# RESEARCH PLANNING CONFERENCE ON PEREGRINES AND OTHER BIRDS OF PREY CORNELL UNIVERSITY, ITHACA, NEW YORK, NOVEMBER 7-9, 1969 – Part 3

by
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[Part 1 was published in *Raptor Research News* 5(3):92-95, 1971, and Part 2 was published in *Raptor Research News* 5(4):123-130, 1971.]

*Session of November 8, 1969*

Bald Eagles

**Alexander Sprunt IV (Florida, Maine, Wisconsin, Alaska).** Table 5 summarizes data collected from Maine, Wisconsin, Florida and Alaska. No material is available on clutch size since data were collected through observations from a light aircraft. Maine has had a 25% decline since 1962 to 24 nests. One hundred and twenty-one young were produced during this time. In Florida Bay the number of pairs has remained stable and this is believed due to a floating population from which lost adults can be drawn. Wisconsin, excluding the Lake Superior population, seems reasonably stable, and Alaska seems to be doing fine. Based on Ratcliffe's Index, there has been a 12% decline in egg shell thickness in Maine (from pre-1947, 0.606 to present 0.535 values based on 17 and 5 eggs respectively), an 11% decline in Wisconsin (from 0.613 to 0.547 based on 33 and 16 eggs respectively) and an 11% decline in Alaska (from 0.615 to 0.550 based on 99 and 7 eggs respectively).

**James Grier (Northwestern Ontario).** Data from northwestern Ontario indicate there has been no decline either temporally or spatially over the last 4 years.

**Table 5. Bald Eagle Data (Sprunt)**

| | % nests containing 0,1,2,or 3 young | | | | no. of years data | % success | Ave. young fledged/successful nest |
|---|---|---|---|---|---|---|---|
| | *0* | *1* | *2* | *3* | | | |
| Maine | 73 | 20 | 7 | 0 | 8 | 27 | 1.3 |
| Florida | 50 | 30 | 18 | 1 | 10 | 50 | 1.4 |
| Wisconsin | 36 | 33 | 28 | 3 | 8 | 64 | 1.5 |
| Alaska | 37 | 23 | 37 | 2 | 5 | 63 | 1.7 |

**Clayton M. White (Aleutian Islands, Alaska).** [This section is an abstract prepared by C. M. White in 1970–Ed.] Fifty-three pairs of Bald Eagles attempted nest construction on Amchitka Island in 1969. Forty-three pairs laid eggs and 33 pairs fledged young. Fledging success was 1.51 young per successful nest and 0.94 young per total nesting attempts. Mean distance between nests was 1.59 straight-line miles (range 0.4 to 7.4 miles).

About 200 eagles are on the island year-round. Sub-adults make up a large part of the population. In June, prior to the fledging of new young, a count on 42 straight-line miles of beach gave 42 to 39 (or a near 1:1) sub-adult to adult ratio. A fall and a winter count gave a 4:5 and a 4:6 sub-adult to adult ratio respectively.

DDE in two eggs was 21.5 and 12.6 ppm on a dry weight basis and 3.27 and 0.75 on a wet weight basis. The shell thickness indexes were 2.87 and 2.42.

On 20 January 1970, 109 straight shore-line miles were flown; 153 adults and 76 sub-adults were counted and 16 nesting stacks were occupied by pairs of adults.

On 26 May 1970, 56 nesting stacks were occupied by pairs of adults while 44 nests contained either young or eggs (75 young on 27 May). Fledging success was not determinable.

**Jon M. Gerrard [including work by D. Whitfield] (Saskatchewan).** A total population estimate for Saskatchewan was set at 500 pairs. Average young/occupied nest from 1967 to 1969 has been 1.7. Three eggs (all addled) collected in 1968 had a mean DDE residue level of 2.19 ppm (wet) and an egg shell index of 2.88. Table 6 summarizes the Bald Eagles, Golden Eagles and Ospreys observed by D. Whitfield in Saskatchewan in 1968.

**Table 6. Saskatchewan Bald Eagle, Golden Eagle, and Osprey Data 1968 (Whitfield)**

| *Territories* | | *Banded* | *Undisturbed* | *Young* |
|---|---|---|---|---|
| | | *Bald Eagle* | | |
| Productive | 82 | 36(65) | 45 | 132-139 |
| Unproductive | 47 | | | ($\bar{X}$=1.6-1.7) |
| | | *Golden Eagle* | | |
| Productive | 6 | 4(7) | | 10-11 |
| | | *Osprey* | | |
| Productive | 5 | | | |

**Thomas Dunstan [presented by B. Harrell] (Chippewa National Forest, Minnesota).** One hundred and seventeen nests were checked by John Mathisen, 60 nests were active and 29 nests were successful. Forty-four young were produced and 17 were banded. DDE residues from muscle tissue from two nest mates were 4.88 and 20.56 ppm (wet weight) respectively. One other sample had 2.69 ppm DDE.

Ospreys

**Paul Spitzer (Long Island, New York and S. New England).** The decline of known Osprey nests in the Long Island and southern New England area has been from 800 in 1941 to 91 in 1969. This decline has been characterized by low hatching rate, embryo mortality and egg disappearance. There has been an annual decline of about 30% in Connecticut and 25% in Rhode Island. No relation between remoteness from human populations and nesting success has been established.

**Stanley Wiemeyer and Paul Spitzer (Maryland and Connecticut Egg Transfers).** To try and determine whether the cause of nesting failure was a result of adult abnormal behavior, food availability, or whether the problem was inherent in the egg itself, a number of experiments involving transfer of eggs was undertaken. Eggs and young from highly contaminated areas were transferred to nests in low contaminated areas and vice versa. It was found almost in every case that eggs from low contaminated areas (or young) did well, whereas those from highly contaminated areas did poorly regardless of where they were put. It was therefore determined that the problem was inherent in the egg and was a result of exposure

to high levels of pesticides by the parent birds before laying time. Adults were found to accept substitute young up to three weeks after their nest had been empty.

**Sergej Postupalsky (Michigan).** Comparisons were made between the whole state of Michigan Osprey population and an area known as Fletcher Pond which is remote and removed from heavily contaminated areas. The statewide average of nests producing young (based on 310) average 28.3% (1.60 young/producing nest), the Fletcher Pond average was 39.8% (based on 98 nests) (1.79 young/producing nest). The average production of eggs per nest was 3, but only 1.6 per nest at time of hatching, indicating a very high percentage of breakage. It was determined that there was ten times the probability of egg breakage or thinning in regularly failing nests than in regularly producing nests.

**Charles Sindelar (Wisconsin).** Table 7 summarizes data on Ospreys in Wisconsin between 1966 and 1969.

**Table 7. Wisconsin Osprey Data 1966-1969**

| *Year* | *1966* | *1967* | *1968* | *1969* |
|---|---|---|---|---|
| Young/active nest | .83 | 1.15 | .69 | .61 |
| Young/producing nest | 1.6 | 1.69 | 1.55 | 1.76 |
| Number of nests | 45 | 66 | 80 | 89 |
| Number of nests occupied | 29 | 59 | 65 | 84 |
| Percent nests 1 young | 40 | 36 | 46 | 41 |
| Percent nests 2 young | 60 | 38 | 46 | 41 |
| Percent nests 3 young | 0 | 25 | 7 | 17 |

Prairie Falcons

**James Enderson (Wyoming, Colorado).** Table 8 summarizes reproductive data for Prairie Falcons in Wyoming and Colorado. Numbers of young fledged/pair in brackets are for birds remaining after birds were taken for falconry use.

**Donald Hunter (South Dakota).** In 1966, 7 eyries within a study area and 11 eyries outside this study area were checked. Thirty-eight young of bandable size were found and 36 had the opportunity to fledge. In 1967, 8 eyries in the study area

**Table 8. Prairie Falcons, Colorado and Wyoming (Enderson)**

| *Year* | *No. Pair* | *No. Eggs/pr.* | *No. Hatch/pr.* | *No. Fledge/pr.* | *No. Y.f./s.p.* |
|---|---|---|---|---|---|
| '60-'62 | | | | | 2.9 |
| '65 | 27 | | | | 2.4 |
| '67 | 16 | 4.7 | 2.5 | 2.2(1.4) | 2.5 |
| '68 | 17 | 4.5 | 1.4 | 1.1(0.6) | 2.3 |
| '69 | 13 | 4.4 | | (1.3-1.4) | 2.8 |

had a potential fledging of 4.5/active nest, 4 young in one nest were found shot. In 1968, 13 eyries had a fledging potential of 4.3/eyrie and in 1969 the fledging potential was 4.5/eyrie.

**Richard Fyfe (Canadian prairies).** Table 9 summarizes the reproductive data on Prairie Falcons in Alberta and Saskatchewan in 6 different areas. Correlation between a decrease in egg shell thickness based on the Ratcliffe Index and an increase in DDE residues has been shown in 36 eggs collected in 1967 and 1968 (Figure 1).

**Table 9. Canadian Prairie Falcon Nesting Production[1] (Fyfe)**

| Area | Occupied territories | Success-pairs | No. of nestlings | N/S[2] | N/O[3] | Egg production |
|---|---|---|---|---|---|---|
| D | 13 | 8 | 24 | 3.0 | 1.7 | 4.0 |
| A | 8 | 6 | 21 | 3.5 | 2.6 | 4.7 |
| F | 19 | 14 | 55 | 3.9 | 3.1 | 3.4 |
| C | 14 | 9 | 32 | 3.6 | 2.7 | 4.5 |
| E | 31 | 18 | 66 | 3.7 | 2.6 | 4.7 |
| G | 6 | 5 | 18 | 3.6 | 3.6 | 4.5 |
| Production | 1968 | | | 3.57 | 2.5 | |
| | 1969 | | | 3.6 | 2.4 | |

[1]Production is of 1969.
[2]Nestlings produced per successful pair.
[3]Nestlings produced per occupied territory.

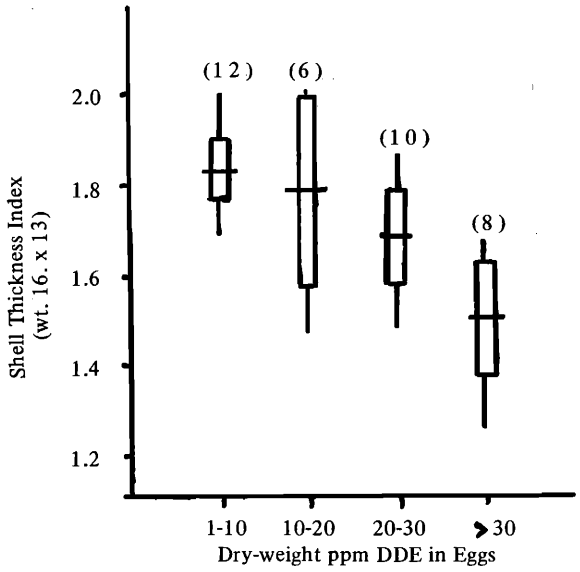


Figure 1. Variation of shell-thickness index with DDE concentration in Prairie Falcon eggs. Sample numbers are in brackets, horizontal lines are means, boxes are 95 per cent confidence limits, and vertical lines are sample ranges.

## Merlins

**Richard Fyfe (Canadian prairies).** Table 10 summarizes known and historically known nesting of Merlins in Saskatchewan and Alberta. A 100% decline is noted in 15 nests previously known in one area of Saskatchewan in 1958 and 1959. Not all areas were re-checked in 1969. The only population of Merlins checked which still appears to be in a healthy state is that in the extensive ranching area of the southern prairies. The region was abandoned as farm land in the 1930's and has been used almost only for grazing since. There has been no recent history of pesticide spraying as far as can be ascertained. In 1968, 2 Merlin nests were found. After a more intensive search in 1969, 10 nests were located. Pesticide levels are high.

**Table 10. Richardson's Merlin, Saskatchewan and Alberta.**

| | Known (Before 1967) | Active 1968 | Active 1969 | Total |
|---|---|---|---|---|
| (a) | 15 | 0 | ? | 15 |
| (b) | 2 | 0 | 1 | 2 |
| (c) | 1 | 0 | ? | 1 |
| (d) | 1 | 0 | ? | 1 |
| (e) | – | – | 10 | 10 |
| (f) | – | 2 | 10 | 10 |
| (g) | – | 6 | 1* | 6 |
| (h) | – | – | 1 | 1 |
| (i) | – | – | 1 | 1 |
| (j) | – | – | 1 | 1 |
| | | 8 | 25 | 48 |

*5 not known

| | | | | |
|---|---|---|---|---|
| Nestlings per nest 43/14 | 3.1 | | | |
| Eggs per nest 69/16 | 4.3 | | | |
| Tree nest | Total | Magpie | Crow | Unknown |
| | 25 | 11 | 9 | 3 |
| Banded nestlings | 36 | | | |
| adults | 1 | | | |

**Stanley Temple (Newfoundland).** Nineteen nesting pairs were found in 1969. Clutch size based on 7 pairs was 4.5/nest; fledging success based on 19 nests was 3.4 young/nest; there appeared to be no mortality in 13 nests up until fledging. The mean DDE residue level was 53.6 ppm (28.5-93) dry weight and the mean Ratcliffe Index was 1.38 (1.2-1.64), based on 4 eggs.

Two male and 1 female sub-adult birds were found breeding. Gray Jays appeared to be the major prey species. Most Newfoundland birds seemed to be migratory, but some are known to winter on the Avalon Penninsula.

The last three weeks of September were spent trapping on Cape Ray and 39 birds were captured. The immature to mature female ratio of 3.2:1 was almost the same as the number of young raised per nest, i.e. mature female, but any correlation between the two is to be much debated. Three hundred and sixteen sightings of Merlins were made.

White-tailed Kites

**Peter Ames (California).** In the 1930's White-tailed Kites were extremely rare and were given total protection; however, in the 1950's and particularly in the early 1960's there was a great increase in numbers from an estimated few hundred to a present population numbered in the thousands. It is a great mystery why these raptors are on the increase when almost all other raptors are on the decrease from pesticides. The answer must lie somewhere in their food habits, for they are exclusively mouse eaters, which have been among the cleanest biological material tested with respect to pesticides, having less than 1 ppm DDE (wet).

Except in areas where they nest in willows their nesting success is very good and about 20% have a second brood.

Marsh Hawks

**Frances Hamerstrom (Wisconsin).** Dr. Hamerstrom has had a very sharp decrease in the numbers of Marsh Hawks seen on her study area. In 1959 there were 317 observations; in 1968 there were 34 observations and in 1969 there were 34 observations. She has also noted a very marked behavior change in Marsh Hawks in her area in that the males no longer go through flight display in the spring. In 1963 there were 25 nests on her study area and 60 young were fledged; in 1968, 2 nests fledged 5 young and in 1969, 9 nests fledged 21 young. Marsh Hawks seem very dependent on good mouse years for good nesting success. 1963 and 1969 were both good years for Marsh Hawks and both followed a very heavy snowfall the winter before. It is believed that this snow gave good protection to voles since the grass was not frozen off; also the spring melt resulted in an abundance of water, all factors believed to contribute to the good vole populations in those years. The most marked decrease in breeding, spatially, seems to be in areas of heaviest agriculture and spraying. High levels of lindane have been found in samples. There has also been a 10% reduction in the weight of breeding females, perhaps indicating a general decline in the health of the overall population of Marsh Hawks.

An interesting point brought out was that there does not seem to be any recruitment into the breeding population from locally raised birds, and there have been only 4 young returned from 400 banded birds.

Cooper's Hawks

**Noel Snyder and Helen Snyder (Arizona).** Work since the conference has led to changes in analyses given in preliminary form at the conference. The report is therefore omitted.

Red-shouldered Hawk

**Joseph Hickey (Eastern United States).** A decline, only recently realized has occurred in Red-shouldered Hawks, particularly in the eastern states. Table 11 gives some data on a preliminary check on egg shells by D. W. Anderson and J. J. Hickey. A weight reduction of between 2.7 and 10.1% is noted, but the decline cannot be correlated with reduction in egg shell thickness as yet.

**Table 11. Red-shouldered Hawk Preliminary Check on Egg Shell Weight (D. W. Anderson and J. J. Hickey).**

| | | N | x ± 95% CL | % Change |
|---|---|---|---|---|
| Western U. S. | Pre | 382 | 4.15 ± 0.04 | |
| | Post | 130 | 4.04 ± 0.10 | -2.7 |
| Coastal Plain | Pre | 270 | 4.21 ± 0.05 | |
| | Post | 120 | 4.11 ± 0.08 | -2.3 |
| N. Great Lakes | Pre | 139 | 4.61 ± 0.07 | |
| | Post | 30 | 4.36 ± 0.12 | -5.4 |
| S. Appalachians | Pre | 20 | 4.28 ± 0.16 | |
| | Post | 19 | 3.89 ± 0.16 | -9.1 |
| S. Texas | Pre | 58 | 4.34 ± 0.12 | |
| | Post | 151 | 3.90 ± 0.08 | -10.1 |

**Sergej Postupalsky (Superior Township, Michigan).** Table 12 shows a marked increase in Red-tailed Hawks coinciding with a marked decrease in Red-shouldered Hawks that are nesting in the Craighead brothers' study area of the 1940's. A change in habitat and the lower level of ground water are put forward as a possible explanation.

Postupalsky has also noted a general increase in the number of reports on Christmas bird counts of Red-shouldered Hawks coinciding with an increase in the number of counts, up until 1960, and then a dramatic drop to almost 0 by 1968 despite only a very slight decrease in the number of counts since 1960.

**Table 12. Red-shouldered Hawk and Red-tailed Hawk Population Changes 1942-1969, Superior Township Michigan (S. Postupalsky).**

| *Year* | *1942* | *1948* | *1949* | *1966* | *1967* | *1968* |
|---|---|---|---|---|---|---|
| Red-shouldered Hawk | 19 | 16 | 14 | 1 | 2 | 1 |
| Red-tailed Hawk | 2 | 5 | 6 | 11 | 9 | 13 |

Utah Raptor Surveys

**Joseph Murphy.** The paper presented was based on a recent publication called "Nesting Ecology of Raptors of Central Utah." The study area consists of 600 square miles of semi-desert shrub which has no pesticide problems, good raptor nesting sites, good prey populations, and little human interference. Raptors include the Golden Eagle, Ferruginous Hawk, Great Horned Owl and Prairie Falcon.

There were 17 Golden Eagle nests in 1969, 7 had eggs and 3 nests raised 3 young. There were 1.13 young/successful nests found, and fledging success was 85%. The high reproductive success of these eagles was credited to a good supply of rabbits.

For Ferruginous Hawks in 1967 there were .67 young hatched per nest, and in 1968 there were 2.3 young hatched per nest. Fledging success was 100%. Forty-five per cent of their prey species consisted of kangaroo rats. They took only a few rabbits.

Prairie Falcons were not considered a common raptor nesting on the study area. In 1968, 4 pair were found. No Prairie Falcon survey was done in 1969.

The breeding distribution of raptors in general over 75 square miles was determined to be 4.5 pairs/square mile. The winter population of Bald Eagles was approximately 100 birds between November and March; they fed mainly on rabbits. The Golden Eagles were generally considered resident, although in colder weather they were supplemented by birds moving in from higher elevations. Shooting was felt to be a great factor in post-fledging mortality among the eagles. Forty-eight were found dead over a two year period, including 26 Golden Eagles, of which 15 were immature. The widespread use of 1080 was felt to be important despite claims

that it did not affect raptors.

Golden Eagles were not felt to be a detriment to the economy of the area in light of the fact that only a single lamb's foot was found in over 200 prey collections. This indicates that these eagles seldom take dead lambs which are very common during the spring.

*Discussion*

The closing discussion on November 8 and at a post-conference session on November 9 concerned two main topics: the proposed Peregrine survey, and the role of Raptor Research Foundation, Inc. with regard to future research.

One of the first problems dealt with concerning the proposed survey was that of timing. Five year intervals had been suggested for practical reasons with the next one being in 1970, but A. Keith indicated that perhaps five years between surveys was too far apart and not in keeping with the current changes in insecticide usage. Areas such as that in the central barrens in particular, where significant changes have occurred each year for the past few years, should probably be done on a yearly basis if at all feasible in order to detect any important population changes. The crash of the eastern Peregrine populations which occurred almost unrecorded was held as an example, and it was agreed that with the possibility of the critical point being approached in the tundra falcon everything should be done that can be afforded. It was also felt that important productivity data were lacking in many cases, but the difficulties in obtaining early checks at remote eyries, especially in the arctic, was realized.

For all work south of the arctic it was felt that an official survey as such was impossible; rather, it was decided that the best policy should be to have a more semi-official type of a survey, with the persons mentioned earlier being responsible for their area and reporting through some sort of media so that other workers would be aware of what was being done. Conferences to be held every year or every second year was raised as a possible medium together with bulletins distributed from a centralized information source where all information would be pooled.

The value of outside volunteer help was not discounted, especially in view of the great amount of area which needed to be covered by a relatively few people; however, it was felt that no active recruitment for help should be made and any

undue publicity should be avoided. It was also realized that people would be going into some areas regardless, and that it would be best to use these people to the best advantage. A need for some sort of coordination was indicated so situations such as occurred last summer with three parties oblivious of each other on the Yukon River at the same time do not occur.

The importance of keeping track of migrant populations such as that on Assateague Island was questioned in view of the variables involved in such surveys, and also in view of the unknown effects of stress when birds are trapped and the limited return of information from banding.

A discussion on future raptor research generally concluded that emphasis should be directed to more standard behavior studies, both in the wild and captivity, especially in regard to problems dealing with stress, in order that the effects of trapping, banding, taking of tissue samples, etc. could be assessed.

In conclusion it was agreed that with the present status of the Peregrine in North America, the delegates of the conference as a whole should make formal application to declare the Peregrine Falcon an endangered species, and that letters to this effect should go to people responsible in Canada, U. S. A., and Mexico.

Byron Harrell gave a short talk on Raptor Research Foundation, Inc. and indicated that the main purpose of the organization was to provide an information center. A complaint that *Raptor Research News* was not issued sufficiently fast enough was voiced and Dr. Harrell indicated that a secretary has been hired and the publication of the *Raptor Research News* has been contracted out to overcome this problem. He emphasized that RRF is not a falconry organization, being primarily concerned with the scientific aspects of raptor research. Captive breeding projects have been a main concern because of the great interest in this subject at the present time, but it was emphasized that other aspects of raptor research were felt to be just as important.

The possibility of having a formal journal was raised, but Dr. Hickey indicated that he felt it would be a disservice to publish research in a new and obscure journal especially when there were so many others which would handle this type of material.

The main need at this time was felt to be an organization which could coordinate what is being done through rapid information exchange, and it was felt that the Raptor Research

Foundation could fulfill this need if the proper approach were taken, including the introduction of abstracting and computer indexing systems and a regular two-month version of RRN to the present system. It was voiced that more researchers would be inclined to send in material if efficiency were increased, and a plea for material was made.

**Appendix A. The Conference Participants included:**

Dean Amadon
Peter Ames
Daniel Berger
Robert Berry
Tom J. Cade
James Enderson
Richard Fyfe
Jon N. Gerrard
James Grier
Frances Hamerstrom
Byron Harrell
John R. Haugh
Steven Herman
Joseph J. Hickey
Keith Hodson
Donald V. Hunter, Jr.
Anthony Keith
Eugene Knoder
Jeffrey Lincer
Heinz Meng
Joseph Murphy
David Peakall
R. D. Porter
Sergej Postupalsky
Robert Risebrough
Charles R. Sindelar, Jr.
John Snelling
Helen Snyder
Noel Snyder
Paul Spitzer
Walter R. Spofford
Alexander Sprunt, IV
Lucille Stickel
William Stickel
L. G. Swartz
Stanley Temple
James Weaver
Clayton M. White
Stanley Wiemeyer
William Wimsatt

**Appendix B.** After the conference, a letter was composed by Tom J. Cade and circulated to the participants and some others for approval or disapproval. It was approved by most but not all. It was then sent to the U. S. Secretary of the Interior, the Minister of Northern Development and Indian Affairs of Canada, and to the Secretaria de Agricultura y Ganaderia of Mexico. The text follows.

Dear Mr. Secretary:

During a conference on birds of prey held at Cornell University, November 7-9, 1969, a group of U. S. and Canadian biologists concluded on the basis of present evidence

that the Peregrine Falcon (*Falco peregrinus*) is an endangered species in all of North America and deserves every protection that can be afforded by the governments of Canada, Mexico, and the United States. As the convener of the conference, I have been asked by those whose names and affiliations appear below to express our deep concern about the status of the Peregrine in North America and to urge the three governments to take such action as seems necessary to preserve this bird from extinction.

As in western Europe, the Peregrine Falcons in North America are victimized by a chemically induced disease caused by hard pesticides of the chlorinated hydrocarbon group, such as DDT and dieldrin. The effects of this disease vary in relation to the amount of pesticide residues in the bodies of adult falcons, but the sickness has several clearly recognizable manifestations. If DDT and derivative residues reach levels of 30 parts per million or more in the brain, death is likely; and there are several documented cases of falcons found dead with pesticide concentrations of this order in their brains. The evidence is also clear that sub-lethal accumulations of pesticide residues affect reproduction in falcons, with the result that the annual production of young birds is insufficient to replace losses in the adult breeding populations. The combined effects of direct mortality and reduced reproductive rate have been responsible for the virtual extinction of the Peregrine as a breeding bird in many parts of its former range in both Europe and America. These catastrophic population declines were well documented by the international group of falcon specialists who met at Madison in 1965 (see "Peregrine Falcon Populations, Their Biology and Decline," edited by J. J. Hickey, University of Wisconsin Press, 1969).

In the United States, there are no longer any Peregrines breeding east of the Mississippi River, and surveys made in the past three years show that the disappearance of breeding pairs at long known nesting sites has continued westward and northward on the continent. Only remnant populations remain in the Rocky Mountains, in Alberta, and along the West Coast from Washington south into Baja California. Even some remote arctic Canadian populations have declined recently.

While some breeding populations in arctic, boreal, and Pacific northwest coastal regions remain unchanged in numbers, it does not follow that these falcons necessarily are in a healthy state. The most quantifiable symptom of the pesticide disease is the production of thin-shelled eggs. This phe-

nomenon, which is unknown in wild bird populations before 1947, has been thoroughly documented in recent years for several species, including the Peregrine populations of both Great Britain and the United States. Thin egg shells are associated with high residue levels of DDE and other chlorinated hydrocarbons in egg contents or in adult falcons, and shell-thinning has been experimentally induced by feeding pesticides to several species of birds, including American Kestrels (*Falco sparverius*) and Prairie Falcons (*Falco mexicanus*), which are near relatives of the Peregrine. In its extreme expression, shell-thinning is associated with an abnormally high incidence of broken eggs in nests and with failure of eggs to hatch.

Biologists have examined eggs from several surviving populations of North American Peregrines in the last three years, and they reported their findings at the Cornell conference. In every case the samples show some degree of shell-thinning, compared with eggs collected from the same regions prior to 1947. These include eggs from Ungava, arctic Alaska, interior Alaska, the Aleutian Islands, and Baja California. In general, the thinner the egg shell is, the higher the residue levels in egg contents or in adult tissues. The arctic Peregrines of Alaska and Canada now lay eggs with shells as thin as those associated with the decimated populations of Great Britain, the eastern United States, and California. From the present evidence, it is probable that all remaining North American Peregrine populations are affected in some degree by pesticide contamination, and if the Peregrine is to survive as a species it is absolutely essential that the use of DDT and related poisons be stopped as soon as possible.

The loss of breeding Peregrines in the settled parts of North America has resulted in greatly increased human attention to the falcons that still survive in the wilder parts, and with modern systems of transportation, even remote arctic nesting sites are readily accessible and have been repeatedly visited since 1965. Falconers, pet-keepers, egg collectors, wildlife photographers, and research biologists have all taken a toll that threatens to continue increasing at an exponential rate, unless this species receives the fullest possible protection. The problem transcends the boundaries of state and provincial jurisdictions and is truly international, as the migrant Peregrines that breed in arctic Alaska, Canada, and Greenland pass southward to winter as far as Argentina.

The current trend toward a sharp reduction in the uses

of DDT and other hard pesticides offers some hope that the Peregrine Falcon will not be completely extirpated from North America. The decline of the Peregrine in Great Britain has evidently stopped, following a reduction in the use of pesticides there. But even after all use of persistent pesticides ends, residues of the chlorinated hydrocarbons will remain as contaminants in the environment for many years to come, so that Peregrine populations will continue in a precarious state for the indefinite future. In order for the Peregrine to make a comeback as a species and to regain range it has now lost, it is essential that the remaining breeding stocks be protected from unnecessary molestation and that the survival of each year's crop of young birds be maximized. With the present greatly reduced population size and lowered reproductive success, the taking of Peregrines for any purpose should be carefully regulated.

The U. S. Fish and Wildlife Service now classifies the taxonomic race of Peregrines called *Falco p. anatum* as an "endangered subspecies." Where one draws the limits of the range of *anatum* in relation to the other North American subspecies, *F. p. pealei* and *F. p. tundrius*, is an entirely arbitrary decision. These are all genetically intergrading and potentially interbreeding populations of one species; and since *pealei* and *tundrius* both include populations that show clear symptoms of the pesticide disease, the only likely way to succeed in preserving this falcon is to declare the entire North American population to be endangered. The moral force of such a declaration by Canada, Mexico, and the United States would place the state and provincial governments, which have legal jurisdiction over the Peregrine, under a strong constraint to tighten their local regulations on man's behavior in relation to this highly esteemed bird.

The foregoing statement has the concurrence of the following conferees who were present at the Cornell meetings in November:

Sincerely yours,

Tom J. Cade
Professor of Zoology