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THE WHITE STORK AS A SUBJECT OF RESEARCH¹

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THE White Stork (*Ciconia ciconia*), as a striking and confiding bird of large size, is especially adapted for many lines of research. For a long time the Vogelwarte of Rossitten has been engaged in studying it, for this station is situated in that part of Germany that is richest in Storks, namely East Prussia.

1. DISTRIBUTION

The numbers of this beautiful bird vary greatly, as has been shown by the surveys made in different places in Germany since the beginning of this century. Recently there has been an increasing number of observers in this field, and many countries have a considerable literature on their Stork populations. It is most important that these surveys should be taken from a uniform point of view, and, if possible, in the same years, so that a comparison can be made over as large a territory as possible.

My project of an "International Population Survey in 1934" met with a cordial response, and hence we now possess for that year a good insight into the Stork population of all of Germany, Holland, Denmark, the Schonen district of Sweden, Switzerland, Austria, Czechoslovakia, parts of Poland and Latvia, and also the Spanish Province of Avila. Omitting Latvia (the figures for which have not yet been reported), the total count comes to about forty-five thousand pairs. In Germany 30,730 pairs with 64,772 fledged young were recorded, of which more than half—16,602 pairs with 33,751 young—belonged to East Prussia, while western and southern Germany is very poor in Storks. In East Prussia an average of 44.5 pairs of Storks nest per one hundred square kilometers. Even more favorable is the Memel region just to the north—formerly a part of East Prussia—for here 69.1 pairs bred per one hundred square kilometers. The highest concentration is that reported by Count Wodzicki for the Rudki county in the Wojewodschaft

¹Translated from the German by Margaret Morse Nice.

Lemberg (Lwow, Poland) with 105.8 pairs per one hundred square kilometers.

It is interesting to follow by means of the figures the dependence of the Stork on environmental conditions, especially food supply. The opportunities for nesting are also of great significance, and these are largely dependent on man. While in northwestern Germany the preference for thatched roofs is striking (in Schleswig-Holstein the ratio of thatched to tile roof was 87:3.5), in eastern Germany (East Prussia and Silesia) the "tile roof is used as often as the thatched, but usually with the aid of an artificial support. Man must compensate with this help for the lack of thatched roofs. Tree nests are rare in many countries, but in others common, as in Upper Silesia (90 per cent) and in Checkish Silesia and Moravia (91 per cent). Here again man has an influence, for in the regions with nests on trees the inhabitants have the custom of placing the artificial support on trees rather than on roofs. Holland has a large number of pole nests (27.1 per cent), where the support is placed on isolated high poles.

2. FLUCTUATIONS IN NUMBERS

The numbers of Storks vary much from year to year. We have now reached a maximum which will probably not continue for long. Apparently there was a minimum about 1928, after which came a striking increase. Not everywhere, however: in Switzerland which had about one hundred pairs at the beginning of the century, the population dropped to 17 pairs by 1927, since when it has continued to decrease with 13, 10, 11, 11, 10, and 7 pairs in 1935, and several of these raised no offspring. Saxony, which reached a minimum in 1928 of only 13 pairs, quadrupled its population in a few years: 13, 15, 19, 22, 28, 37, and, in 1934, 54 breeding pairs!

Two sorts of influences must be distinguished. The spread of civilization with its dangers from drainage, high-power lines, etc., is injurious, especially along the borders of the range. On the other hand, in the regions where Storks are common and real competition occurs, it is chiefly the food supply and weather that are the decisive factors.

In fact we see great differences in the reproduction-coefficient (number of young fledged per nest) according to the favorableness of the year as well as of the situation. The average number fledged in Thuringia in 1934 was 3.6, but in the Memel region (with sandy soil) only 1.7. In East Prussia it was 2.7 in 1931, but in the drought year 1934, 2.0. The question remains to be investigated as to how far changes in the weather of a periodic nature influence the population.

3. FOOD

The food of the Stork is of special interest to the hunter in those

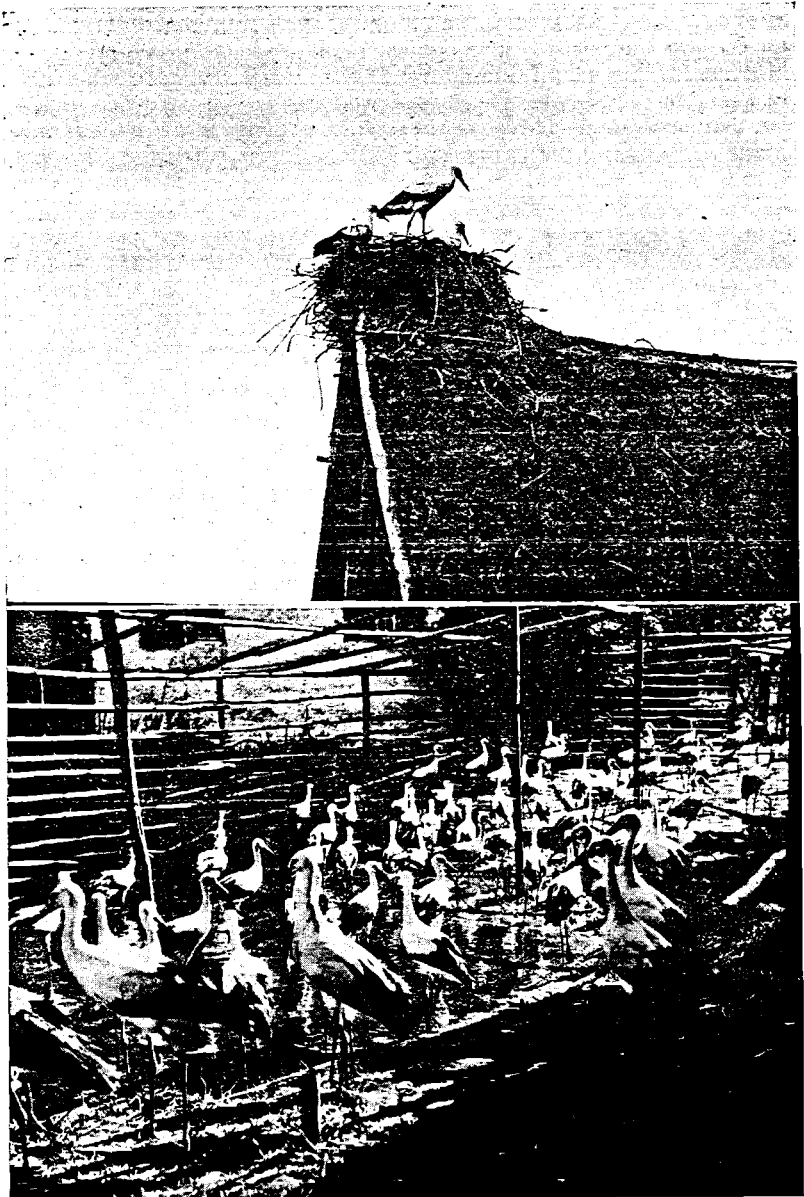


FIGURE 1
A TYPICAL STORK NEST IN EAST PRUSSIA.

FIGURE 4
A VIEW OF THE EXPERIMENTAL STORKS OF THE VOGELWARTE OF ROSSITTEN.

regions where this bird is common. Large number of stomach-analyses on the part of the Vogelwarte of Rossitten give little or no evidence for the harmfulness of the Stork, except in rare instances. On the other hand we have many proofs of the importance of this bird as wholesale destroyer of mice (for instance in the great mouse plague of 1930 and many other times) and of many kinds of insects. Beetles of all kinds and grasshoppers are devoured in numbers, as well as insignificant-looking larvæ. A Stork had eaten more than seven hundred larvæ of saw-flies (*Tenthredinidæ*) for one meal, while another had the remains of over seventy May-beetles (*Melolontha*) in its stomach. On its wintering grounds in South Africa the Stork is highly regarded as the "Locust Bird".

4. MIGRATION

The migration of the White Stork in Europe is peculiar, since the birds that nest east of the Weser River travel round the east end of the Mediterranean to reach eastern South Africa—a distance of over ten thousand kilometers—while the more westerly Storks reach Africa by going through southern Spain. It would seem that some at least of these western Storks reach eastern Africa, for a dart found in a Stork killed in Spain is believed by ethnologists to have come from a Negro tribe inhabiting Kenya. Yet we know for certain that some Storks occur in the west in tropical Africa. We are anxiously awaiting further recoveries.

5. NESTING

The breeding biology of this bird, particularly from the standpoint of behavior, is a fascinating subject. In East Prussia the Stork arrives at the beginning of April, usually the male first and a few days later the female. As a rule an old nest is adopted, a set laid by the end of April and hatched in thirty days. The young stay some nine weeks in the nest and are typically altricial, during the first weeks lying flat in the nest on the approach of a person, thus allowing themselves to be easily ringed. Migration occurs about the middle of August, and in about seventy per cent of the cases the young leave several days before their parents, the latter sometimes renewing courtship activities at this time just before their departure.

The nest plays a very important role in the home life of the Stork. One often has the impression that it is first the nest that is defended and second the mate. Very remarkable are the fights that regularly take place over nests that are already occupied. And even when excellent nests are present in the vicinity ready for adoption! The fact of the occupation of a nest by a pair of Storks seems to present a challenge to strangers of the species, and it is a curious fact that at times the intruders drive out the rightful owners, yet raise no brood themselves. In the reproductive mechanism of such individuals, the instinct to possess a nest is present, but the rest of the

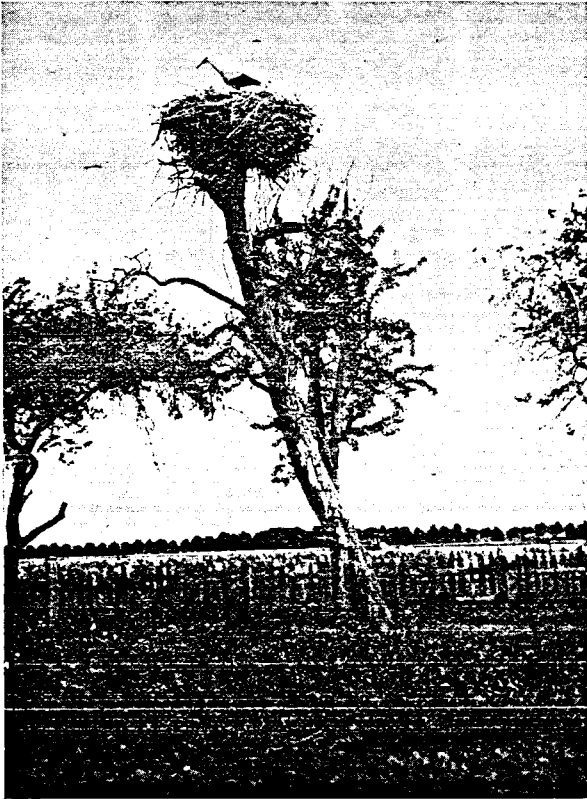


FIGURE 2

A TREE NEST IN EAST PRUSSIA.

pattern is lacking. These are probably two- or three-year-old birds that are not yet fully mature.

6. AGE OF BREEDING

Year-old Storks never return to the home nest. They are often found throughout the summer in their South African winter quarters. In two-year-old birds the mechanism of the reproductive activity is better developed, even if not fully so; they may at times lay claim

to nests, but do not breed. Three-year Storks often nest, but usually have fewer young than older birds, or perhaps none at all. Four-year-old Storks are nearly always sexually mature.

The large troops of "Bachelor Storks" that roam around together in the breeding season in East Prussia and roost in trees at the edge of the woods consist to only a small extent of year-old birds, but largely of two-year-old or even older individuals. Perhaps there are also old birds that fail to breed because of some pathological reason. It would be more correct to call these troops of "Bachelors" or "Robber Storks" "Stork Children."

7. MORTALITY OF THE YOUNG

The weather appears to make little or no difference in the number of eggs laid, but often affects the number of young raised through its influence on the food supply. The smallest of the family (incubation always begins before the last egg is laid) is sometimes raised when food is plentiful, but never when it is scarce. When the little bird lies feebly on the bottom of the nest, it is no longer fed. Older young are thrown out, but as I can prove by photographic evidence, small young (for example, twelve days old and weighing 570g.) are swallowed by the parent. Sometimes several small young disappear in this manner. If all the young die, there is a strong suspicion that they have succumbed to a heavy infestation of intestinal trematodes, whose intermediate host is a frog (*Rana esculenta*).

8. METHODS OF INVESTIGATION

The best method for investigating the life-history of this species is to concentrate on a small area, as here in Rossitten, and study the ringed birds. We are trying to do what Mrs. Margaret Nice has done in her classical study of a small bird—*Melospiza melodia*. Naturally the technical requirements with a large bird which can hardly be ringed when adult are different—in some respects easier, in others more difficult. We can ring only the young Storks, and must plan the work with a view to the future, since the birds do not breed till several years old.

For years the Storks of the Insterburg District in East Prussia have been systematically ringed. Especially large rings with large figures are used so that they can be read with field-glasses while the birds are standing in normal fashion on the roof. In addition to the approximately fifteen hundred young Storks of this sample district, the populations of the Stolp District (Pommerania) and Kottbus (Mark Brandenburg) were ringed of late years, as well as the Storks of all Upper Silesia. Of course systematic observation must go hand in hand with this work. The rings of the different regions have different numbers and are also easily distinguishable by the form of the clasp.



FIGURE 3

THE RINGS OF THE VOGELWARTE OF ROSSITTEN.

AAA. Pelicans. AA. Swans, Golden Eagle. A. White-tailed Eagle, Bustard. B. Storks, Herons. BB. Special Rings for Researches with the White Stork. C. Medium-sized Raptors. D. Crows, Medium-sized Gulls. E. Black-headed Gulls, Lapwings. F. Starlings, Thrushes. S. Swits, Kingfishers. G. Most Small Birds.

9. HOMING EXPERIMENTS

In the course of these studies, which are chiefly concerned with the instincts of this bird, the question arises as to what external and internal factors are involved in the matter of way-finding in migration. Our researches have been concerned with the fall migration of the young birds. Several years ago 196 young Storks were confined and not released till after the departure of the adult birds. With a few exceptions they found the right direction, apparently to a certain extent independently of leadership of experienced individuals.

In 1933, 133 young Storks from East Prussia were taken to west Germany and released in Essen (Rheinland) and Frankfurt (Main), thus on the other side of the "migration boundary", on the 12th of September, at a time when the native Storks had already left. These visitors from East Prussia for the most part took a southerly to southeasterly course that corresponded with the direction from East Prussia, but—with some exceptions—had nothing in common with the migration-route of the western Storks. It is noteworthy that young Storks from East Prussia that were freed at an earlier, and hence normal, time in the west, for the most part migrated to the southwest and were found in certain cases with wild Storks that presumably were acquainted with the route.

So way-finding with these birds seems to depend partly on a hypothetical inherited "instinct for direction" or some similar factor, and also leadership of more experienced birds, as well as to a small degree on the ecology of the countryside passed over. I need not emphasize the fact that no real explanation is given by the term "instinct for direction" (*Richtungstrieb*). But we must attempt to penetrate more deeply into these problems.

10. SOME PRACTICAL APPLICATIONS

Every scientist feels the duty not only to orient his work from the theoretical standpoint, but also to make it serviceable to his country and fellow men. That these studies offer special responsibilities and opportunities to the ornithologist is shown by the great public interest in them, for they are concerned with a bird that more than any other is closely bound up with life of the folk and that forms an integral part of the homeland.

This is felt especially keenly in Germany. Hence the Vogelwarte of Rossitten constantly receives questions as to his studies and particularly as to the possibility of reintroducing this well-loved bird in places where it formerly nested. The researches of Professor Thienemann have shown that it is possible through raising young Storks in new, yet suitable localities, to establish them there, for

some of these Storks returned in later years to breed in their adopted home. In this case there was a distance of only one hundred kilometers between places of birth and adoption. Will transplanting over greater distances (one thousand kilometers) succeed? Following the great increase in the population in East Prussia it was possible in two years to send over five hundred young Storks from East Prussia to west, middle, and south Germany. These birds were raised in many places on artificial nests by people especially suited to such work, and most of them migrated normally after about four weeks. Even if colonizing at this distance (and mostly on the other side of the migration boundary) is very doubtful, yet the raising of the birds, observations on them, and recoveries from a distance provided a great variety of interesting facts. Best of all, we were able to share our abundance of Storks in East Prussia and give many people the great pleasure of seeing the beautiful birds at close range and of watching their growth and flights.

The studies on the White Stork would not have been possible to the extent described had it not been for the help of the Vogelwarte and ornithologists of all the countries in which Storks are found. For this fine coöperation I wish to express my gratitude.

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