

Attached is an English translation of an article published by the Ministry for Greenland (Commission for Scientific Research in Greenland) in 1980 outlining general results of the Greenland Peregrine Falcon Survey 1972 to 1978. The article was sent to the editor in June 1979. The correct bibliographic reference for the attached article is:

Mattox, W. G., W. A. Burnham and F. P. Ward. 1980. Undersøgelse af rovfugle på Grønland/Kalâtdlit-nunãne tigutsisilingnik misigssuineK. Forskning i Grønland/Kalâtdlit-nunãne ilisimatût misigssuinerinik TUSAUT. vol. 1-2/1980, pp. 7-13. [Journal published by the Commission for Scientific Research in Greenland, Copenhagen, Denmark. Title of journal translated into English: Research in Greenland. Journal published in Danish and Greenlandic]

# RESEARCH ON BIRDS OF PREY IN GREENLAND

by

William G. Mattox\*  
William A. Burnham\*\*  
F. Prescott Ward\*\*\*

## Introduction

Studies of birds in Greenland have been carried out for many years. Especially noteworthy is the work in recent time by Dr. Finn Salomonsen, who organized the modern system of bird-banding in Greenland (Mattox 1970a). Until 1972 little attention had been devoted to Greenland's birds of prey. Past efforts recorded incidental observations of birds of prey as a part of more general ornithological studies, but no attempts had been made to study thoroughly a particular area's raptor population or to carry out banding. In 1967, Graham and Mattox went to West Greenland to band gyrfalcons (Falco rusticolus) during autumn migratory movements. They banded 14 gyrfalcons and 19 times retrapped already banded birds (Mattox 1970b). Until 1972 no further bird of prey studies were carried out in Greenland.

## Peregrine Declines and Establishing the Greenland Survey

By the mid-1960's researchers noted rapid declines of peregrine falcons (Falco peregrinus) in North America and Europe (Hickey 1969). By 1965 the peregrine had become extinct as a breeding bird east of the Mississippi River and had suffered drastic population reductions in western United States and Europe. At a conference in Madison, Wisconsin in 1965, reports on the

---

\* Ohio Department of Natural Resources, Fountain Square, Columbus, OH 43224

\*\* Cornell University Peregrine Fund, 1424 N.E. Frontage Road, Ft Collins, CO 80521

\*\*\* Ecology Branch, Chemical Systems Lab. (DRDAR-CLT-E), Aberdeen Proving Ground,  
MD 21010

peregrine falcon were presented for most northern areas except Greenland.

In 1969 another conference, at Cornell University, heard overwhelming evidence about the cause of the decline in peregrine falcon populations -- chlorinated hydrocarbons used in pesticides and herbicides. High residue levels of pesticides in some birds resulted in thin eggshells, eggshell breakage, and low hatching rates (Porter and Wiemeyer 1969; Ratcliffe 1970). The 1969 conference heard no evidence from Greenland, so plans were started to make a special effort to determine the population status of Greenland peregrines as part of a large-scale survey of North America planned for 1970. Although other regions were studied, the Greenland survey never materialized in 1970 or 1971. It was to begin studies in Greenland that a five-man team led by Graham and Mattox carried out the first intensive effort to survey an area and band peregrines there in 1972.

#### Peregrines in Greenland - The Survey

General descriptions of the peregrine falcon in Greenland have been published (Salomonsen 1950-51), but little quantitative data exist on nesting density, breeding success, and possible existence of pesticide residues in the Greenland peregrine population. Up to 1972 only 35 peregrine falcons had been banded in Greenland (Mattox 1970a).

The West Greenland Peregrine Falcon Survey began in 1972 when 9 active cliffs were located by Burnham and Mattox and 13 nestlings banded (Mattox et al. 1972). Each summer thereafter teams of four to seven persons have revisited the 1972 area and expanded the survey to encompass land to

the southeast and northwest (Burnham et al. 1974; Mattox 1975). The survey area is located at the head of Søndre Strømfjord near the Arctic Circle in the widest part of ice-free land of West Greenland. From the edge of the inland icecap, the study area stretches 89 km (55 miles) toward the outer coast (50° - 52°W). The north-south width is 56 km (35 miles) from 66° 45' to 67° 15'N. The area is mountainous, reaching elevations of over 1,122 m (3,600 ft) above sea level at the extreme northwest, but the active falcon cliffs have elevations under 610 m (2,000 ft) and vary between 27 m (88 ft) and 117 m (384 ft) in height. The many mountain ridges and valleys are divided by Søndre Strømfjord in an area dotted with nearly 1,000 lakes and many connecting streams. Four glacial outflow rivers traverse the area and hinder easy access.

The study area has been covered each summer since 1972 by back-packing teams which locate nest sites of these falcons, often found on precipitous cliffs difficult of access. The team members reach the next ledge using standard rock-climbing techniques with ropes, sling seats, and karabiners.

After reaching the nest ledge, where the falcon merely scrapes a shallow depression on the ledge instead of building a nest, the team bands the young falcon nestlings before they have started to fly. Two bands are placed on each falcon: on one leg a standard aluminum band (from Universitetets Zoologiske Museum), on the other tarsus a red plastic band with white numerals. This color banding technique, part of the International Peregrine Falcon Color

Banding Program under Dr. F. Prescott Ward, enables observers to determine the general geographical origin of the falcon (red for Greenland, yellow for northern Canada, green for eastern U.S. migrants, etc.). If conditions are good, the number on the color band can be read from a distance of 20 m with binoculars and 100 m with a spotting scope.

### Observations of Nesting

In 1972 and 1973 daily observations were made at several nest cliffs (Harris and Clement 1975). One cliff was observed daily for a period of six weeks. During the second week after hatching a blind was placed on the cliff ledge nine meters (30 ft) from the eyrie. A total of 231 hours of direct observation was recorded, including 51 hours from the blind and 157 hours from a lookout position about 100 m from, and of equal elevation with, the eyrie. The observers collected data on development of the young, daily activity cycle, prey species, and the behavior and role of the parents. A census of breeding birds in a sample area near the nest cliff was also made.

In 1974, two eyries were observed for seven weeks with a spotting scope and time-lapse cameras which exposed over 60,000 frames of cinematic film at one frame per minute. Spotting scope observations averaged 12 to 16 hours a day, including one uninterrupted 40-hour vigil.

### Results

In the seven seasons (1972-1978), 103 peregrine falcons were banded, of which 80 were color banded (red). All were banded as nestlings in the study area, except three nestlings banded on Disko in 1974, one migrant

immature male on the southwest coast in 1975, and one adult female banded in the study area in 1975. Out of the 103 falcons banded since 1972, four have been recovered (3.88%). Two banded falcons were trapped and released by autumn banders at Cape Charles, Virginia (1974) and Cape May, New Jersey (1978). One peregrine banded in July 1974 was shot in Ecuador in December 1975. A fourth falcon, also banded in July 1974, was found dead in June 1975 in Egedesminde District 137 km (85 miles) northwest of its banding place.

Of the 101 nestlings banded, 59 were males and 42 were females.

During the seven years, 12 different cliffs produced 117 young at an average of 2.72 per producing cliff (43 cliffs, 117 young). Of the 117 young, 101 were banded; the remaining 16 were either too young to band or were free-flying about the cliff. The average production of young (2.72 per producing cliff) is considered excellent, but does not indicate how many young falcons succeeded in leaving the nest and began their first migration southward. Yearly production averages ranged from 2.25 (1977) to 3.26 (1976) young per producing cliff. One-half of the producing cliffs had three young each (21 of 43, or 49%), one-fifth had 4 young (9 of 43), 18% had one young, and 11% had two young. At many cliffs producing three young, teams found an addled egg, indicating that the average clutch size is 3-4 eggs, probably more normally 4. These addled (infertile) eggs were collected for pollutant analysis and eggshell thickness measurement.

Thin eggshells have been a characteristic of all the declining peregrine falcon populations. The degree of thinning appears to be associated closely with levels of the DDT compound p,p'-DDE in the eggs (Walker et al. 1973).

Eggshells and shell fragments collected in Greenland in 1972 were measured for evidence of shell thinning, and two unhatched eggs were analyzed for chlorinated hydrocarbons. During the 1977 and 1978 seasons, six addled eggs were collected, but have not yet been studied. During the 1972 survey one unhatched egg was collected from each of two eyries. In addition shell fragments of seven hatched eggs from four different females were collected. The mean thickness of these nine eggs from six females ( $0.298 \text{ mm} \pm 0.018$  - 95% C.L.: range 0.26 - 0.33) was 14 per cent lower than the mean thickness of 42 peregrine eggs from Greenland that were collected before 1940 (thickness =  $0.347 \text{ mm} \pm 0.018$ ) (Walker et al. 1973).

DDE concentrations are within the range of those measured in peregrine eggs from Alaska and northern Canada. The Greenland samples provided analyses for the first time of polychlorinated biphenyls in arctic peregrine eggs, and showed levels comparable to those of DDE. Profiles of PCB residues in these eggs are strikingly like those of fat biopsies from peregrines in Chile, which illustrates the global nature of this pollution problem.

Organochlorine compounds in Greenland peregrines are apparently not sufficiently high to affect reproductive success, and might be comparable to that in other arctic peregrines in the mid-1960's which experienced drastic population declines thereafter. The study therefore concludes that a small increase in DDE levels to which Greenland peregrines are exposed would endanger the population.

### Gyr Falcon (Falco rusticolus) Banding

No gyrfalcons had been banded in Greenland before 1946. Between 1946 and 1965, 51 gyrfalcons were banded there, five of which were later recovered -- all in Greenland (Mattox 1970a).

In 1967 Mattox and Graham banded 14 gyrfalcons, 10 females and 4 males. Of the 14 falcons banded, two were later recovered, both females (14%). One gyrfalcon was found dead 390 km (240 miles) south-southwest of the banding location four weeks after banding. The other gyrfalcon was shot seven weeks after banding 160 km (90 miles) south-southwest of the banding location.

From 1972 to 1976 the project banded 23 more gyrfalcons, 15 in the survey area and 8 at an autumn trapping location near Frederikshab. No recoveries have been received from these recent bandings, so the per cent of recovery (2 of 37) is 5.4%.

In 1973 detailed studies were carried out on gyrfalcon nesting behavior from hatching to fledging (Jenkins 1978). Gyrfalcon studies and banding have been a secondary priority of the falcon survey, but interesting interactions have been noted between peregrines and gyrfalcons. Some nest cliffs are used interchangeably by the two falcons. In 1978 three former gyrfalcon cliffs were occupied by peregrine falcons which produced young.

Because background pollutant levels are quite low in Greenland, gyrfalcons do not appear to be threatened because they do not migrate regularly from the island. Gyrfalcon populations and their reproductive success appear normal, fluctuating only with the natural variations of prey populations.



## Summary

In seven field seasons the West Greenland Peregrine Falcon Survey, led by William G. Mattox and William A. Burnham, has banded 103 peregrines and 23 gyrfalcons in a study area of about 2,570 sq km (1,000 sq mi) near Søndre Strømfjord. Through the falcon research we hope to be able to gain basic knowledge about the peregrine which has suffered population declines in much of its former range. The Greenland peregrine migrates in September each year to Central and South America where it spends the winter before returning to Greenland in May to breed. It is believed that the pollutant residue levels in Greenland peregrines results from this southern overwintering. Close watch must be kept on the Greenland peregrine population to detect any changes in production or in pollutant loadings.

We thank Dr. Finn Salomonsen, the Ministry for Greenland, and Sukkertoppen Kommunalbestyrelsen for support and encouragement in this project.

## References Cited

- Burnham, W. A., M. A. Jenkins, F. P. Ward, W. G. Mattox, D. M. Clement, and J. T. Harris. 1974. Falcon research in Greenland, 1973. Arctic, 27(1):71-74.
- Harris, J. T. and D. M. Clement. 1975. Greenland peregrines at their eyries: A behavioral study of the peregrine falcon. Meddelelser om Grønland, 205(3):1-28.
- Hickey, J. J. (ed). 1969. Peregrine Falcon Populations; Their Biology and Decline. Madison: University of Wisconsin Press. 596 pp.
- Jenkins, M. A. 1978. Gyrfalcon nesting behavior from hatching to fledging. Auk, 95:122-27.
- Mattox, W. G. 1970a. Bird-banding in Greenland. Arctic, 23(4):217-28.

- Mattox, W. G. 1970b. Banding Gyrfalcons (Falco rusticolus, L.) in Greenland, 1967. Bird-banding, 41(1):31-37.
- Mattox, W. G. 1975. Bird of prey research in West Greenland, 1974. Polar Record, 17(109):387-88.
- Mattox, W. G., R. A. Graham, W. A. Burnham, D. M. Clement, and J. T. Harris. 1972. Peregrine Falcon Survey, West Greenland, 1972. Arctic, 25(4):308-11.
- Porter, R. D. and S. N. Wiemeyer. 1969. Dieldrin and DDT: effects on sparrow hawk eggshells and reproduction. Science, 165(1889):199-200.
- Ratcliffe, D. A. 1970. Changes attributable to pesticides in egg breakage frequency and eggshell thickness in some British birds. Journal of Applied Ecology, 7(1):67-115.
- Salomonsen, F. 1950-51. Grønlands Fugle/Birds of Greenland. København, Ejnar Munksgaard, 607 pp.
- Walker, W. W., W. G. Mattox, and R. W. Risebrough. 1973. Pollutant and shell thickness determinations of peregrine eggs from West Greenland. Arctic, 26(3):255-56.