

RESEARCH PLANNING CONFERENCE
ON PEREGRINES AND OTHER BIRDS OF PREY
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Session of November 7, 1969 (continued)

Peregrine Falcons—Breeding Populations (continued)

Tom Cade (Upper Yukon River, Colville River, Alaska). Table 2 summarizes Cade's data for the Upper Yukon River and the Colville River in Alaska since 1951. It is noted that in neither area is there any decline in the over-all number of occupied eyrie sites, but a definite decrease in reproductive success is evidenced. If we base a reproductive success on the number of fledglings per total pairs we observe a decrease from an average of possibly 1.25 in 1951 to an average of 0.93 in 1969 along the Yukon and a decrease from an average of 1.40 in 1952 to an average of 0.79 in 1969 along the Colville River. Probably the most meaningful parameter we can look at is the increase in unproductive birds: they increased from 36.3% in 1951 to 53.3% in 1969 along the Yukon River and from 34.4% in 1952 to 60.4% in 1969 along the Colville River. Probably the most distressing evidence of reproductive failure are the young between two and three weeks of age which were found dead at the nests for no explainable reasons as yet (10 collected, others decomposed). Weather was not felt to be the cause since the only unseasonable bad spell of weather did not occur until after the young had died. Coinciding with the deaths of these young was an increasing awareness of the breakdown of parental care for the young at these nests and in instances they were observed to not brood or feed young for long periods of time. One

Table 2. Reproductive Data on Peregrines [T. Cade]
A. Along the Upper Yukon River (172 Miles)

Datum	1951	1966	1967	1968
Total number of pairs	16-19	17	15(min)	17
Unproductive pairs	ca. 7/19 36.3%	3/17 17.6%	?	8/15 53.3%
Eggs or downies/laying pairs (Average)	—	34/13 3.09	—	19/5 3.80
Nestlings/hatching pairs (Average)	—	—	32/13 2.46	14/7 2.00
“Fledglings”/successful pairs (Average)	20/12 1.67	27/12 2.25	—	14/8 1.75
“Fledglings”/total pairs (Average)	20/16-19 1.05-1.25	27/15 1.80	14/10 1.40	14/15 0.93
Total probably fledged	20	30	21-23	16

B. Along the Colville River (183 Miles)

Datum	1952	1959	1967	1968	1969
Total number of pairs	32	36	27	32	33
Unproductive pairs	11/32 24.4%	33.0%	9/27 33.0%	16/32 50.0%	20/33 60.6%
Eggs or downies/laying pairs (Average)	54/17 3.18	—	40/18 2.22	50/18 2.78	76/26 2.92
Nestlings/hatching pairs (Average)	56/21 2.67	—	—	—	—
“Fledglings”/successful pairs (Average)	35/14 2.50	—	34/18 1.89	34/16 2.13	26/13 2.00
“Fledglings”/total pairs (Average)	35/25 1.40	—	34/27 1.26	34/32 1.06	26/33 0.79
Total probably fledged	44	—	34	34	26 or less

young observed in the process of dying was not being brooded at all by the parents. It was hypothesized that altered steroid physiology due to the effects of pesticides could perhaps in turn affect parental behavior in this way.

In general, data available since 1951 and 1952 up until 1969 indicate there is no reduction in numbers of pairs of falcons along the Upper Yukon River and Colville River, and

it is postulated that even though reproductive success has been significantly decreased, production of young is still adequate to balance loss of adults from the population.

Pesticide levels and egg shell indices from eggs collected in these areas of Alaska are presented in Table 4.

Gerald Swartz (Interior, Alaska). Dr. Swartz presented data based on 8 known traditional Peregrine sites in interior Alaska. In 1969, 7 of these eyries were occupied, but only one was known to have hatched eggs; one other pair abandoned eggs after two weeks. The successful nest fledged 4 young, and in 1966 from the same site 2 young were fledged. The possibility of weather being a widespread cause of reproductive failure in interior Alaska was raised since it was an extremely dry year with no rain between February and August. These dry conditions also led to extremely severe fire and smoke conditions over much of this area for much of the summer, and the effects of this on hunting ability and behavior of the adult falcons can only be guessed at.

Clayton M. White (Aleutian Islands, Alaska). [This section is an abstract prepared by C. M. White in 1970—Ed.] This reports the first detailed study of Peregrines in the Aleutian Islands, Alaska. The studies were made on Amchitka Island which is situated in the North Pacific between 51 and 52°N Latitude and is an island of treeless tundra. This report outlines my data from May to July 1969, January 1970 and May-June 1970, observations by other investigators recently on the island, and specific observations on Amchitka from older literature.

Fifteen pairs and two apparently unmated adults defended territories. Mean distance between pairs was about 5.3 straight-line miles. Nesting success could be determined at only 11 eyries in 1969. I have no data for the other four pair. Fledging success for the 11 eyries was about 1.36 per nest. In seven nests, examined during the incubation period, clutch size averaged 3.14 eggs. Most observed nesting mortality was apparently caused by human activity. Fledging began near the end of June and there was near synchrony in fledging dates. Where nest loss occurred there were no re-nesting attempts.

About 75% of the prey taken, May through July 1969, was small alcid of five or perhaps six species. Land birds

become more common as prey shortly before fledging and on into the fall.

Perhaps most of the birds remain on the island through the winter. On 10 January 1970 on a 53 straight-shore line mile flight pairs of adults were found at 3 eyries and 7 sub-adults were counted. On 20 January 1970 on 109 mile flight 13 adults (8 eyrie sites occupied by at least one adult) and 5 sub-adults were counted.

The 1970 nesting season showed 19 sites occupied by adults and of 12 sites climbed there were 40 eggs or young for an average of 3.3 items per nest. I had to leave the island before data of fledging could be obtained.

Extrapolations from Amchitka population density, from ecological variables of Amchitkan and other marine Peregrine populations, and from the physiography of the islands could suggest that 300 breeding pairs inhabit the Aleutian chain.

Steven Herman (Interior, California). No birds were found at 18 sites which were checked. From other sources and rumors there may have been another 5 known occupied sites, and probably at least 3 pairs laid eggs. One adult bird was known to have died at an eyrie, and an immature female which appeared to be of the subspecies *F. p. pealei* was shot in late July in northwest California.

Robert Risebrough (Coastal, California). Probably the best known Peregrine eyrie in California is located at Morro Rock. Up until 1967 the young birds were always taken by falconers but from 1967 on the eyrie was closely watched by the Audubon Society. In 1967, 2 young were fledged and in 1968, 3 young were fledged. On Easter Sunday, 1969, the female was found dead and the immediate cause of death was determined to be a prolapse of the oviduct. It was interesting to note that despite the coastal situation of this eyrie, all prey species were determined to be land birds, including Mourning Doves (*Zenaidura macroura*), Yellow-billed Magpies (*Pica nuttalli*), and passerines.

[Robert Risebrough (Baja California). An egg was collected in 1967 with 500 ppm net weight of organochloride residues. In 1968 (nearby site) one egg was hatched and fledged from this nest. The egg shell was 39% thinner than previous shells. In 1969 at the original site there was one small egg

lacking a yolk. Also the same year 22 adults and one immature were seen, seven eyries found, and at least three young fledged.—Ed.]

Pesticide levels and egg shell data from material collected in California and Baja California are presented in Table 4.

James Enderson (Rocky Mountain Region). Thirty-six out of 50 eyries known in Arizona, New Mexico, Colorado, Wyoming and Montana were visited in 1969 and 10 sites were found occupied. Eight sites were successful in producing 11 downies, and 4 were known to fledge. One Colorado site was not re-checked to determine if young were produced.

Clayton M. White (Utah). Two active eyries were observed in Utah in 1969: at one at least 1 young was raised; at the second a pair of adults was observed.

Joseph Hickey (European populations). Table 3 summarizes reproductive data on French Peregrines. In Switzerland all but 1 of 15 eyries were deserted.

In Great Britain 1969 data were not available, but a general southward trend of reoccupation has occurred since the banning of chlorinated hydrocarbons.

In Ireland the situation is reported to be getting worse, coinciding with no reduction in the use of Dieldrin, DDT, etc.

No data are available from Finland, Germany, or Spain.

Peregrine Falcons—Migrant Populations

Robert Berry (Assateague Island, Maryland). For many years Assateague Island has been known to falconers and others as an area where migrant tundra Peregrines could be trapped in numbers, and in past years an average of 37 birds per year have been taken. In 1968, 30 birds were trapped, and in 1969, 34 birds were captured. In 1969 a total of 146 trapper days were spent on the beaches between September 24 and October 18, and 161 sightings of Peregrines were made. The adult to immature ratio was less than 1:5, or approximately 17% adult.

**Table 3. French Peregrine Data from Jean-Francois Terrasse
25 October 1969**

A. Status at 146 territories visited in 1968.

Region	Bourgogne	Jura	South of Massif Central
Ecology	Near important cultivation	Not far from cultivation	Very poor agriculture
% of territories			
Deserted	17.5	20	0
Single bird	29.5	23	16.7
Pair	53	57	83.3
Pair with young	17.5	32.7	66.7
Young per pair	1.66	1.93	2.70

B. Trend in Jura Mountains (66 territories known).

Year	1967	1968	1969	
Number visited	57	61	61	
Deserted	7	12	21	
Single Adult	11	13	18	
Single Immature	0	1	3	
Pairs (Adult + Immature)	0	1	1	
(Both Adult)	39	34	18	
With young		25	20	7
Young per eyrie (per pair?)	2.0	1.93	1.66	

James Enderson (Texas Gulf). Comparisons were made between 1964 and 1969 on the number of birds seen while driving the beaches, with an average of 4.9 birds per 100 miles travelled on the beaches and 4.7 birds per 100 miles in respective years. In 1964 the adult to immature ratio of 1:1.38 based on 38 birds was almost twice the ratio of 1:0.64 for 1969 based on 36 birds.

Daniel Berger (Cedar Grove, Wisconsin). Twenty years data at Cedar Grove have indicated approximately a 30% drop in numbers of Peregrines sighted from 1953 to 1967, based on five-year running averages to overcome weather differences.

It was stressed that one must keep in mind that there are many variables which can affect such data, including weather, different observers, etc. In 1969 there were 9 adults, 7 immature, and 3 undetermined. A 54% drop in the numbers of Merlins was also noted.

Noel Snyder (South Florida). Snyder reported initiating a new 35-mile survey route in November 1949.

Discussion

Following the presentation of papers on the Peregrine Falcon, a discussion led by Dr. Hickey ensued in which the subject of pesticides and PCB's was dealt with. Table 4 presents the levels of pesticides and egg shell indices given by workers with material from their area analyzed.

Dr. Hickey indicated that an over-all reproductive success of North American Peregrines based on the papers presented was about 1.0 young per occupied site, and a need for more early season data was indicated. He also indicated that residue levels in some areas are relatively low and cannot be correlated with population troubles as yet.

The most reliable parameter for estimating the effects of pesticides (plus PCB's) on the reproductive potential of Peregrines seems to be at present the egg shell index used by Ratcliffe in Great Britain. Correlation between indices and amounts of DDT and DDT derivative residues have been shown in Herring Gulls (Keith), Double-crested Cormorants and White Pelicans (Risebrough), Bald Eagles (Sprunt), and Prairie Falcons (Fyfe). A 19% reduction in egg shell thickness based on indices seems to be critical in the Peregrine. Indications are that at least in northern Canada, interior Alaska, and in California, populations are probably beyond the critical stage where this thinning begins to affect reproductive success, being 21.7% and 34% respectively (Table 4).

The problems of PCB's have only begun to be explored, but there are suggestions that their effects are about equivalent to that of DDT and its derivatives. R. Risebrough indicated that the ratio of DDT to PCB's in San Francisco Bay ranges from about 1:1 near shore to 1:10 far out. DDT:PCB ratios in Pacific coast birds are given as 16 in Slender-billed Shearwaters (*Puffinus tenuirostris*) and 6 in the Ashy Petrel (*Oceanodroma homochroa*), while those for Atlantic coast

Table 4. Pesticide and Egg Shell Data

T. Cade	<i>Pre-1947</i>	<i>Post-1947</i>	<i>Thickness Reduction</i>
Peregrines			
<i>Interior Alaska</i>			
Egg Index	1.79(N=20)	1.49(N=11)	16%
DDE(ppm dry)		106 (N=11)	
<i>Arctic Alaska-Canada</i>			
Egg Index	1.89(N=18)	1.48(N=23)	21.7%
DDE(ppm dry)		194 (N=11)	
Rough-legs			
Egg Index	2.16(N=48)	2.08(N=16)	8.4%
DDE(ppm dry)		4.40	
J. Enderson			
DDE(ppm wet), Peregrine biopsy fat			
<i>Arctic Alaska</i>		599 (N=9)	
<i>Mackenzie River</i>		1262[?Ed.]	
R. Fyfe			
DDE(ppm wet), Peregrine Eggs			
<i>Barrens</i> 1966		4.35(N=6)	
1967		7.98(N=4)	
1968		21.75(N=1)	
<i>Ungava</i> 1967		13.31(N=10)	
<i>Q.C.I.</i> 1966		6.77(N=2)	
1968		22.83(N=1)	
C. M. White			
<i>Aleutians</i>			
Egg Index	1.92(N=30)	1.74(N=6)	6%
Egg Weight	4.23(N=30)	3.96(N=6)	6.4%
DDE(ppm dry)		25.1(N=6)	
DDE(ppm wet)		3.8 (N=6)	
R. Risebrough, California and Baja California			
<i>Morro Rock</i> Female Peregrine, DDE (of lipid content) (fat basis) 700 ppm (subcutaneous fat, 1000 ppm), PCB 300 ppm (subcutaneous fat 400 ppm)			
<i>Baja</i> 1967-	DDE 5 mg/100 mg sample? 1 egg		
1968-	from egg remnants 34% thinning from pre-war average		
1969-	1 egg-pre-war thickness average 34, post-war thickness .29, DDE 388 ppm, Dieldrin 13.4 ppm, PCB greater		
	1 egg-post-war thickness .28		

birds are given as 0.86 for Leach's Petrels (*Oceanodroma leucorhoa*), 0.29 for Wilson's Petrels (*Oceanites oceanicus*), and 0.68 for Audubon's Shearwater (*Puffinus lherminieri*). This would indicate a much heavier contamination of the Pacific coast with PCB's than the Atlantic coast.

Short talks were given on the physiology of egg shell thinning by R. Risebrough and L. Stickel. One of the puzzling aspects of this thinning process is that only a small amount of DDE and/or PCB is required to cause an initial substantial decrease; greater amounts of these chemicals then cause only a much decreased rate of thinning. By the time levels of DDE have reached 2500 ppm the egg shell thickness has decreased to where there is little more than egg membrane left. Most recent evidence suggests that the calcium must be hit at some sensitive site involved with enzymes, perhaps at the point where calcium is absorbed by the gut. This absorption involves active transport by certain membrane proteins, and it has been shown that DDE can affect these proteins. Vitamin D is also considered to be essential in this active transport. Another possible sensitive site is the calcium pump of the shell gland where a calcium binding enzyme is found which is affected by DDT. This enzyme is usually found in excess though; therefore small amounts of DDT would probably not cause a rapid change in egg shell thickness via this pathway. Another enzyme induction theory is concerned with the effects of pesticides on hepatic enzymes somehow involved in calcium metabolism. Needless to say, much work has yet to be done on this subject.

The discussion period closed with the decision that if possible a continental-wide Peregrine Falcon survey should be undertaken every five years beginning in 1970. R. Fyfe was to be responsible for Ungava, the Maritimes, Ontario, S. Quebec, Alberta, S. Baffin Island, Interior Barrens, District of Mackenzie, Yukon Territory and the Queen Charlotte Islands or as much as could be feasibly handled; T. Cade was to be responsible for the Aleutians, arctic Alaska, and interior Alaska; S. Herman and J. Enderson were to be responsible for California, Washington, Oregon and the Rocky Mountain region; and M. Kirven was to be responsible for Baja California and Mexico. The details of this survey were to be worked out in later discussions.

(This report will be continued.)