

The main orientation of the author, however, is not in the foregoing direction. Regardless of the cause or causes of the decline of the Peregrine, it is quite possible that in the future birds directly from the wild will not be available for falconry. For this reason the author initiated his work on the domestication of the Peregrine in cooperation with other interested individuals.

Acknowledgments

The continuing experiment, of which the subject matter of this paper is but a beginning, has been made possible by the help of many people and institutions. To Raptor Research Foundation, of Center-ville, South Dakota, must go the credit for co-relating the work and providing background data. The Canadian Wildlife Service has provided some of the birds involved in the current program, these being some of the falcons which were originally collected for the National Research Council relative to clearing gulls from the vicinity of airports. The British Columbia Fish and Wildlife Branch has ensured the continuity of the program by providing special permits to take young Peregrines for the project. The British Columbia Provincial Museum, with which institution I am employed, has provided the time and has paid my personal expenses on the expeditions to obtain birds while the Federal Fisheries Department has provided the large sea-going vessels, complete with crew, that made collecting possible along the west coast of the Queen Charlotte Islands. David Hancock, who collected the Research Council birds, also made the photographic record, in movies and stills, of the nesting attempts (including the four photographs reproduced in this paper).

Egg-laying by Captive Raptors

Although falconers have handled and flown Peregrines for some two thousand years, the husbandry of the species does not seem to have been attempted until modern times. Most of the traditional procedures of handling and caring for hawks and falcons have mitigated against any attempt by the birds to reproduce once removed from the wild population. Possibly foremost among these is the traditional concept of capturing birds for falconry only after they can fly well and have learned to hunt. Such birds, while they can be trained rather easily and tamed to a limited degree, are yet never entirely relaxed in the semi-captive situation. Similarly, when nestlings (known to falconers as eyasses) were taken, the traditional methods of keeping these were no better oriented toward reproduction than were those of the wild-caught birds. They were always taken when nearly ready to fly and then made as much like the wild-caught birds as possible by a period of free-flying known as "hack." These traditions have led to a further tradition that a high incidence of loss is to be expected, and comparatively few eyas birds have been kept long enough to reach reproductive age. Fewer yet of these have had any access to natural mates. Traditional falconry has been strongly oriented toward the use of the females. The males, mostly because of their smaller size, received comparatively little attention and were seldom taken if females were available.

Nevertheless in the recent history of falconry there runs a situation under which apparently unmated females occasionally produce eggs. These birds have a remarkably similar history and background. To my knowledge they have been, without exception, birds that have been taken from the nest much younger than traditionally advised, usually as downies. Generally speaking, such birds have been kept in a specific place or building over a period of three years or longer, and if flown at all this has been done over a limited, and familiar, terrain most or all of this time. In addition, these birds have usually been handled almost entirely by one individual. Sometimes years before eggs are produced there are indications of a pair-bond being formed with the human, for such birds greet the appearance of the human "mate" with the sounds characteristic of the species when calling to the natural mate, accompanied by the same bowing and rotating ceremonials that occur with mated pairs. When eggs eventually are produced, and sometimes long before, the birds become extremely hostile to all humans except the one individual.

If a nest-ledge is provided and eggs are laid, such birds generally become so preoccupied with incubation as to be unconcerned about their own health and discomfort. Lacking a natural mate to relieve them on the nest, they cover the eggs continuously, day and night, scarcely leaving them long enough to eat. Later, if young of their own, or even of a different species, are substituted for the eggs, these adults will at once adopt, feed, and defend them. What such birds usually will not do is accept a natural mate at any time, and males of their own species that are introduced into their territory are usually attacked at once and may even be killed. It is the fairly regular occurrence of these egg-laying birds that has caused falconers to consider the possibility of the husbandry of some of the rarer raptors. It should be pointed out that many species have been involved in this type of behaviour. To my knowledge females of the Golden Eagle, European and American Goshawk, Red-tailed Hawk, Peregrine, and Prairie Falcon have all laid eggs under the foregoing circumstances, and there are probably others. If they have done nothing else, these birds have clearly indicated that the female of a number of species of raptorial birds needs little exercise and very little space to remain in good health and to come into reproductive capability, for many have been very closely confined. Indeed, the evidence suggests that only very well-fed, sedentary females of many of the large raptors are capable of ovulation.

There are some instances of some of the larger raptorial birds reproducing in zoos. The vultures and owls quite regularly reproduce in the zoo environment, as do some of the smaller falcons, most notably the kestrels. Certain species of the buteoid hawks have also, less commonly, reproduced in zoos. So too have several species of eagles. Possibly the large falcons and some of the accipiters might also have done so by this time were these groups more adaptable to the confinement provided by screened enclosures, but most species in these genera have a reputation of being almost useless as public exhibit due to their habit of repeatedly flying at high speed into the restraining mesh. In recent years some of the more

progressive of modern zoos have attempted to show these birds by leashing them to lawn-blocks in the same way that falconers have traditionally kept their birds. Such an arrangement does permit the exhibit of these species, but of course gives them no opportunity to reproduce.

Prior Attempts at Captivity Breeding

There are verbal reports of some attempts to breed Peregrines in Hungary between the two world wars but the first documented account is the series of experiments by Renz Waller in Germany during the Second World War, and no report of similar experiments with Peregrines can proceed without reference to his work. The account has been published in the book "The Wild Falcon Is My Companion" and that portion relating to the breeding experiments has been translated into English by Erling Sundve and Ronald Stevens.

The reported experiment extended over a period of some eight years and concerned both Peregrines and Goshawks, but it is only to the former that I shall refer here. The entire sequence with the Peregrines involved only three individuals, one female and two males. The year the first nesting attempt was made is not definitely stated, but it would appear to be in 1938 or 1939. The female was about five years of age. The pair was confined in an aviary 15 feet long, 9 feet broad, and 6 feet high. Two eggs were produced, the first on the 21st of March. Both sexes took part in incubation but the eggs failed to hatch. No information is given as to whether the eggs were fertile or not, nor is there any information on the background of the two birds, but there is an unstated implication that they were both eyasses. After full-term incubation, two large downy Buzzards were placed in the nest and the eggs were removed. The young Buzzards were ignored but not molested by the female, were fed by the male for fourteen days, then abandoned.

The same pair made a second nesting attempt the following year in the same aviary. Again the eggs failed to hatch. This time one of the eggs was opened and a well-developed, dead embryo was found. No information on the treatment of the two adults in the time interval between these two attempts is given, nor are the dates of egg production.

The third attempt occurred in 1941. The female was the same bird that attempted the two previous nestings, but she had been moved to a different place and a different setting. The quarters this time are described simply as "a room," the dimensions not given, but the pair seems to have been quite closely confined. The new male was an injured, wild-caught adult of unknown age. Three eggs were laid between the 10th and 15th of March and were brooded by both sexes until the 20th of April but failed to hatch. The eggs were removed, checked, and found to be infertile.

In the spring of 1942 the fourth reproductive attempt was made by this falcon in company with the same wild-caught male. Four eggs were laid between the 5th and 13th of March when temperatures were as low as 20 degrees below zero. Both sexes again took part