

Population Ecology of Peregrine Falcons *Falco peregrinus* in Baden-Württemberg, 1965-1991

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SUMMARY

The population development of Peregrines over a period of 27 years (1965-1991) is discussed. During this time the number of successful pairs in the study area increased ten-fold. Basic parameters of an expanding population (breeding success, age structure, exploring of new habitats, results of ringing experiments) are demonstrated and the results are compared with other European populations. Conservation strategies and the spread of the population into the surrounding regions are illustrated.

DISCUSSION

The Peregrine Falcon *Falco peregrinus* population in Baden-Württemberg is one of the best-monitored. Baden-Württemberg is a Federal State in the south of Germany, highly industrialised and densely populated. The Black Forest, Swabian Alps, Rhine and Neckar valleys and Lake Constance are examples of the diversity of its landscapes.

The AGW (Working Group for Protection of the Peregrine) was founded in 1965 and for the past 27 years has carried out a long-term study to which there is no foreseeable end, since each year we acquire fresh knowledge and current threats continue to make protection work necessary (Schilling & Rockenbach 1985).

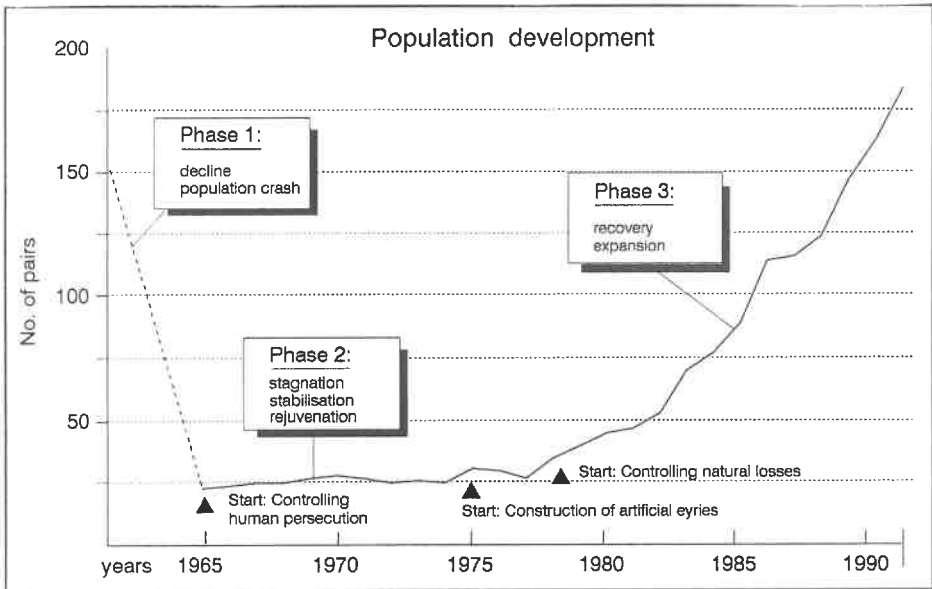
The Peregrine population had dramatically crashed from 150 pairs in 1950 to a level of 20-25 pairs, only 15% of its former size, when we started our protection work in 1965. In most of Germany the species had been extirpated with two exceptions: small surviving groups in Baden-Württemberg and in the northern Alps (Fig. 1).

Our own experience indicated that this dramatic decline was the result of human persecution. On the other hand it was becoming apparent that no region of the globe could avoid the negative impact of pesticides on mortality and fertility. We accordingly collected material for pesticide analysis (eggs, dead nestlings and adults, feathers, prey items, etc.).

These revealed that Peregrines in Baden-Württemberg were highly exposed to different pesticides and PCBs (Schilling & König 1980). There were in addition, other, local reasons for the decline, although these were denied by some people, who held that pesticides were solely

responsible. Our own experience over more than 20 years has shown that the argument of “pesticides — the only threat” was wrong; their negative impact was accompanied by almost unbelievable human persecution (pigeon breeders, commercial falconry, etc.) combined with the rise and steady growth of a financially attractive market for birds of prey (Brücher & Wegner 1988).

Figure 1. Number of peregrine pairs per year, 1965 -1991.



During the first years of our protection work we concentrated on guarding eyries round the clock in order to minimise illegal nest-robbing, trapping and shooting. For more than ten years there was little change in both the number of breeding pairs and young hatched, but a general rejuvenation of the population. The argument put forward by some, that local residents were being reinforced by immigrants from outside, was incorrect, mainly for three reasons:

1. Estimates of mortality in adult Peregrines were formerly based on ring recoveries and assessed at 25% per year (Mebs 1971). New investigations by Kirmse and Kleinstäuber (1977), our working group and, in particular, Newton and Mearns (1988) clearly indicated that in both declining and expanding populations the mortality of adult females is *ca.* 9% and that of adult males *ca.* 11%.
2. Peregrines show a high degree of philopatry, generally returning to their place of birth or its near neighbourhood. As a result, the rate of geographical dispersion is slow. In Scotland Newton and Mearns (1988) found the average distance between birthplace and first breeding attempt to be *ca.* 20km for males and 68km for females. In Baden-Württemberg these figures are presumed to be lower because of a denser population.
3. At that time the population of surrounding regions was either extinct (north and east) or almost completely extirpated (Switzerland, the French Vosges and parts of the northern Alps).

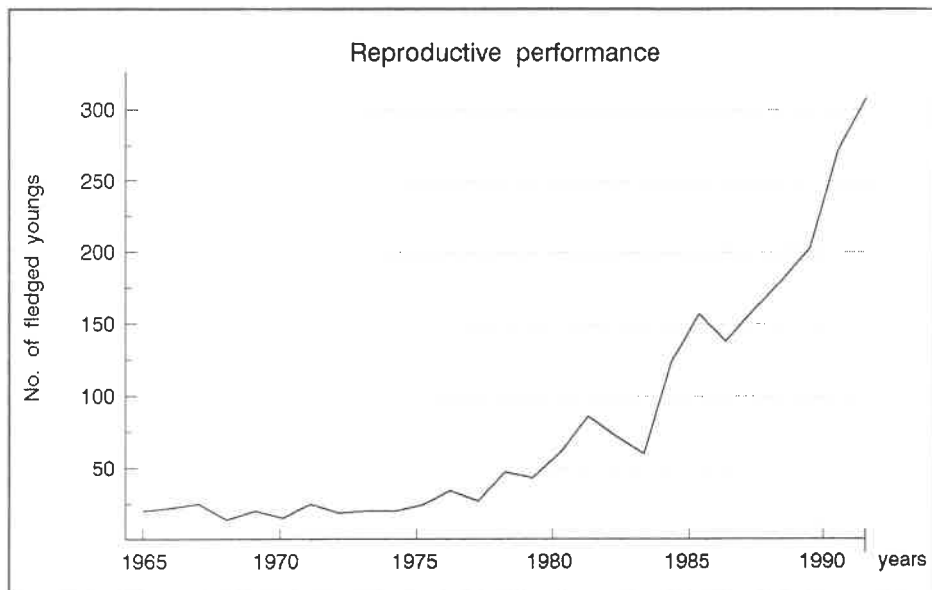
In 1975 we embarked on what proved to be the most successful programme in the long term: the building of artificial eyries and improvement of existing ones. We even extended this technique to cover the whole region. Thus the colonisation of new areas became possible: higher altitudes in the Black Forest, cliffs lacking suitable nest-holes or ledges, quarries and even buildings.

From 1975 onwards we tried to control losses to martens and ticks (e.g. *Ixodes arboricola*) (see Schilling *et al.* 1981) and, if possible, find solutions to the conflict between Eagle Owls and

Peregrines and, currently, rock climbers.

Stage III saw an expansion of the breeding population to a level never formerly reached, further increased by the exploitation of towns and industrial areas. Parallel with the increasing number of breeding pairs, productivity reached new records: from an average 20-25 fledglings over a long period to more than 300 in 1991 (Fig. 2).

Figure 2. Number of fledged youngs per year, 1965 - 1991.



These results were obtained by protection measures alone, without any support from a release programme.

In undisturbed populations the average fledging rate per successful pair is about 2.60. Figure 3 shows clearly that three populations investigated in Western Europe suffered a substantial decrease in productivity in the years 1956-1975, undoubtedly due to the extensive use of pesticides in agriculture.

Several facts need to be mentioned. According to Ratcliffe (1980), in the period 1961-1965 the population in Great Britain achieved only 70% of its normal pre-war level of productivity, but it was in a very weak condition. Between 1966 and 1980 the success rate slowly increased until it reached almost its old level, while during the same period the population size was still only half the norm.

In the French mountains of the Jura both the population and success rate decreased very rapidly during the years 1961-75. Then, in 1974-75 a quite rapid growth began, despite the fact that productivity was low (Monneret 1988). The Peregrine population in Baden-Württemberg suffered relatively less than elsewhere and reached its pre-war level faster (Fig. 4). This was surely due to our combined efforts to combat human and other threats and to our improved and intensified work on artificial eyries (Hepp 1982). For the same reasons the recovery rate was comparatively higher in Baden-Württemberg than in other populations in Central and West Europe.

The recolonisation of cliffs in the former German Democratic Republic has been almost exclusively based on captive-bred falcons released in a programme of the Deutscher Falkenorden (Kleinstäuber 1987). The fitness of these birds is not significantly different from that of wild populations, as is shown by the fact that these captive-bred birds occupied first those same cliffs which had been the last to be abandoned. These cliffs are called "alpha places" on account of their prime attractiveness (Kirmse & Kleinstäuber 1977; Saar *et al.* 1982).

Figure 3. Fledged brood size of the Peregrine (1930 - 1991).

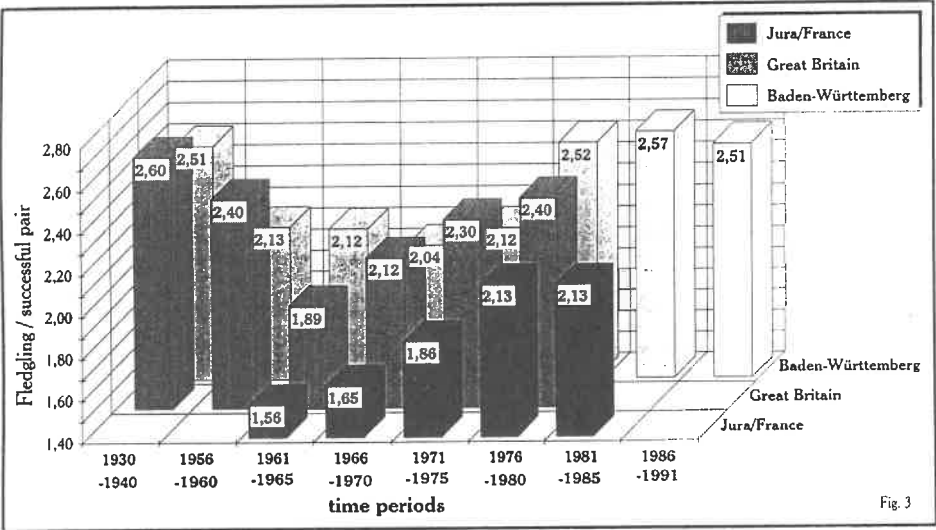
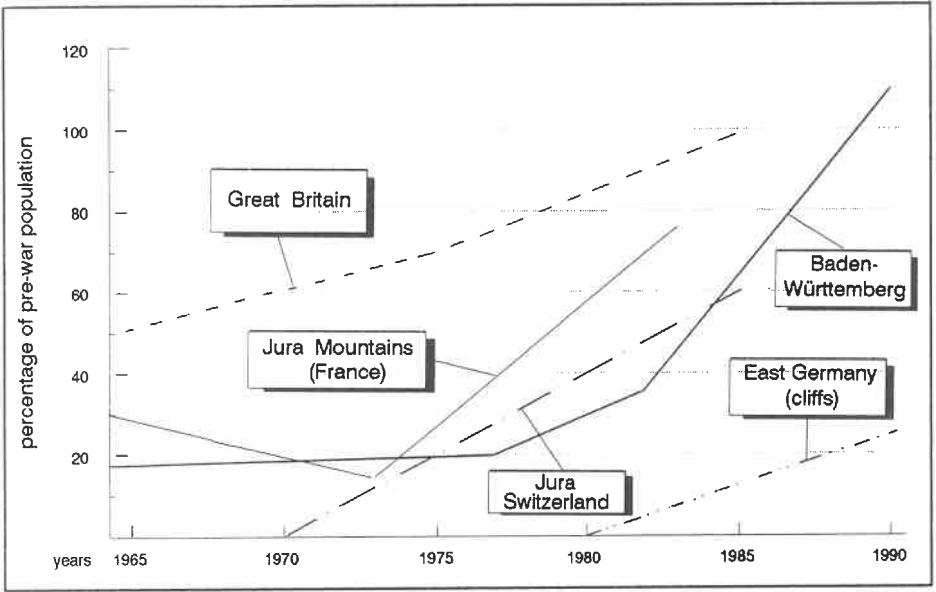


Figure 4. Recovery of Peregrine populations in West and Middle Europe.



Comparisons of development in breeding pairs and fledglings led to the conclusion that not only new pairs had established themselves but also that the causes of loss could be substantially minimised (Fig. 5).

At the start of our work we had an average success rate of 40% for all broods. This increased to 65% in the years 1990-91, i.e. about 50% more young per pair (successful + unsuccessful) reached the fledging stage than formerly. This is a further important contribution of our protection work.

After the period 1980-85 there was a structural breakthrough, with a steadily increasing part of the population established in quarries and, for the first time, on buildings simultaneously (Fig. 6). Following the first nest on a building we decided, after much discussion, to promote this new trend by providing artificial eyries. This was an immediate success. At present we are trying to establish a completely new population in the industrial belt stretching from Koblenz to Cologne and the Netherlands border. Bearing in mind the normally slow rate of geographical dispersion, we believe that we have here a possibility of reoccupying still abandoned cliff sites from bridgeheads in the lowlands (Wegner 1989). On these cliffs there is an actual need for Peregrines, in order to protect complex habitats for many plants, insects and other fauna. A cooling tower or factory chimney may be a suitable site for an eyrie but provides no chance of promoting a nature reserve.

Despite a steadily increasing breeding success we have been able to maintain a high rate of ringing the young, at over 87% per annum (Fig. 7). We originally used combinations of colour rings from the official Vogelwarte on one leg, and on the other a SOS ring with telephone number in case of emergency. But for some years now both rings are of the same colour, so as to avoid overlap with other ringing programmes.

A 100% ringing value is not possible for several reasons. Some cliffs with nests are too dangerous to climb; at others we arrive too late. But we consider 87% to be a satisfactory figure.

Figure 5. Reproductive performance in Baden-Württemberg.

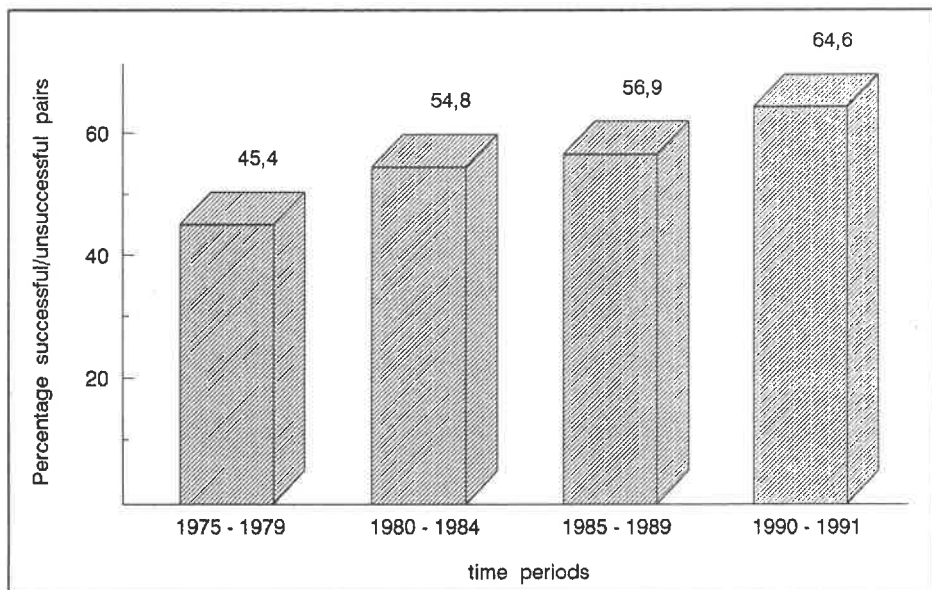


Figure 6. Exploring of new breeding habitats in Baden-Württemberg.

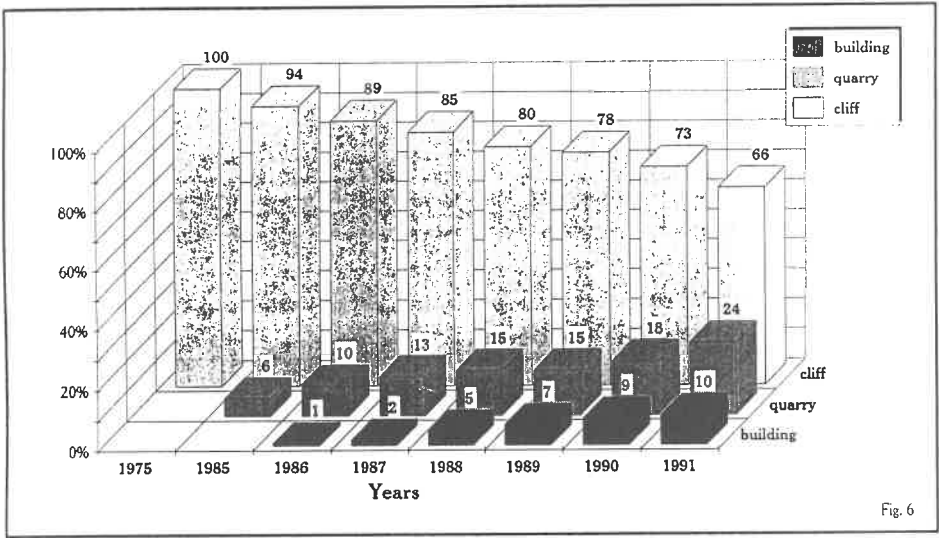


Fig. 6

A newly-established population in special deep quarries (i.e. steep-sided holes 100m or more deep in flat country) provided extremely interesting data. There we used a special ringing scheme, with both rings on the same leg. The results agree with the above-mentioned dispersion mechanism. Starting from a founder population, many neighbouring biotopes were explored exclusively by males, which paired with females of other origin, wearing normal ringing patterns or unringed. These males were not detected in the nearby Swabian Alps and nor were any females, which must have moved greater distances. These findings agree with the observations of Newton and Mearns (1988). Generally speaking, the pioneers in still Peregrine-free areas far from the normal distribution centre are females.

Unfortunately we are unable to scan and control all breeding birds, whether ringed or not (Fig. 8). Nevertheless we have done so for roughly 170 birds per year, an average 20% of which are unringed and with only a small fraction wearing rings different from ours; for instance, in 1991 we found only three such females (1 DFO ring and 2 from Switzerland). The number of unringed birds is slightly higher than the 12-14% of fledglings we were unable to ring. This difference may reflect an immigration of falcons from neighbouring countries but, equally, older birds can lose their rings and some may be birds from so far undiscovered eyries.

Up to 1991 we ringed over 2,000 Peregrines and received 170 recoveries. An analysis of these data and of more than 11,000 food items will be published in the near future by Dieter Rockenbauch.

Our work in Baden-Württemberg has been and will continue to be of vital importance for the survival of the Peregrine in Central Europe. No other German state is so densely populated, thus providing a source for recolonisation of other parts of the country. There are already many pairs which wear our rings known in Rheinland-Pfalz, Switzerland, the Vosges, Frankonia, in the Main Valley and along the rivers Mosel and Rhine up to Cologne.

A programme of this scale and quality can be realised only with the help of numerous enthusiasts. Some of the most dedicated among hundreds of fellow-workers are as follows, B. Ficht, V. Hennig, M. Heller, K. Hepp, G. Kersting, H. Loeffler, R. Luehl, H. Nickolaus, D. Rockenbauch, K. Roebel, F. Schilling, H. Walliser, H. Wasser and P. Wegner.

Figure 7. Fledged Peregrines, percentage of colour banding.

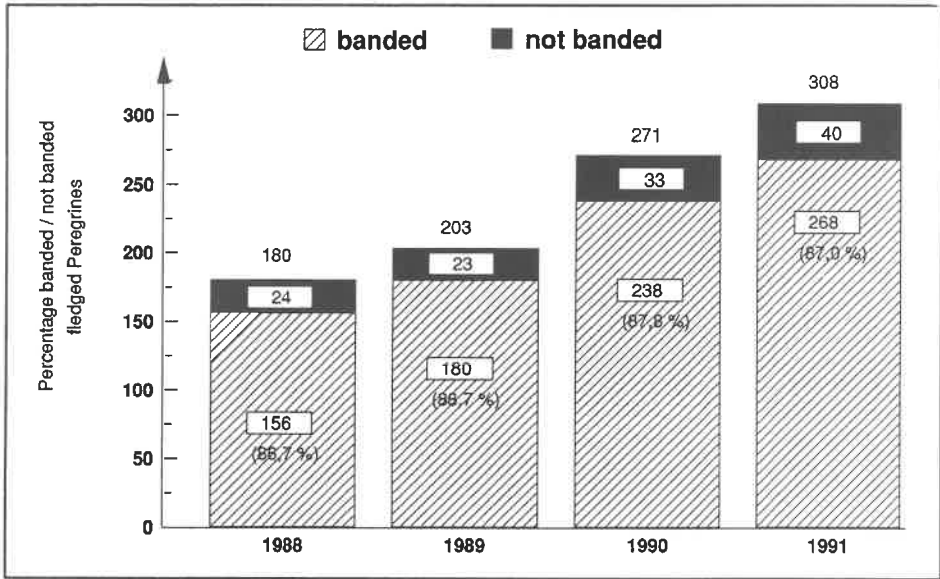
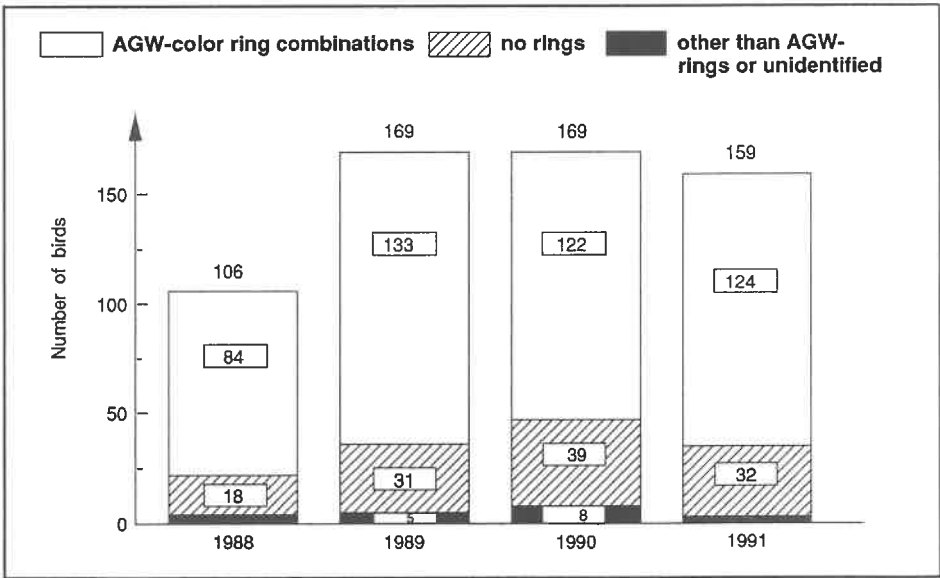


Figure 8. Peregrine Falcon in Baden-Württemberg: Identification of breeding birds by ring-observations.



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