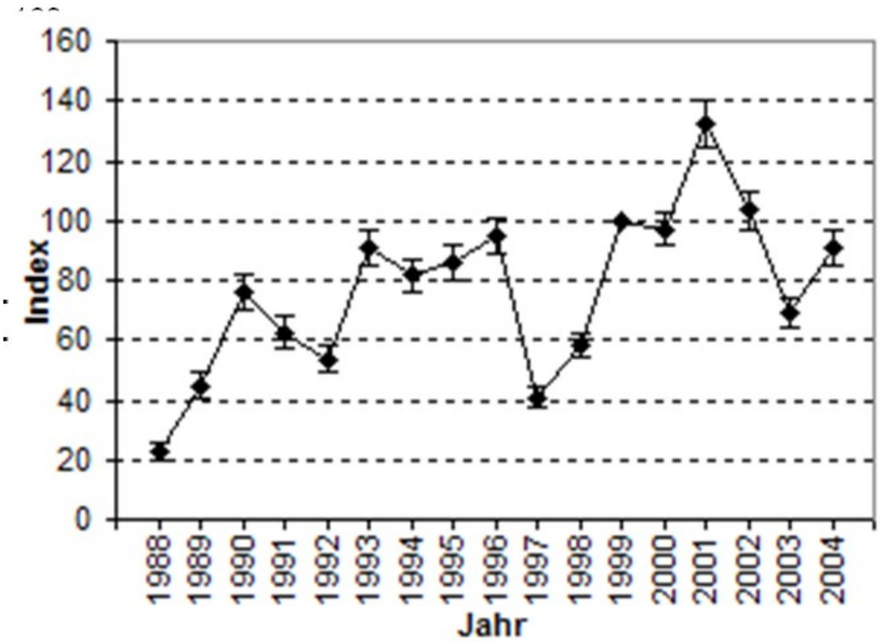

Figure 1: Population development of the Barn Owl *Tyto alba* in Germany from 1988 – 2004 (1999 = index value 100) (from MAMMEN 2008)

KARL-HEINZ GRAEF 2004 has published the values of the development of the Barn Owl population in the Hoehenlohekreis/Germany and recently actualized it. Already in this first example we meet with the very important factor for population numbers: the presence of possible nesting sites. Here (fig. 2) on one hand we see that the position of nest boxes nearly steadily has been continued throughout the total time interval. Then it became obvious that this nest box activity not at all immediately lead to an increase in brood numbers. This one only occurred several years after the start of the action. It is visible as well that the action showed an effect until about 1996. Thereafter we only detect the usual oscillations of the population. The cause for

[1] Translation of: Kniprath E 2014: Was lässt sich aus den Bestandszahlen einzelner Untersuchungsgebiete zur Entwicklung des Schleiereulenbestandes ableiten? Eulen-Rundblick 64: 12-15

these oscillations then no more was a lack of nest sites. The nest box action already 1996, latest 2011, could have been stopped. Afterwards everybody is more talented. If we only look at the numbers from 1997 on, i.e. after the assumed end of the effect of the nest box action, then we no more could speak of an increase of the population, better we could see a decrease (fig. 3).

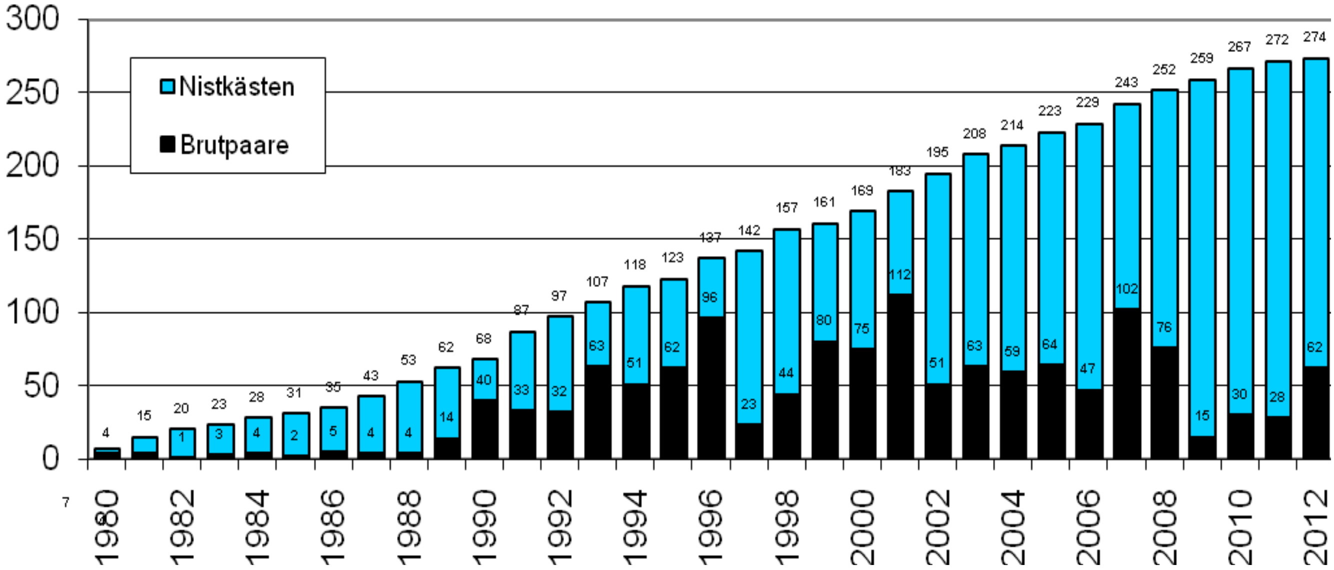

Figure 2: Nest box offer and population development of the Barn Owl in the Hohenlohekreis/Germany 1980-2012 (pers. comm. K-H GRAEF)

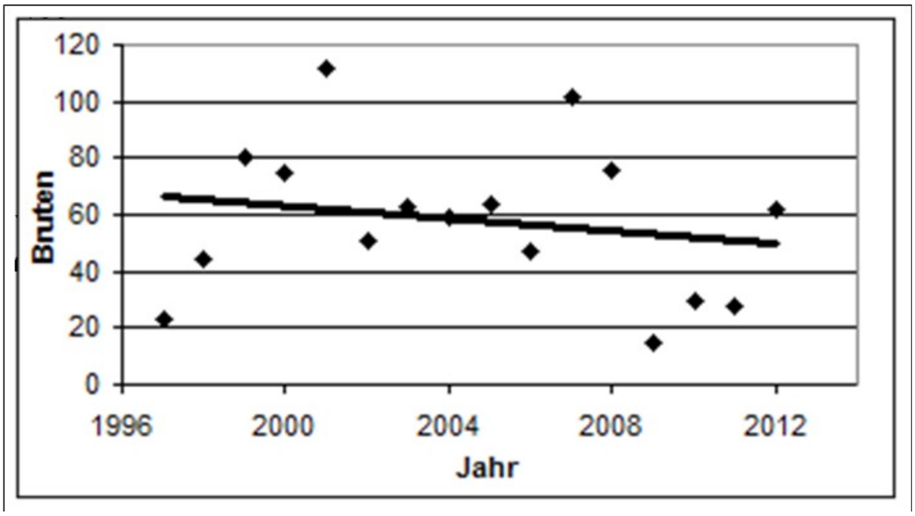

Figure 3: Development of Barn Owl pairs in the Hohenlohekreis/Germany after the end of the influence of the nest box action (data from fig. 2)

From 1967 – Dr. REINHARD ALTMÜLLER in the county Celle/Germany (around Lachendorf) likewise has posted nest boxes and beginning with 1972 controlled very intensely the population (fig. 4). As we may see in the analyses of these data (Knipráth 2007) there was a yearly general increase of the population averaged at about 6%. Of course also here we meet with the in part violent up and down development during shorter or longer phases. I should add that also here we study an exclusive nest box population. These boxes were posted just into the study period. The proper start period from 1967 – 1972 is lacking in the figure. Here as well we may attribute the increase of the population up to 1978 to the nest box action. If we only consider the years after, there still is an increase recognizable, which in contrast is a little less (fig. 5).

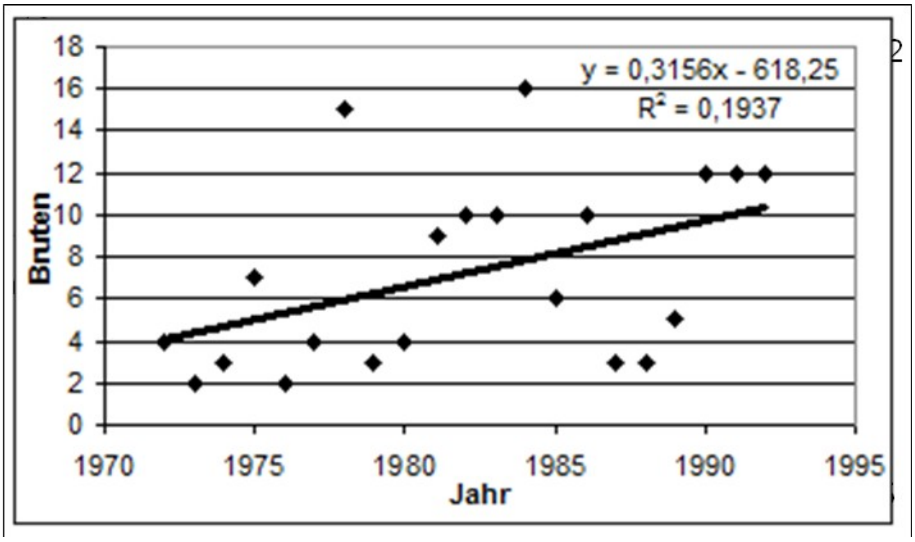

Figure 4: Development of the Barn Owl population around Celle/Germany (following ALTMÜLLER; from KNIPRATH 2007)

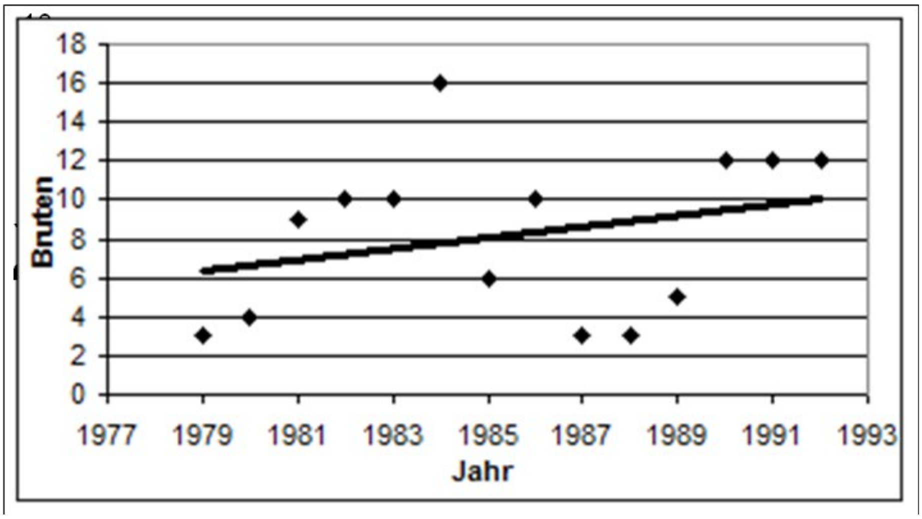

Figure 5: Development of the Barn Owl pair population around Celle/Germany after the end of the effect of the nest box action (data from fig. 4)

Friendly HORST SEELER has placed at our disposal the data of the local working community OAG Barnbruch. From the much more extensive data we select here those from 1992 – 2010, as during that interval the number of boxes no more has been increased considerably and the controls mostly had been at a constant level (SEELER pers. comm.). The linear regression here also exhibits an development downwards (fig. 6).

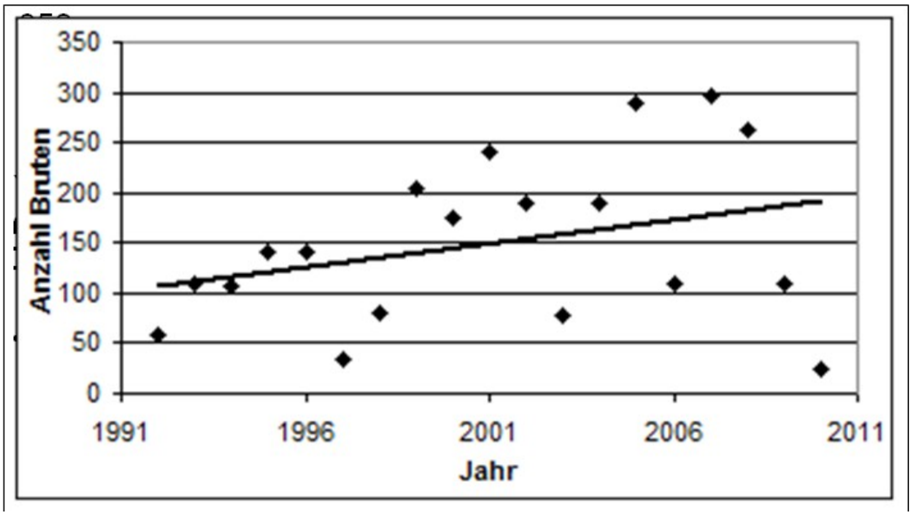

Figure 6: Brood numbers in the area around Wolfsburg/Germany (OAG Barnbruch; Horst Seeler per E-mail) with linear and binomial regression lines

A further well controlled population is that in the county Northeim/Germany. This one as well is a nest box population. The boxes, as we already pointed to at our meeting 2012, have been posted in an exemplary action during longer than 30 years by our member HORST WEITER with the aid of the county government. Our study in a defined area, the northern part of the county Northeim, started 1996. Then the box posting period already had ended several years ago, the number of boxes thus mostly constant during the total study period (1996-today).

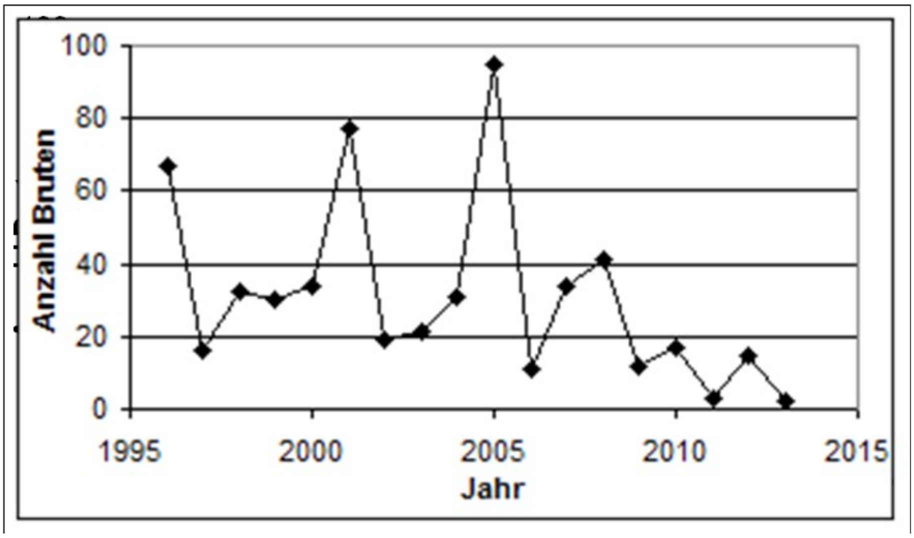

Figure 7: Development of the Barn Owl population in the northern part of the couznty Northeim/Germany 1996 – 2013

I intend to use these data to demonstrate, how chances of data selection act on the analyses of population trends. Depending on which years we use, the development looks very different. Our first year was 1996. And that one was a peak year. On that basis a population first cannot develop other than downwards. Of course, the clearly lower numbers at the end of this study likewise act altering on a trend. I present trend lines as they are produced by EXCEL, beginning with the years 1996 – 2000 (fig. 8, first column) and then in the following columns each time a further year is added. The addition of the years 2001 and 2005, both peak years by brood numbers, changed a hitherto negative trend to a clear positive one. The year 2008, likewise very positive, preliminary stabilized the positive trend. The result should make cautious at all linear trends. They always only count for the actual period.

Figure 8: (please look at the German version) The trend lines of the population development in the northern county Northeim/Germany, beginning with the years 1996-2000 (left column), and then in the following columns each time a further year added (columns to be read from top down)

How exactly a trend line reflects the real trend of a development, is shown by the measure of accuracy (R^2) or the regression coefficient (fig. 9). These indicate, how close the single values are to the regression line. The values maximally go to 1. This then means that all values exactly fall into the line. Here the measure is 0.052, what means very far away from 1. EXCEL indeed presents other kinds of regression lines. A clearly higher regression coefficient is reached for a binomial regression (0.1862 instead of 0.0519) (Fig. 9). Following this, in spite of the high value of the year 1996, until about 2004/05 there would have been an incline, indeed afterwards a decline.

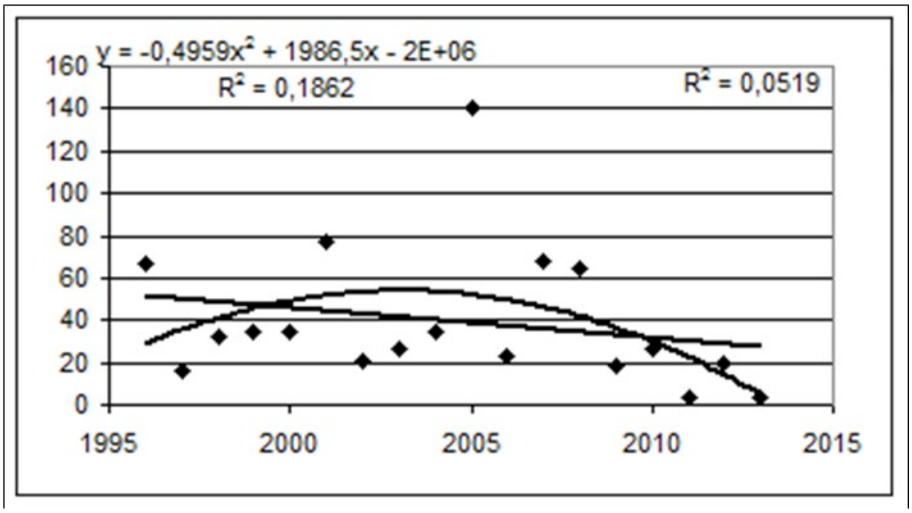

Figure 9: Linear and binomial trend line to the development of the population in the county Northeim 1996-2013

Nevertheless in this figure, independently of the yearly oscillations, it is visible that the three peak values for themselves do have an increasing tendency. This might indicate that despite of all oscillations, the development until to the last peak value 2005 has been positive. But again caution! It as well may indicate that the oscillations themselves have become greater and perhaps will do so in the future. An indication for that as well is that the minima show a slight downward tendency.

EXCEL still offers more possibilities to analyse a row of values. The trend line may be prolonged beyond the last value (fig. 10). This indeed for us is no help, neither for the linear nor for the binomial regression. A trend towards negative values in addition is not real.

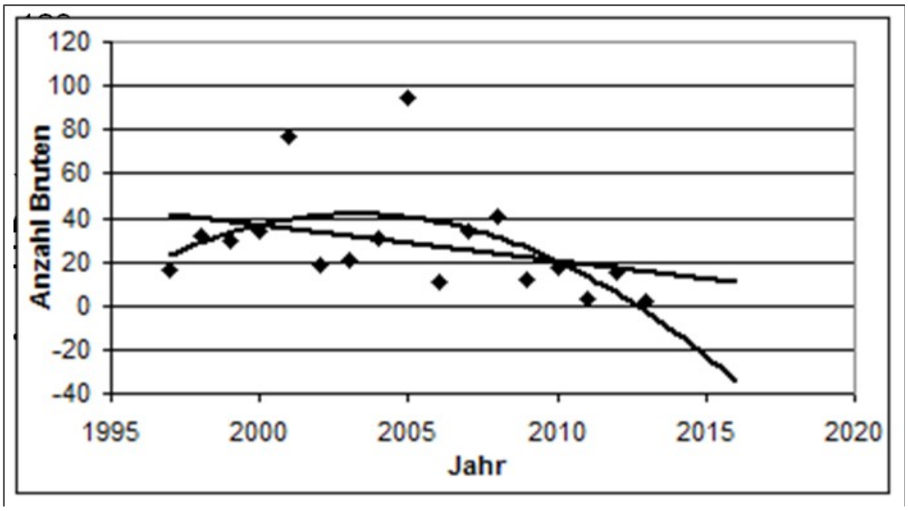

Figure 10: Linear and binomial regression with prolongation until 2016 (data from fig. 7)

Nevertheless in EXCEL we find, exceeding the binomial regression further more ones using higher exponents (polynomial). If we go up to x6, then the supposed trend turns over (fig. 11), at least. Here obviously it is considered that hitherto the population always has regenerated and that in 2012 there really has been a slight recreation. By that, the principle (the hitherto regular recreation) is confirmed.

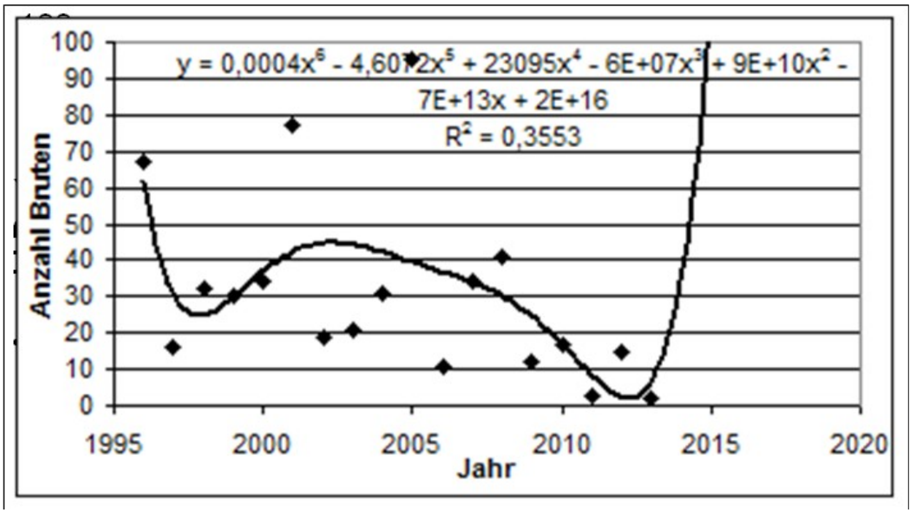

Figure 11: Polynomial regression line with prognosis until 2ß16 (data from fig. 7)

Conclusions

During the study of the single study areas we learned that for the analysis of a population trend it is indispensable to look at the years of nest box activities separately. These after a start phase lasting several years during the nest box action always had a positive effect. This increase still lasted some years after the end of the respective action. If we intend at the depiction of the development of a population to show the effect of a nest box activity, we could/should also include the numbers of five years on beyond of the action. If we in contrast intend to calculate the development without the influence of increasing numbers of boxes, only those data should be used, which beginning with about the sixth year after the end of the nest box activity or after the first very clear maximum have been obtained.

On comparing the trends of the single study areas to the numbers summed up over central Europe in MAMMEN (2008) the suspicion arises that the positive development also here, during the 80es and the 90 ties years is to attributed at least in part to the nest box activities, as they were performed nearly everywhere. It should be interesting to see, how the development would look like, if this influence was considered.

Now we should compare the development in the four study areas after distraction of the years of nest box activities. Only for one area it was positive. This study indeed, that of ALTMÜLLER, fell into the time, during which the development still had been positive in the areas of the three others. For these three in accordance at linear presentation a negative development and then at the binomial one a similar one is visible, but with a prominent positive phase about ten years ago.

My conclusion: It looks gloomy. If we are cautious, we hardly can deduce a positive tendency from the data. Nevertheless I hope.

Literature

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