

RICHARD J. CLARK

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Editor: Richard R. Olendorff
3317 Olympus Drive
Bremerton, Washington 98310 U.S.A.

Associate Editors:

Byron E. Harrell
Department of Biology
University of South Dakota
Vermillion, South Dakota 57069 U.S.A.

Donald V. Hunter, Jr.
Centerville, South Dakota
57014 U.S.A.

RAPTOR RESEARCH is published quarterly in Spring, Summer, Fall, and Winter issues and occasional Supplements. The contents are usually divided into three sections. The first section is *SCIENTIFIC PAPERS* for reports of original research or theoretical analyses. These papers will be given careful editorial and referee scrutiny. A second section, *REPORTS, REVIEWS, AND OPINION*, will include secondary material, translations of material originally published elsewhere, reports of work still in progress, reports on meetings, often in some detail, book reviews, and other similar items. This material will be edited for accuracy but will not receive the critical review given the Scientific Papers. Because of the preliminary or secondary nature of the material in this section the Editors recommend that this material be cited in other papers only with great care or in a very general way and especially with specific preliminary or conference material only after consultation with the source of that information. Papers which express a personal opinion or letters to the Editor will be included in this section. *NOTES, NEWS, AND QUERIES* is used for notices of information or events, requests for information, news items either specially prepared or reprinted from other sources, and similar small items.

This journal began publication as **RAPTOR RESEARCH NEWS** with Volume 1 in 1967 as a quarterly in typewritten mimeographed form on an 8½" by 11" page size. Volumes 2 and 3 in 1968 and 1969 were offset printed but continued the same frequency, page size, and standard typewriter type. An analytical index for Volumes 1-3 was published. Volumes 4 and 5 in 1970 and 1971 were published six times a year in offset printing, 5½" by 8½" page size, and with IBM Composer typefaces; an analytical index for Volumes 4-5 is in preparation. In 1972, Volume 6, the name of the journal was changed to reflect the broader scope to **RAPTOR RESEARCH**. Currently the journal is published quarterly by offset printing with 6¾" by 9½" page size and IBM Composer typefaces and annual analytical indexes.

For membership and publication costs see inside back cover.

FOOD HABITS OF AMERICAN KESTRELS IN A LOW VOLE YEAR

by

John Hart

309 E. 2nd Street

Morris, Minnesota 56267

Since 1968, Frances Hamerstrom has observed 50 American Kestrel (*Falco sparverius*) nest boxes on a study area in central Wisconsin. Each year kestrels rear young in about one-fifth of the boxes. In 1971, 12 boxes produced 54 young, the greatest one-year production since the boxes were put up.

Summer censuses of voles (*Microtus*) have been made on the study area since 1959 (Hamerstrom, 1969). In 1971, following a record high the year before, populations of voles were at the lowest ever recorded. In 1,192 trap nights only one vole was caught (Hamerstrom and Hart, in prep.).

What are the food habits of the kestrel which permit a large production of young despite such a presumed dearth of food?

In August, 1971, after kestrels had fledged, I collected all the material from the inside of each of 8 boxes in which young were reared. I separated the bones and exoskeletons from the litter and calculated the proportion of the total volume of these skeletal remains on the basis of water displacement (Table 1). In the remains, 16 birds were counted. All were passerines. Of 23 mammals, 17 were microtines.

Heintzelman (1970), states that kestrels "feed largely upon insects and small rodents, such as the prolific Meadow Mouse [vole]." He compiled a graph of the per cent composition of the prey of kestrels from crop and stomach analyses given in May (1935). May's data were obtained from a variety of regions at different times of the year (Fig. 1).

In another analysis of kestrel food habits in Pennsylvania, Heintzelman (1964) found that of 271 individual prey items recovered from pellets and remains in nests, 54.3 per cent were of small mammals, 31.7 per cent were of insects, while birds comprised 13.6 per cent. One reptile was also noted.

In a similar tabulation of the total number of individual vertebrates found in prey remains or pellets in Wyoming nests, Craighead and Craighead (1956) recorded 80.9 per cent (178 of 220) small mammals and 19.1 per cent small birds. In Michigan, the Craigheads found that 76 per cent of the prey remains at nests were mammals and 24 per cent were birds. The Craigheads made no attempt to determine the insect component of the kestrel's diet.

I averaged the per cent composition of the 1971 kestrel prey in Wisconsin (Fig. 2). As I am dealing only with the skeletal remains from nest boxes, many insect parts must have been lost making it impossible to include all prey captured. My data are thus not wholly comparable to Heintzelman's and the Craigheads'. The larger proportion of birds than mammals is striking, nevertheless. Furthermore, this disproportion occurred in 6 of the 8 boxes.

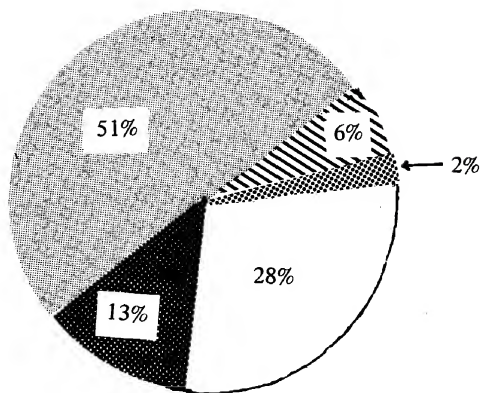


Fig. 1. Typical American Kestrel prey, Heintzelman (1970) from May (1935).

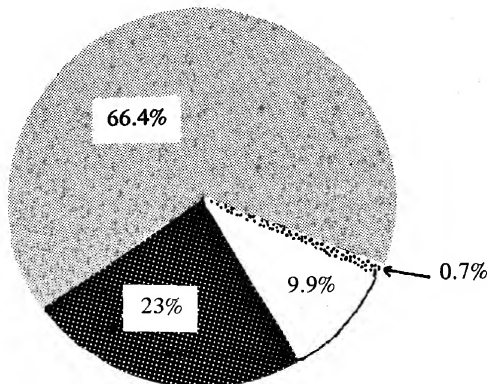


Fig. 2. American Kestrel prey, Wisconsin, 1971.

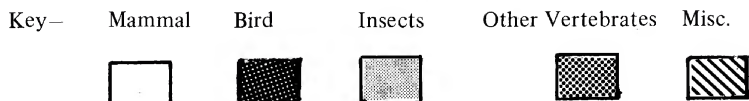


Table 1. Per cent composition by volume of 42.0 cc of skeletal parts of American Kestrel prey found in nest box litter in central Wisconsin, 1971.

	Box	1	2	3	4	5	6	7	8
% Insects		46	96	67	98	70	49	40	67
% Birds		54	2	25	-	20	34	31	16.5
% Mammals		<1	<1	8	<1	10	16	28	16.5
% Reptiles and Amphibians		-	2	-	2	-	<1	<1	-
Total volume		1.3	4.6	4.8	9.8	5.0	6.8	8.5	1.2

It is clear that kestrel production was not depressed by the vole low of 1971, and it appears that the falcons compensated for a paucity of microtine prey by taking more birds and insects.

(I wish to acknowledge the help of Keith Janik in separating the box litter from prey remains. Dr. Frances Hamerstrom helped identify the prey remains, and she and Dr. Frederick Hamerstrom gave valuable criticism.)

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UNUSUAL CAUSES OF RAPTOR MORTALITY

by

Dwight G. Smith and Joseph R. Murphy

Department of Zoology

Brigham Young University

Provo, Utah 84601

Among the numerous and well-documented causes of raptor mortality discussed in the literature are pesticides, habitat disruption and destruction, predator control programs, and indiscriminate "sport" shooting (Ellis, Smith, and Murphy. *Great Basin Naturalist* 29:165, 1969). Recently we have noticed two types of less common or possibly less publicized causes of mortality among predatory birds.

The first involves the apparent electrocution of Golden Eagles (*Aquila chrysaetos*) and Bald Eagles (*Haliaeetus leucocephalus*) by high tension wires. We know of several cases in Utah; in one, at least nine eagles (five Golden and four Bald) were electrocuted over a period of two years by a power line located in Tooele County, Utah, near the U. S. Army's Deseret Chemical Activity. Bodies of the eagles were found beneath utility poles in various states of decomposition. In a second situation, a total of at least 47 Golden Eagles were evidently killed by a segment of power line in Beaver County, south-central Utah. This incident was discovered by local conservation officers and received considerable publicity in the Utah news media. The utility company subsequently provided adequate grounding to prevent further eagle losses.

All carcasses were examined and found to be free of shot and bullet holes. The relatively high tolerance levels of eagles to the 1080 bait poison used locally suggests that it, too, was not the cause of death. In these two cases, therefore, it was theorized that the eagles electrocuted themselves by short-circuiting the lines, probably during take-offs or landings. More recently, specific information regarding the details of this type of accident were supplies us by G. B. Peterson, Journeyman Lineman with the Utah Power and Light Company. On 14 January 1970, Peterson was patrolling a three-phase 12,740 volt power line running between the small communities of Clover and Vernon, Tooele County, Utah, seeking the cause of a temporary power failure. About 10 miles north of Vernon he found a freshly-killed Golden Eagle, which upon examination proved to have been extensively burned on one foot and the end of one wing. From the evidence at hand, Peterson surmised that the bird had contacted the middle phase with the foot and the outer (east phase) with the extended wing; this caused a short circuit of 12,740 volts to pass through the eagle's body. Incidentally, the eagle was a juvenile we had banded as a fledgling on 30 May 1969 in a nest near Goshen, Utah County, Utah, approximately 40 airline miles from the site of recovery.

Our second cause of raptor mortality is somewhat more bizarre. For the past 2 years we have been conducting studies on the ecology of predatory birds

nesting and roosting in the abandoned Ironton Steel Mill complex near Springville, Utah County, Utah. While searching for nest sites we chanced to investigate the underground tunnels connecting the blast furnace ovens with their 200-foot-high smokestack. Here we found the remains of four Barn Owls (*Tyto alba*), three Red-tailed Hawks (*Buteo jamaicensis*), and a Prairie Falcon (*Falco mexicanus*). An examination of the carcasses yielded no evidence of shooting or other overt causes of death. As the only entrance to the tunnels was by the circular opening at the top of the smokestack, we suggest that the birds had apparently roosted on the stack or more likely on the smoke deflector apparatus approximately 9 feet below and inside the stack, and had been unable to regain the rim in the narrow confines of the stack. In another part of the mill complex we found the remains of an Osprey (*Pandion haliaetus*) entangled in the pipes of a water cooling building. This bird had evidently somehow gained entrance to the pipe maze and had been unable to extricate itself.

Obviously there is some question as to the over-all significance of these types of mortality, particularly in light of such decimating causes of raptor reduction as pesticides and habitat destruction. They do, however, represent detrimental influences on local raptor populations. Electrocution, in particular, could have effects of a magnitude hitherto unsuspected.

(Paper received October 14, 1971.)

COMMENTS ON REARING YOUNG BUTEOS

by

Richard R. Olendorff*

Department of Zoology

Colorado State University

Fort Collins, Colorado 80521

Introduction

A total of seven Swainson's Hawk (*Buteo swainsoni*) eggs, seven Red-tailed Hawk (*Buteo jamaicensis*) eggs and five Ferruginous Hawk (*Buteo regalis*) eggs were obtained and hatched during the springs of 1969 and 1970. Fourteen of the nineteen young birds were raised successfully in a laboratory and measured periodically from hatching through 45 or 46 days of age. Body weight and food consumption were recorded daily. The following linear measurements were taken at intervals of two to several days: Thigh, crus, tarsus, third toe, first talon, second talon, brachium, antebrachium, manus, bill depth, bill length, maximum width of the head, fifth primary feather (from the inside), fifth primary covert feather, second secondary feather (from the outside), second secondary covert feather, right middle tail feather and right middle tail covert feather.

Eggs were obtained from tree nests within a seventy-five mile radius of Fort Collins, Larimer County, Colorado including the area from Livermore, Colorado, on the north and west, Denver, Colorado, on the south and New Raymer, Colorado, on the east. Most birds were taken on or near the Pawnee National Grassland with the exception of several Red-tailed Hawks taken in the Denver and Livermore areas. The eggs usually cooled during transportation to the laboratory, but this did not prevent hatching, since all eggs obtained for the project hatched.

Incubation

The eggs were incubated in a No. 150-E, 205-watt, still-air incubator manufactured by Leahy Manufacturing Co. of Higginsville, Missouri. The temperatures used were 35.5 C (96 F) in 1969 and 37.2 C (99 F) in 1970. Stanley (1937) and Stanley and Witschi (1940) used 35.5 C to obtain later stages of Red-tailed Hawk and Cooper's Hawk (*Accipiter cooperi*) embryos for their studies. Full-term incubation of Swainson's Hawk eggs failed in 1969 at 35.5 C, so the temperature was increased to 37.2 C in 1970. This was still well below the optimum of 38.5 C (101.3 F) used for chickens (Bellairs, 1960: 136).

Humidity was not measured during incubation. There was always a shallow pan of water the size of the entire floor of the incubator below the eggs. The eggs were turned every 3 to 5 hours between 0600 and 2200 hours.

Incubation posed little difficulty, since all eggs used for the study were taken in the late stages of incubation. Red-tailed and Ferruginous Hawk eggs were

*Current address: 3317 Olympus Dr., Bremerton, Washington 98310.

procured 5 to 6 days before hatching on the average. Swainson's Hawk eggs were obtained only 1 to 3 days before hatching, since their abundance made it possible to observe many nests for signs of hatching.

Treatment of the Birds

All birds were reared in large classroom laboratories except for short periods at the beginning of each summer when smaller rooms were used. Effective air conditioning was not available, but ventilation was possible using large fans placed in windows. In general, the temperature in the laboratories was within a few degrees above or below ambient outside temperature during average or warm days, and several degrees higher on cold or rainy days and nights. The major differences between the laboratory and natural environments were (1) a lack of direct sunlight, (2) better shelter from winds and cold temperatures and (3) a different diet composition.

The birds were not helped out of the eggshell during the hatching process.

A rigid schedule was not established for treatment of the chicks at hatching because the birds hatched at all hours of the day. In general, they were removed from the incubator about 8 to 12 hours after hatching. If a bird hatched in the early morning hours, say at 0500, it was removed in the late afternoon. Birds which hatched in the late morning or early afternoon were removed between 2000 and 2200 hours. Those hatching in the late afternoon or evening were not removed until the next morning. Birds were fed as soon as they were removed from the incubator.

The 12 hours in the incubator after hatching was spent in a small box lined with tissue paper. The bottom two inches of a half-gallon milk carton proved adequate. Reduction of the temperature in the incubator was not necessary, nor desirable, since the incubator served as an excellent brooder. The birds showed no signs of distress when kept at 37.2 C just after hatching. Within three hours after hatching the birds were essentially dry, but some of the natal down stayed matted to the skin for the first 24 to 36 hours of life.

After the birds were removed from the incubator, brooding temperature was maintained by goosenecked electric lamps with 100-watt bulbs. Mercury thermometers placed beside the chicks allowed adjustment of the ambient temperature to within a degree or so of the desired level.

The best temperature for brooding young birds 1 to 3 days old was found to be 31 ± 1 C. The technique used to set the temperature levels was simply to observe each bird and note if it was panting or shivering. After a short period of trial and error an adequate temperature was established and maintained.

After 5 or 6 days the temperature was lowered to 27 or 28 C without harming the birds. Birds at 7 or 8 days of age did well at 25 to 26 C. Between 9 and 15 days of age the heavy second coat of down developed and the temperature was progressively lowered to room temperature (22 to 23 C) and left at that level for the remainder of development.

The nests of the birds, after they outgrew their initial incubator boxes, consisted of a larger box lined with newspaper, inside of which was placed separate plastic containers for each bird. Inside the plastic containers were still smaller

nest boxes lined with small wads of newspaper or tissue paper. The idea of box-in-a-box design was that the birds could mute (defecate) outside of the nest, but usually not outside of the plastic containers onto the other birds. Also, they could not mute outside of the larger box into the room.

As the birds became mobile, other arrangements had to be made. In 1969 I used a wire corral in the laboratory. A better arrangement used in 1970 was an open-topped cardboard enclosure constructed of large furniture boxes between two long tables. One end of the enclosure was removable for the purpose of entering to remove birds for weighing, feeding and measuring. Nest boxes lined with wads of newspaper were provided in the enclosure. These boxes were used by the birds except during the final stages of the experiment. The birds were allowed free reign of the enclosure until removed from the experiment at 45 to 47 days of age.

Feeding

The most time-consuming activity in studying young birds in the laboratory is their feeding. The preparation of food and the actual presentation of the food to the chicks takes about one and one-half hours per day per bird. This time includes cutting meat into small pieces or grinding it, warming it to room temperature or above before each feeding, dipping each piece into warm water and then coaxing the birds to peck at it. When this is done on a schedule of every four hours from 0600 until 2200 hours, by the time one feeds the sixth or eighth bird, it is time to begin again.

The birds were usually ready to eat within 3 to 5 hours of hatching, although they were left in the incubator about 12 hours on the average before being fed. For the first 48 hours after hatching, feeding was a hit and miss proposition because the birds were quite inept at grabbing food. Their neck muscles were not developed sufficiently to control their over-sized heads.

A 4¾-inch curved-ended forceps proved to be a very satisfactory feeding tool. It was important that the tips of the forceps met perfectly so that small pieces of meat could be grasped readily and easily released when inside the hawk's mouth. When the birds were clumsy at feeding time, or stubbornly refused to eat, the best procedure was to place the food far back in the mouth behind most of the tongue.

It was found to be better to space the feedings of a very young bird 3 to 4 hours apart, than to keep the crop full constantly. It is not unnatural for the crop to empty periodically. To determine if a very young bird should be fed the crop was inspected. If the food in the crop was firm, the bird was not fed. If the crop was empty or a little very soft food remained and the bird was easily stimulated, it was fed.

If a very small bird ate too much, chances were it would cast (regurgitate) some of the food soon after the meal. This was not cause for alarm, even though food lodged in the throat sometimes caused slight breathing difficulties with the bird gulping air for several minutes rather than breathing normally.

Problems arose when a bird ate too much and did not put the meal over (pass it from the crop to the proventriculus) in a reasonable amount of time.

Several years ago I lost two hatchling red-tails to an unknown malady. The only symptoms involved a failure to put over food and eventual regurgitation of very dry, sour-smelling bits of food. Death followed within a few hours. The first Red-tailed Hawk hatched during this study died in a similar manner a few days after hatching. A malady called sour crop, characterized by similar symptoms, occurs in grown birds of prey.

Dehydration is always a danger when raising wild birds in captivity. In 1969, at the suggestion of Dr. Paul H. Baldwin, I began giving half an eyedropper of water once or twice a day and dipping the meat in water as it was fed. The mutes (feces and urates) became somewhat more watery than one might normally expect, but no more trouble with sour crop was encountered that year.

In 1970 two red-tails again developed sour crop. As soon as it was detected that food was being put over too slowly, or in one case when sour meat was regurgitated, I forced all food out of the crop, gave the bird an eyedropper full of flat coke (sugar water), and replaced the food with breast meat from a freshly killed pigeon and portions of coagulated blood. Both birds recovered without interruption of the increase in body weight.

One cause of sour crop seems to be feeding too much food without adequate moisture. It is a lethal problem if not dealt with immediately. Preventives include spacing the meals properly, giving natural amounts of blood or supplementing the moisture content of the food with water, and feeding the best food available. Good food for newly hatched raptors includes pigeon breast, liver, heart and leg meat, or the red viscera and leg muscles of small birds, mice, young rats or other rodents. Poor food includes rabbit muscle, beef heart, chicken (except for a small amount of liver or gizzard) and other foods with a high muscle content. Many of these low grade foods can be used in small amounts if vitamin and calcium supplements are given. The problem is not one of caloric content. The danger lies in the tendency to use these easily prepared foods too extensively thereby depriving the birds of an adequate diet.

When raising several birds of varying ages, one must not carelessly increase the size of the pieces of meat fed the youngest birds. It is easy to begin cutting larger pieces of meat for larger birds and then to feed the larger pieces to small birds. This may well be another source of sour crop.

The critical period during which feeding had to be precisely controlled lasted for 7 to 10 days after hatching. After that time the birds grew well and ate aggressively. The pieces of meat given were larger than before, and small bones, small amounts of fur and some feathers were given. Bone was incorporated into the diet quite early, but the acceptance of bones by each bird varied. Some day-old birds accepted the ribs and crushed skull bones of mice and the neck vertebrae of sparrows; some birds ten days old refused them.

The problem of feeding an ample amount of bone was solved by grinding whole mice, rabbits, pigeons, chicks, etc., very finely at first, and somewhat coarser later on. The food items were skinned and eviscerated. Evisceration was a practical procedure, since the digestive tracts rendered an odor to the ground food which made it relatively less palatable to the birds and less acceptable to the researcher. It is well documented in the literature that intestines are usually

discarded before the prey is fed to the young. Furthermore the digestive tracts of pigeons often carry a disease called trichomoniasis which is caused by a flagellated protozoan.

In general, only as much food as was demanded by the birds was given at each meal, but it was often difficult to get the birds to start eating. Holding the meat at about a 30-degree angle above the beak and 1 to 2 inches away was the most effective method. If the mere presence of food did not elicit feeding responses, moving the forceps in a circular motion in front of the birds often stimulated the birds to peck at it. Tearing dead animals apart near the birds and cracking bones in the process seemed to be a strong feeding stimulus. Once a bird took one bite, it was often anxious for a varying number of additional bites in rapid succession. After the feeding tempo slowed, a two-minute pause followed by several more bites usually ended the feeding.

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(Paper received August 21, 1971.)

THE INCUBATION PERIOD IN PEALE'S FALCONS

by

R. Wayne Nelson

c/o Department of Biology

University of Calgary

Calgary 44, Alberta, Canada

Abstract. Based on observations of three clutches of *Falco peregrinus pealei* eggs in the wild, the period of time from the laying of the last egg until the essentially synchronous hatching of the young is about 32 to 34 days, but may be as long as 35 days. Observations by others on captive Peale's Falcons suggest similar or slightly longer incubation periods. The 28 to 29 day interval mentioned in the literature for Peregrines does not apply to *F. p. pealei* and probably does not apply to a number of other subspecies of the Peregrine.

In view of efforts currently directed towards captive breeding of Peregrines and artificial incubation of eggs taken from captive Peregrines, the following observations are offered as an indication of the length of the incubation period in *Falco peregrinus pealei* in the wild on the Queen Charlotte Islands, British Columbia. Comparisons will be made with lengths of incubation stated in the literature and as seen in some captive breeding Peregrines.

During the 1971 season I was able to observe parts of the sequence of egg-laying and the duration of the incubation period from distant blinds at three eyries. By "incubation period" I refer strictly to the interval between the laying of the last egg and the hatching of that egg, according to Swanberg's (1950) definition. Nice (1954), considering this definition, noted that "in nature it is generally possible to ascertain the incubation period with satisfactory exactitude by checking the time from the laying of the last egg to the hatching of the last young. To this I will add the qualification, when all eggs hatch." By referring only to the last egg, the incubation period describes what is most likely the shortest interval between laying and hatching of an egg in a given clutch; earlier eggs presumably will have the same or a longer interval between laying and hatching.

During my study I did not number the eggs as they were laid. Furthermore, I was unable to carry out a continuous watch through the entire laying period and through the hatching period. Although the incubation periods described here are only approximate, they are accurate to within about one day, as will be seen.

Field Observations. At Eyrie 1 the first egg (E1) was observed on April 8 and was probably laid the previous day, I suspect very early in the morning. The second egg (E2) was present on April 9. The other eggs appeared on April 11, 13 and 15. The fresh egg could usually be told from others in the clutch for the

first day by its brighter rusty coloration. Two eggs were lost before hatching. On May 16 one egg was pipped. At first light on May 17 one nestling was hatched and dry. The second nestling was emerging from its eggshell when the female left the scrape at 06:52. The remaining egg did not hatch. Presuming one of the two nestlings hatched from the last-laid egg, the incubation period was 32 days. If the two eggs which hatched were laid earlier in the clutch, and if serious incubation began with the second-last egg, then the interval of serious incubation was as much as 34 days.

I was unable to visit Eyrie 2 regularly during laying. E1 was present on April 16 and it might have been laid the previous day. Three eggs were present on the 23rd and, presumably, the last one was laid on April 19 or 20, most likely the 20th. On May 22 the parents were incubating solidly and their behavior gave no suggestion that the eggs were active (i.e. noisy, cracking, or pipping). I was unable to observe this eyrie on May 23. On May 24, at noon, there were three nestlings present. I am fairly certain that they hatched early on the 24th. Incubation period at this eyrie was a minimum of 33 days, a maximum of 35 days but, most likely, 34 days.

At Eyrie 3, one egg was seen on April 24 and may have been laid on the 23rd. It was very pale in color. On April 28 there were three eggs, the original one one which was half tan and half normal color, and a third fresh egg of normal coloration. I suspect they were laid on April 24, 26, 28, although each could have been laid a day earlier. On May 27 the three eggs were present, with no signs of hatching. On May 29 one nestling was present at 10:30. At 15:44, after many minutes of uncoordinated trying, its mother fed it what appeared to be its first meal, suggesting that it had hatched earlier on the 29th. The two abnormally colored eggs did not hatch. The incubation period at this eyrie was probably 31 or 32 days. However, if the normal-colored egg was E2, then incubation took 33 or 34 days.

Hatching in a wild Peale's Falcon clutch appears to be quite synchronous. At only one eyrie (not one of the three noted above) has hatching of the last nestling been as much as a day later than the hatching of the others.

If, as is suspected, serious incubation begins with the second-last egg, the last-laid egg might be expected to hatch about two days later than the other eggs. However, there is some means whereby a late embryo might attempt to "catch up" to its nestmates so that the hatching interval might be reduced (e.g. see Johnson 1969).

Observations of Captive Peale's Falcons. Peregrines breeding in captivity seem to have an incubation period similar to or even longer than that seen in the wild.

Even though the birds were not *F. p. pealei*, it is useful to consider Waller's (1968) successes with Peregrines in captivity. In 1942 his Peregrine laid eggs on March 5, 8, 10 and 13. One egg was lost during incubation. Two nestlings hatched on April 12. The remaining chick pipped on the 13th, but was dead in the egg on the 14th. If E4 was expected to hatch on April 14, then the incubation period was 32 days. If serious incubation began with E3, then the interval of

incubation for the two eggs which hatched was 33 days. Waller noted that the falcons were not incubating in earnest at the time of the arrival of the third egg, so the actual interval of incubation for E1, E2 and E3 may have been somewhat less than 33 days.

In Waller's 1943 attempt, eggs were found on February 25, 28 and March 3. The last was an abnormal egg which later proved to be infertile. On April 3 the second-laid egg hatched. E1 died at the pipping stage. From March 3 to April 3 is 31 days. There is no way of knowing whether the E3, had it been fertile, would have hatched on April 3 or several days later. If we ignore that egg and presume serious incubation began with the arrival of the second-last egg (E2 in this instance), then incubation of E2 lasted 34 days.

With his captive *F. p. pealei*, Beebe (1967) felt that incubation began with the arrival of the second egg of clutches of four. The fertile eggs in 1967 experienced difficulties at hatching and those that hatched died in a short time. Beebe suggested a 32-day interval between laying and hatching for each egg, but he noted that the deaths of the nestlings might have been due to prolonged intervals in the eggs. If we presume that the one egg which hatched unassisted was one of the first three laid, and that incubation began with the second-last egg (E3), then the interval from onset of incubation (March 28) to hatching (April 29) was 32 days.

In describing Schramm's captive *F. p. pealei*, Peterson (1968) noted that "after 38 days two of the (three) eggs hatched." This would represent a particularly long incubation period.

Meng's (1971, and BPIE report) captive *F. p. pealei* had one egg on March 29, three on April 2, and laid a fourth sometime later. Probable dates of laying were March 29, 31, April 2 and 4. Incubation of this clutch and an earlier infertile clutch was stated to have begun with the second-last egg (E3). The sounds of nestlings were heard on May 8, indicating that some eggs had hatched. A visit to the ledge on May 10 showed two dead nestlings, a third one almost dead, and a fourth just hatching. From April 4 (possible date of laying of E4) to May 8 is 34 days. If E4 was laid on April 4 and was seen hatching on May 10, then the incubation period was 36 days. Likewise, if the serious incubation of the eggs began with the laying of E3 (presumably April 2), then the duration of actual incubation would have been about 36 days for E1, E2 and E3.

Literature References. Although not specifically referring to *F. p. pealei*, some references to incubation intervals elsewhere in the literature are interesting and, perhaps, potentially harmful if followed closely. Bent (1938) mentioned that for Peregrines "the period of incubation has been said to be 28 days"; however he noted that J. A. Hagar "has definitely determined that it varies from 33 to 35 days" in the Massachusetts Peregrines. Witherby *et al.* (1939) state the incubation period of Peregrines as 28 to 29 days for each egg. Brown and Amadon (1968) noted, "Incubation begins with second or third egg as a rule, and in any case before the completion of the clutch," but they then add, "The young hatch after incubation of 28-29 days for each egg, with some difference between the oldest and youngest eyasses." Herbert and Herbert (1965)

observed, "On the Hudson, incubation did not usually begin until the laying of the second or third egg, depending on air temperatures. It began most frequently on the fifth day with the laying of the third egg and averaged 32-33 days from the time of commencement until the hatching of the last egg." This suggests that, in the strict sense, the incubation period was 30 to 31 days.

Discussion. Clearly, the incubation period itself, and the interval of serious incubation of individual eggs, are quite variable and are considerably longer than many of the references in the literature suggest. One might think that birds which enjoy the close proximity of one another and the protection from disturbances afforded in captivity would incubate very closely and hatch their eggs in a shorter period of time than wild birds could. It seems to be true, however, that some captive *F. p. pealei* must incubate their eggs somewhat *longer* than wild falcons of the same subspecies. Air temperatures, clutch sizes, sizes of individual eggs, substrate of the eyries, and physiology and sizes of the parents may be important factors leading to variations in incubation intervals. It seems likely that smaller subspecies might have slightly shorter incubation periods than those found in *F. p. pealei*.

Acknowledgments. These observations were made while conducting a study on the behavioral ecology of coastal Peregrines. For assistance of various kinds during the study I wish to thank the British Columbia Fish and Wildlife Branch, the Canadian Wildlife Service, the Marine Division of the Ministry of Transport at Prince Rupert, the National Research Council of Canada (for assistance via a grant to M. T. Myres), the University of Calgary and, especially, my wife, Alora Nelson.

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(Manuscript received February 27, 1972.)

REPORTS, REVIEWS, AND OPINION

REPORTS: BREEDING PROJECT INFORMATION EXCHANGE

The following letter and questionnaire were sent to cooperators; B.P.I.E. 28-40 are reports returned to the RRF Breeding Committee for the Special Conference on Captivity Breeding of Raptors. B.P.I.E. 27 was submitted earlier.

Centerville, South Dakota 57014
October 31, 1971

Dear Breeding Project Participants:

We hope those involved in breeding projects will be able to send us information requested on the other side of this sheet before the conference to be held in Sioux Falls, South Dakota, November 22 and 23, 1971.

This is a slight modification of the questionnaire sent out in 1970 which was designed to help the RRF and NAFA Breeding Committees formulate procedures which are most likely to produce results in breeding captive raptors. As chairman of both committees, I feel the so-called backyard projects, whether supported or unsupported, have sufficient merit to be counted strongly in the picture, but only if the experimenters are serious in cooperating and coordinating their efforts toward a common goal. This does not mean the lack of approval of governmental projects or that we would not like reports on such projects from those in charge. We greatly need everyone's assistance, and since we feel this approach will help each of us to succeed, we are confident you will give it.

If you wish, the data you send will be kept strictly confidential (I will personally guarantee this). However, if you have no reason to want the data kept confidential, we would like permission to use it at our discretion at the breeding conference or in *Raptor Research News*.

If you have in any way attempted a breeding project this year (or in other years and have not reported same), it would be most helpful if you would take the time to answer the following questions. If you are updating a previously reported project, you need not duplicate the answers where there is no change. If you have more than one project, we would like additional reports; information that is the same need not be repeated. What you have done may be of real importance in helping solve the problems connected with captive breeding of raptors.

Sincerely,
Donald V. Hunter, Jr.

BREEDING PROJECT QUESTIONNAIRE

[We have listed the numbered questions without space for the answers so that the reports if duplicated can be more compact and for overseas correspondents

less expensive to mail. For duplication for the conference, it would help if the answers can be typewritten single spaced with a dark ribbon and sketches made carefully in dark ink; leave reasonable margins on 8½x11 sheets (or smaller paper). If the numbers on the outline are used, the questions need not be repeated in your answers.]

1. a. Respondent's name; b. Address; c. Please indicate if report is confidential, or not confidential, but not for duplication for conference or publication in RRN, or may be used at conference and as B.P.I.E. in *Raptor Research News*. [Only for publication reports included below—Ed.]

2. a. Date of report; b. Time period of report; c. Previous reports on this project (B.P.I.E., RRN, other).

3. a. Species; b. Subspecies if known.

[4-7. Answer each question for both male and female.]

4. Age in years.

5. Origin of birds (give year taken): a. Eyass; b. Passage; c. Haggard, or d. Unknown.

6. Eyrie: a. Latitude of origin to nearest degree; b. If not known, area of origin (e.g., arctic, etc.); c. Latitude where trapped (or place, date also).

7. Handling: a. Hatched? b. Manned? c. Flown free? d. Flown at game? e. Disposition? f. Imprinted?

8. Sketch the facility in which the birds are kept, giving approximate dimensions, size of windows, and direction of exposure of such windows. Also a brief description of materials and construction.

9. Was artificial light used? (Wattage, number of bulbs, duration of light period, etc.)

10. Color and texture of interior—e.g., white, black, unpainted wood, beams exposed, etc.

11. Describe provisions made for nest.

12. Describe how birds were introduced to facility and to each other; if not put in aviary together, which bird was first and by how long. Give dates.

13. Observations of behavior toward each other.

14. Nest building? a. Materials provided? Did both birds help with building or making of scrape? c. If not, which one did? d. Describe giving dates. (If no nest or scrape was made, please so state.)

15. Food: Give a description of food provided, amount, when given, consumption and observations of behavior while eating. Excess or old food removed?

16. Endocrine treatment tried? If tried give full description of technique and effect on bird.

17. Was copulation observed? If so a. Date; b. Time of day? c. Brief description of where and how it took place. (For example, on nesting place, male mounting female from side.)

18. Was artificial insemination tried? If tried give full description of technique and behavior of the birds.

19. Eggs? Date for egg No. 1; No. 2; No. 3; No. 4; No. 5.

20. a. When did incubation start? Date; b. Which sex (or sexes) participated in incubation? Explain; c. When did incubation cease? Date; Why?

21. Incubation temperatures: a. Did you take incubation temperatures? If so what were they? b. Describe variations of air temperatures during incubation; c. Humidity?

22. Did you attempt artificial incubation? a. Describe incubator; b. Temperature? c. Humidity? d. Successful hatching? Describe, date in, date hatched, etc.

23. If you used a foster brooder: a. What kind? b. In what sort of nest? c. Successful hatching? Describe as above.

24. If eggs did not hatch: a. Were they fertile? b. If so, when did the embryo die? c. Probable cause of death?

25. If parents did hatch eggs: a. Dates for each; b. Description of parental behavior.

26. If some eggs hatched and others did not, do you know which were which in respect to sequence laid? Explain.

27. Did you have unhatched eggs assayed or analyzed? Results?

28. Food; Describe food and feeding of young.

29. If death occurs to young, explain.

30. How long were surviving young kept with parents? Describe briefly parent-offspring behavior from hatching to removal of young or parents, and after if noteworthy.

31. If young hand reared, give details.

32. Final description of F1 generation.

33. Any additional information that you think important.

34. Suggestions for improving questionnaire.

Please return reports to Donald V. Hunter, Jr.
Centerville, SD 57014

B.P.I.E. No. 27. Peregrine Falcon—Saker Cross

1. Ronald Stevens, Formagle Lodge, Costelloe, Co. Galway, Ireland, reports on a Peregrine/Saker cross-breeding project entered into by him and the Hon. John Morris jointly.

2. 1971.

3. Male Peregrine—*Falco p. peregrinus*, owner R. Stevens. Female Saker—*Falco cherrug*, owner J. Morris.

4. Male—6 years. Female—5 years.

5. Male—eyass. Female—eyass.

6. Male—unknown. Female—near Teheran, Iran.

7. Male—manned flown at teal. Female—flown free. Disposition: male friendly, female friendly, but attacked owner on occasions while stooping to lure. Neither imprinted.

8. Wooden shed 40 feet long by 18 feet wide and 16 feet up to the eaves.

Six barred windows—3 on the east side and one at each end—each 6½ feet high by 4 feet wide. The 6th window is on the west side—6½ feet high by 6 feet wide. The shed is equally divided by a double-latticed wooden screen designed to allow the passage of air and to enable one to peer through without being seen by hawks on the other side. The floor is concrete covered with sand and there is a bath 3 feet x 3 feet let into the floor in each division, each fed by tap and hose. Two nest ledges in each division about on a level with the eaves. They are shallow wooden trays 3 feet square with sides 3½ inches deep fitted annually by fresh turves of peat in one piece. Two concrete blocks 4 feet high in each division serve for the placing of food. Perches—beams under the roof and shelves in the windows where they are cleansed by sun and rain. The breeding pair has the division at the far end with windows facing north and east and half the window on the west side.

9. None.

10. Walls whitewashed. Beams exposed.

11. (See 6.) Access by ladder.

12. Male put in shed 1968. Female introduced February 23, 1971.

13. For the first few days the female Saker was viciously aggressive but the male Peregrine evaded her attacks. Within the first week she became peacefully inclined. After about another two weeks they had the appearance of being a pair.

14. Materials provided (see 6). Did not see either of the old birds making a scrape. They adopted a shallow depression I made by punching the tray.

15. No wild birds given for fear of agricultural poisons. Up to the time the eggs were hatched, cockerels from 4 to 5 months old, an age at which they ripen sexually, was the food provided alternated with female domestic pigeons. If the pigeons had no eggs in them a bantam's egg was put into the abdominal cavity after removal of the guts except for the liver. The abdominal skin was then sewn up to contain the egg. No food additives were given until the young had hatched when a few drops of ABIDEC were smeared over the meat once daily as a precaution against rickets because no rays of the sun could reach the nest ledge occupied by the young. After the young were hatched, chickens two to three months old and young pigeons (given cold) was the food provided. Before the egg-laying period the old birds were fed once daily. They were compelled to pick every bone clean before a fresh supply was given. This was to prevent their becoming too fat for breeding. After the eggs were laid this rule was relaxed so that when either the Peregrine or the Saker took time off from incubation there was always food available and a never-failing supply of food was always there after the young were hatched.

16. —

17. No. The male was in breeding condition before the female was put into the shed on Feb. 23. Not until early April was the female seen to solicit copulation by which time the male had seemingly cooled off.

19. Date first egg seen May 14.

20. After second egg was laid. Both female and male took turns in incubation.

21. Did not take any air temperature; often hot during incubation. Very little rain.

22. No.

25. Parents hatched 2 eggs. First young seen June 22. Second young seen June 24. Parental behavior exemplary.

26. No.

27. Did not have unhatched eggs analyzed because they disappeared gradually.

28. Food: Parents did not show any awareness of any particular food needs of their young. When young pigeons were given whole the parents carefully removed the intestines before carrying the body parts to the nest. Both parents fed their young.

30. The two young eyasses fledged naturally. The first left the nest July 30. Both were out together by August 5 but between those dates the young frequently returned to the nest. The young falcon was coaxed through the doorway into the other division August 5. On August 7 the young tiercel was also shepherded through to join his sister. In neither case did parents show concern. On August 16 the young tiercel was judged to be hard-penned and was removed from shed, jessed, hooded and tied up in sinews. The young falcon followed him a week later. From first to last every care was taken not to antagonize the parents in the hope that good relations will be maintained next year.

32. Weight of male 25 oz; female 33 oz. Moustache less than that of average Peregrine. Feet greyish blue—Saker-like. Length of tail between Peregrine's and Saker's. Thighs streaked like Saker's. General appearance more like Peregrine's than Saker's. Neither imprinted.

33. Additional information: Sand was found to be unsatisfactory as a floor covering because hawks often got their meat down into it. More and more sand adhered to it while the meat was being eaten until hawks got disgusted and left it. Much anxiety was felt for the young in this respect for fear sand might accumulate in their insides. Fortunately, however, the parents almost always took the food direct from blocks and shelves to the nesting ledge when feeding young.

We were able to observe activities at the nest from the top of a ladder which was propped against the division screen on the other side, without being seen by hawks. By peering through the double lattice not only observation but photographs too were proved possible.

The breeding shed is in a sheltered secluded position. Hawks spend much time in the windows watching the activities of wild birds outside. The trained hawks often visit them when much mutual chattering is heard.

Owing to the good relations maintained with the parents we were able to enter their half of the shed daily to clean up and run the bath water. Had this not been possible flies would have swarmed and might have been a menace to the young eyasses when they were in the helpless "flab and paunch" stage.

34. Suggested additions to questionnaire: What sort of floor has your breeding pen? How do you clean the floor? Do you use sand in any part of your pen? Can your hawks see outside?

Under food: Do you give wild birds as food? Do you take care to give birds of both sexes? Do you give eggs? If so, describe how given. Do you give food additives? Did parents show awareness of any special food requirements for newly-hatched young, such as viscera?

Did the young suffer from molestation by flies? Was precaution taken to keep out flies? If so, was it successful? Were you attacked by the parents? Did they allow you to enter to clean up daily? If they did not, at what stage did they make you keep out? At what age did you take the young? Were you able to take them without being attacked by the parents? If you did not antagonize the parents, describe the subterfuge used.

B.P.I.E. No. 28. Peregrine Falcon, Merlin, Red-tailed Hawk

1. a. J. A. Campbell. b. Box 130, Black Diamond, Alberta. c. Not confidential.

2. a. November 8, 1971. b. One year. c. None.

3. a. Peregrines, Merlins, and Redtails. b. The Peregrines came from the Yukon, but by their size and color I think they are *anatum*. They came from the taiga or wooded section of the Yukon and not the tundra.

4. Two pairs of Peregrines. One pair obtained as eyasses in 1967 and one pair as eyasses in 1969. A pair of Richardson's Merlins as eyasses in 1970. One female Redtail as an adult of two years old in 1970 and one immature male in 1970. This male was a bird of 1969 nesting year.

5. See above. All eyasses.

6. The 1967 pair came from the same nest on the Porcupine River just inside the Yukon border down river from Old Crow. The 1969 pair were from separate nests. The tiercel came from the same nest as the above two birds. The falcon came from a nest on the Yukon River between Dawson City and Forty Mile Creek. The Merlins came from the South Saskatchewan River near Empress, Alberta. The Redtails—The female from near Turner Valley, Alberta, and the male from near Edmonton.

7. a. No. b. Peregrines all flown free and manned. Merlins not handled much or flown free. Redtails—female manned—male not handled much. d. Peregrines yes. Rest of birds no. e. Good—one Peregrine was a chronic screamer for first three months but eventually gave it up. Rest of birds—good. f. No—none.

8. The Peregrine pens and the Redtails each measure fourteen feet west to east and twelve feet north and south. The three pens are in line and all windows point south. Each pen has four windows about fifteen inches across horizontally and two feet vertically. The windows are taken out from the end of March until the beginning of November. They are protected by dowelling on the inside of each pen and have fine mesh chicken wire outside this. The materials in the construction of each pen are shiplap and plywood, unpainted. Each pen has its own time clock which controls a battery of four flood lights each of 150 watts. Each light can be directed in a wide arc so that the whole pen can be covered. This gives a lighting effect of about four watts per square foot. In win-

ter (from October until March) twelve hour artificial light was used. I then increased it a quarter of an hour per day until they were on a continuous daylight by mid-May. The floor of each pen was concrete covered with a thick layer of straw. A nest ledge was made of plywood and filled with fine gravel and sand. The pens were seven to eight feet high. The Merlin pen was eight feet square and had one small window fifteen by two feet. It was facing north. I lost the jack before breeding season. The Redtails were under the same conditions as the Peregrines, but artificial light corresponded with the natural daylight in this latitude.

9. See above.

10. Unpainted wood.

11. The Peregrines had a box made of plywood across one corner of each pen. The two sides measured three to four feet. The boxes were nine inches approximately deep, and filled with gravel and sand. A rough branch was nailed along the front so that the birds would not perch on the thin plywood. The Redtails were given a platform of straw bales and tree sticks and branches were placed in the pen. No nest was formed for them.

12. The 1967 Peregrines. The tiercel was put in the pen three weeks ahead of the falcon. The young Peregrines were introduced together. The Redtails were put in together. Behavior towards one another did not change. The 1969 tiercel hardly left the nest ledge from the last week in February until the middle of March. The original male Redtail died suddenly February 13th. Did postmortem in the pathology lab but could not find cause of death. An immature male was introduced about February 20th.

13. See above.

14. The 1967 female Peregrine made a scrape in the nest box April 16th. The 1969 falcon made one April 18th. Neither tiercel seemed to take part in nest building. The female Merlin made a scrape April 4th but did not sit in it or defend it. However, she is very noisy when I enter the pen.

15. From January until April 6th all birds were fed pheasant or quail. I ran out from April 6th until 25th and had to feed chicken heads. From April 25th on we went back to pheasants and quail. Food was in front of birds at all times, especially at dawn. No old food was removed except when we went in to change the bath water—about every five days. Falcons and tiercels fed separately. The falcons seemed to feed first and then the tiercels. The tiercels did not carry food to the falcons.

16. No endocrine treatment tried.

17. No, but 1969 falcon would fly up to the tiercel and sidle up to him, and gently extend a foot towards him. This was not done aggressively but very gently. The tiercel seemed frightened of the falcon and would fly away from her. She would then follow and repeat it.

18. No because I felt the birds should lay before trying it. I tried it on the immature Redtail, but could not get any semen.

19. None.

20. None.

21-34. Not applicable.

B.P.I.E. No. 29. White-tailed Sea Eagle.

1. a. David Allen, Curator of Birds. b. Kansas City Zoo, Swope Park, Kansas City, Missouri 64132; c. For use in RRN, Conference, B.P.I.E.

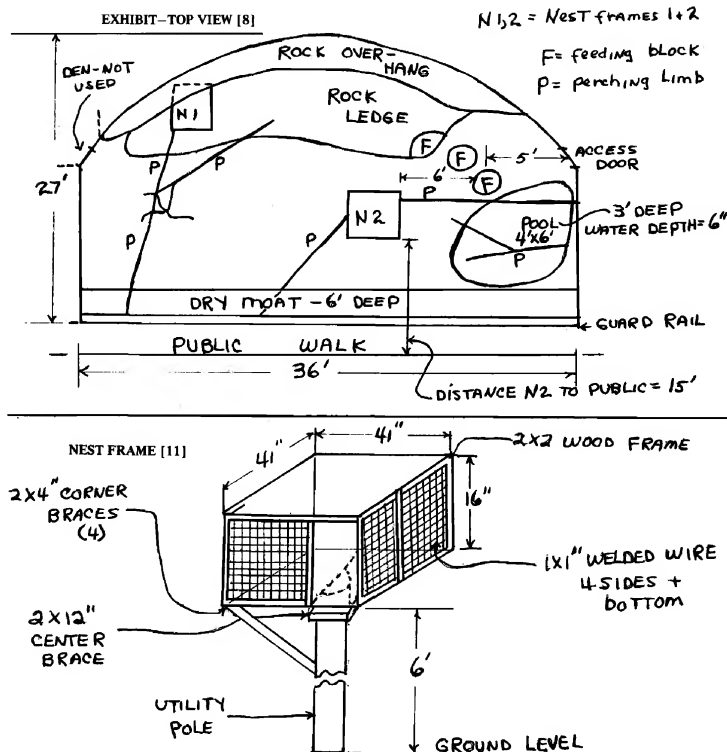
2. a. November 16, 1971; b. February 1970 through November 1971; c. None.

3. a. *Haliaeetus albicilla*.

4-6. Male and female, haggards, were purchased from animal dealer in 1964, arrived in adult plumage.

7. a., b., c., d. No, e. Excitable, aggressive; f. No.

8. Birds are exhibited at zoo in enclosure previously built for mammals (has dry moat), built in 1940 by W.P.A. No. 11 chain-link covers top and 2x4 welded wire covers front. Back and sides are stone block. Height of enclosure: from 10 feet to 14 feet. Public viewing is from front only, which faces south. See sketch below showing top view of exhibit.



9. No. Outdoor exhibit.
10. Brown stone, grey masonry, some seasonal vegetation.
11. Two nesting frames (see sketch on previous page); 2x2 inch wood frame-work, 1x1 inch welded wire. 16 inches deep x 41 inches square, bottom of nest 6 feet from ground. Birds chose nest No. 2.
12. Released in aviary together, 1964.
13. Introductory—unknown. Strong pair bond since 1968.
14. Yes; a. sticks, pine needles, prairie hay; b. yes; d. February 1970; February 1971.
15. ZuPreem Bird of Prey Diet*, $\frac{3}{4}$ lb/bird/day, 5 days/week; one freshly killed adult rat/bird, once weekly. Fasted one day/week. (Note: not fasted between November and June). Feeding schedule and consumption vary seasonally. Behavior while feeding—normal, birds are fed on individual feeding blocks; pre-nesting—courtship feeding—male to female on ground or on rock ledge 3 feet high. Excess and old food removed daily.
16. No.
17. Only on two occasions; April 13, 1968—time and description not recorded; December 21, 1970, 4:30 PM, male mounted female from left side, in nest No. 2.
18. No.

1970

19. Two eggs; No. 1 on March 7 or 8; No. 2 on March 11 or 12.
20. a. With first egg, March 7 or 8; b. Both sexes, female about 80% day, 100% night; male—about 20% day; c. April 15; remaining egg hatched.
21. a. No; b. upper 30 F to upper 70 F; c. not known.
- 22,23. No.
24. On March 28, one egg missing. No evidence, presumed infertile.
25. a. Remaining egg hatched April 15; b. Parental behavior—both sexes fed young, brooding of young mostly by female. During hot and rainy weather, female protected young by standing on nest frame with outstretched wings.
26. No. Eggs were not numbered.
27. No.
28. On April 14, diet changed to 3 freshly killed adult rats per day, 7 days/week. Young fed by both sexes. Diet for parents and offspring changed back to ZuPreem in August.
29. Surviving.
30. Young kept with parents until September 29 (168 days). Parent-offspring relationship went smoothly until mid-September. The young became aggressive toward the parents—was observed footing and biting parents (most often the male parent).
31. N. A.
- 32, 33. Female. At hatching, young was 6 inches long, light grey, black beak.

*ZuPreem Bird of Prey Diet, Hill's Division Riviana Foods Inc., P.O. Box 148, Topeka, Kansas 66601.

By April 21 (46 days) had lost most of down, starting primaries and secondaries. By May 22, dark immature plumage, retaining black beak. Feeding self by shredding rats brought to nest by parents. On June 30, young observed off nest (77 days).

1971

19. Three eggs; No. 1 on February 14 or 15; No. 2 on February 17 or 18; No. 3 on February 21 or 22.

20. a. With first egg, February 14 or 15; c. March 24; remaining egg hatched.

21. a. No; b. 26 F (2-day snow storm, during which egg No. 3 was laid; female did not leave nest—fed by male) to lower 60 F; c. Not known.

22, 23. No.

24. March 16—one egg missing, no evidence; March 22—egg broken in nest, contained fully developed embryo (dead), cause undetermined. Could hear remaining egg “peeping.”

25. March 23—remaining egg pipped; March 24—remaining egg hatched.

26. No. Eggs not numbered.

27. No.

28. Same as 1970.

29. Surviving.

30. With parents at time of writing. Parent-offspring behavior good. 1971 young also became aggressive (in same manner as 1970) toward parents, but ceased after a few days.

31. N. A.

32, 33. Male. Development similar to 1970.

34. Good method for reporting essential data.

B.P.I.E. No. 30. Peregrine Falcon.

1. Heinz Meng, State University College, New Paltz, N.Y. 12561. Not confidential, may be used.

2. November 12, 1971. 1967 through 1971.

3. *Falco peregrinus pealei* Ridgway (356b.)

4. Both birds are 4 years old.

5. Both birds were taken in 1967. They were almost branchers and each sex was from a different eyrie.

6. Eyrie: Queen Charlotte Islands, British Columbia, Canada.

7. Birds were handled for about a month (jesses and block perches) and then put in a small holding chamber which was 12x4 feet and 7 feet high. The falcons were kept in this chamber for 2 years.

8. At 2 years of age the pair was put in the breeding chamber which was 10x15 feet and 10 feet high at the eaves. Breeding chamber was attached to original hawk house. At first the 1964 pair of passage Peregrines (*Falco peregrinus tun-*

drius White) had the entire chamber to themselves but in 1969 I partitioned it to make 2 chambers. Partition was made out of 2x4 lumber and covered with burlap on each side. Entrance is through hawk house into chamber A. To get to chamber B one must go through chamber A. By going through hawk house there is always a closed door so that birds can not possibly escape. Window areas (facing south) are 6x10 feet and are provided with 3/8 inch vertical aluminum rods placed 2½ inches apart center to center. The window areas facing north are 4x10 feet.

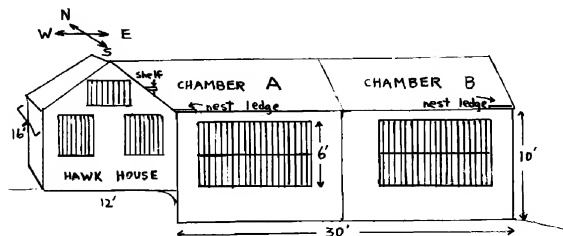
The area outside of the aluminum bars was covered with 2x4 inch mesh welded wire coated with vinyl to prevent escape should the falcons be able to push between the bars. At the bottom of the window areas on the south there is a 3 foot wide shelf with a lip 2 inches high filled with sand. At the end of each shelf there is a large bath pan. At the 3 foot mark (3 feet above the bottom shelf) there is another shelf 3 feet wide, covered with rug and astroturf material. The north window areas are the same size but have no shelves. The upper half of each area is covered with burlap to provide some protection from the north wind, but the open lower half allows some wind to circulate through. The floor is of cement. Perches are arranged so that birds can't defecate on them from above. There are only 3 rafters in each chamber and these are covered with rug or astroturf. The birds usually use these to roost on since they are the highest perches available.

9. There is a light in each chamber but during the 1971 season they were not used.

10. The interior of the breeding chamber is unpainted wood and the walls are of homosote board, a pressed fiber material.

11. In chamber A which houses the Peale's Peregrines, the nest ledge runs north and south along the eaves of the hawk house. Ledge is 2 feet wide and has a lip of a rug covered 2"x3" wood. Sand about 2 inches deep fills the entire ledge (2x15 feet). The part of the hawk house roof that is covered by the breeding chamber roof forms a darker area above the nest ledge. Half way up this sloping roof is a horizontal shelf about one foot square. Often both birds sit on this ledge together.

12. Both birds have always been together from the time they were taken from their eyries.



13. The falcons have always been friendly towards each other and when mature, especially during the winter and spring (1970-71) they went through all of the typical breeding behavior patterns.

14. Both birds engaged in scraping.

15. Food consists mostly of freshly killed homing pigeons in good health. As a precaution against trichomoniasis the heads and crops are removed; also the feet. Pigeons are torn into 3 pieces by pulling wings apart and then removing the back and legs from the breast piece that has them still attached. The food is then placed on the upper window shelf from the outside. Both birds come to the ledge and take the food from my hand. Also day-old chicks and an occasional rabbit are fed.

16. No drugs or vitamins have been used. Wheat germ oil was mixed with egg yolk and put on meat for about a week during end of February.

17. Copulation was not observed—probably occurred on or above the nest ledge where I was unable to observe the birds. In the very peak of breeding chamber A I have now put in a small partition and one-way glass so that now I can view every part of the chamber from the hawk house.

18. Artificial insemination was not tried.

19. Four eggs were laid at 2 day intervals starting on March 4, 1971. After 8 days of incubation they were candled and found to be infertile. The eggs were removed and 13 days later the falcon had recycled and laid 4 more eggs.

20. For each clutch incubation started with the third egg and female did most of the incubation at the beginning, but as time went on the male did more and more.

21. Temperatures were not taken.

22. Artificial incubation was not tried.

23. -

24. -

25. Eggs of second clutch hatched on May 8th (3 young) and May 10th (one young).

26. -

27. -

28. Freshly killed homing pigeons were provided and prepared as described under 15. Male took food to nest ledge and gave it to female. Female went to nest site and started plucking and eating, young were peeping. On May 10th, 2 days after I first heard peeping, I finally climbed to nest ledge to see what there was in it. I hadn't disturbed falcons since the laying of the 3rd egg of the second clutch. I found 2 dead young, one almost dead and another one just hatching. I brought the young into the house but the almost dead one died shortly after. The one that was hatching was out of the egg at 2 PM and immediately ate 3 small pieces of pigeon breast meat. For the next 10 days he was fed mostly skinned, eviscerated day-old chicks. These were cut up and fed with round tipped forceps. All of the bone and cartilage was fed along with the meat. A 40 watt bulb was used for heat and was so regulated that the temperature stayed at about 35 degrees Centigrade. The bird was able to move away from the light if it felt too warm.

29. Apparently the female fed herself at the nest site but not the eyasses. She brooded them well though.

30.--

31. Details of hand rearing, see 28.

32. F1 generation. One Peale's Tiercel produced. Perfect health and feather. No hunger streaks. Weight 24 ounces.

B.P.I.E. No. 31. Goshawk.

1. a. Donald V. Hunter. b. Centerville, S.D. 57014. c. No restrictions.

2. a. November 15, 1971. b. 1971 spring breeding season. c. B.P.I.E. 16 (RRN 5:115-119, 1970).

3. a. Goshawk—*Accipiter atricapillus*. b. American—*atricapillus*.

4. 5 years.

5. 1966. a. Eyass.

6. Central Rocky Mountain 42 °N Lat.

7. Manned and flown at quarry (rabbits) 1967 and 1968.

8. East room of building—20x12x10, two windows to south barred with laths. Converted chicken house made of lumber. Rafters and study exposed (2x4's).

9. No.

10. Whitewashed wood.

11. Box on top of pole. 7' from floor in west center of room. Box on east wall.

12. No male.

13. -

14. Sticks were provided as in year before. Old mat was torn down by bird in March and rebuilt partially to be torn down again. This was repeated several times. No attempt was made to build at 1969 site. When a new site in the form of a box on the east wall was provided a fairly large nest was built but not completed. This was placed in the room on June 10th.

15. One four week old chicken per day. None of excess removed.

16. No.

17. to 32.—0—

33. Providing new nest site may be important.

B.P.I.E. No. 32. Peregrine Falcon.

1. a. Donald V. Hunter. b. Centerville, S.D. c. No restrictions.

2. a. November 15, 1971. b. 1971 Spring Breeding Season (March through July). c. No.

- | Male | Female |
|--|-------------------------|
| 3. a. <i>Falco peregrinus</i> | <i>Falco peregrinus</i> |
| b. <i>pealei</i> | <i>pealei</i> |
| 4. 5 years | 5 years |
| 5. 1966 | 1966 |
| 6. Queen Charlotte Islands. | |
| 7. Manned and flown to lure 1966 only (both very wild now). | |
| 8. Room in House 15x15x7½, two windows to south, one to west. | |
| 9. No. | |
| 10. White plaster. | |
| 11. Nest box with sand 3' from ceiling in SW corner. | |
| 12. Both put in together in fall, 1966. | |
| 13. Never any antagonism between them. The female has always been dominant—at times feeds male. This happens when both are eating from same piece of food. She allows him to take food from her beak. These birds were raised in captivity by Frank Beebe's adult Peregrines (see <i>RRN</i> 1:61-86, 1967) though each was from a different eyrie. Both vocal in later winter—March—and sometimes in the fall for a short period. | |
| 14. Scraping not observed. Believe only female made scrape which was made as far as I could see just before eggs were laid—really wasn't much of a scrape. During the few days just before the eggs were laid both birds were very quiet and sitting with feathers tight and close to walls as if hiding. | |
| 15. Month old chick apiece each day or if much food was left over only one chicken for the pair. Excess food was not removed. | |
| 16. No. | |
| 17. No. | |
| 18. No. | |
| 19. Eggs—May 10, 12, 14. | |
| 20. Incubation started with second egg. Only female observed on nest. Male paid no attention to nest so far as I could determine. On May 28 eggs were removed and candled—found to be infertile—were not returned to nest. No more eggs were laid though behavior led me to believe there would be. | |
| 21. No temperature taken. | |
| 22-32. - | |
| 33. Believe that egg laying was delayed due to low level of light in room. | |

B.P.I.E. No. 33. Gyrfalcon.

1. a. Donald V. Hunter. b. Centerville, S.D. c. No restrictions.
2. a. November 15, 1971. b. 1971 Spring Breeding Season (March through July). c. No.

- | Male (Malcolm) | Female (Lena) |
|--|--|
| 3. Gyrfalcon (dark) <i>Falco rusticolus</i> | Gyrfalcon (white) <i>Falco rusticolus</i> |
| 4. 3 years | 8 years |
| 5. 1968, Eyas | 1963, Passage |
| 6. Arctic (Eastern) | 73 °N Lat. |
| ? | September 6 |
| 7. Manned very tame. Flown every day fall and early winter. | Manned but not tame. Flown fall and winter of 1963-65. |
| 8. Both birds have freedom of one room downstairs and hall and one room upstairs in house. | |
| 9. 75 watt bulb is on at all times downstairs room. | |
| 10. Light colored wallpaper. | |
| 11. Several nest opportunities are available in each room. Male chose sand box in hall. | |
| 12. Male was raised by hand in facility. Female was introduced to same in December 1968. | |
| 13. Female tries to ignore male. Male very interested in female when I am not present, becomes aggressive toward her when I am in room, usually driving her upstairs. Often observed trying to engage her in play. He is always rejected—ignored. | |
| 14. Male makes scrapes at all times of year and seems to enjoy leading me to them and showing them to me. Doubtless disappointed because female will not look at them. I do not think he is imprinted to me but transfers to me when rejected by female. | |
| 15. Staple chicken one month old. His hunting kills are fed when available (and suitable). | |
| 16-27. No. | |
| 28. Around the 4th of July two young Gyrfalcons were introduced to the pair. The female immediately went upstairs and did not come down again as long as young were there. The male adopted them and fed them until as long as they were there. Food was month old chickens and pigeons. | |
| 29. Male was given to James Weaver as a mate for one of his females mid-July. Female became ill the following week and died six weeks later after extensive treatment for aspergillosis. Full report elsewhere. | |
| 30, 31. The young female was left with male until she died. In order to keep her tame, as I intended to exercise these two together, I had fed her while Malcolm fed the young male. She remained very tame and did not resent handling, while the male, though at first tamer than the female, became very resentful of handling. | |
| 32. See 29. | |
| 33. Feeding of young seems certainly innate and also it seems certain that Malcolm will breed in this circumstance with proper female. | |

B.P.I.E. No. 34. Red-tailed Hawk.

Donald V. Hunter, Jr., Centerville, South Dakota.

In 1970 cyass Red-tail (Willard) hatched locally, in 1967 built a nest, and sporadically tried to incubate a chicken egg. He rejected female put in with him after nest was commenced. Would not allow her off the floor in one corner of large room.

In 1971 same pair placed together earlier in another location. In this case female relegated Willard to corner of room. He was removed to save his life, as she would not allow him to eat. She built no nest. When placed in an outdoor enclosure by himself, Willard built a nice nest of sticks laid with baling twine and shredded cardboard. He diligently incubated infertile chicken eggs for 34 days, then for 15 more a Swainson's Hawk egg, which after this time I opened and found nothing to indicate that an embryo had even started to develop. Ironically, we apparently stole an infertile egg. The eggs we left in the nest hatched within a week of removal of the egg given to Willard.

B.P.I.E. No. 35. Prairie Falcon.

A brief explanation of the breeding project will help clarify the answers to the Breeding Project Questionnaire.

This project was actually born at the Fort Collins Peregrine Symposium just two years ago. My two sons have worked diligently on every aspect of this with me, and we have received a great deal of help, advice and encouragement from many friends.

As we had a trained haggard female and were able to trap a magnificent haggard male in our local area, we were able to begin promptly. These birds were remarkably compatible and all was well until March 19, 1970 when the falcon developed frounce; she was taken from the project and treated with Enheptin until we were able to get Emtrol. When she recovered, she was put back in the pen, where she continued to show a great deal of "broodiness." A painted brown chicken egg was put in the scrape and incubated but no eggs were laid that first season. Accordingly we tried an adoption plan and it was completely successful. We have the foster F1 pair in another breeding pen just like the one the haggard birds inhabited. This season, 1971, our haggard female laid a clutch of four eggs and incubated them; however, they were infertile, and she did not recycle. Philip L. Shultz, M.D., Santa Fe, New Mexico.

1. Philip L. Shultz, M.D., 107 Cienega St., Santa Fe, New Mexico 87501. This report may be used without restriction.

2. a. November 17, 1971. b. December 1969 to present.

3. Prairie Falcon (*Falco mexicanus*).

4. Male and female trapped as haggards two years ago.

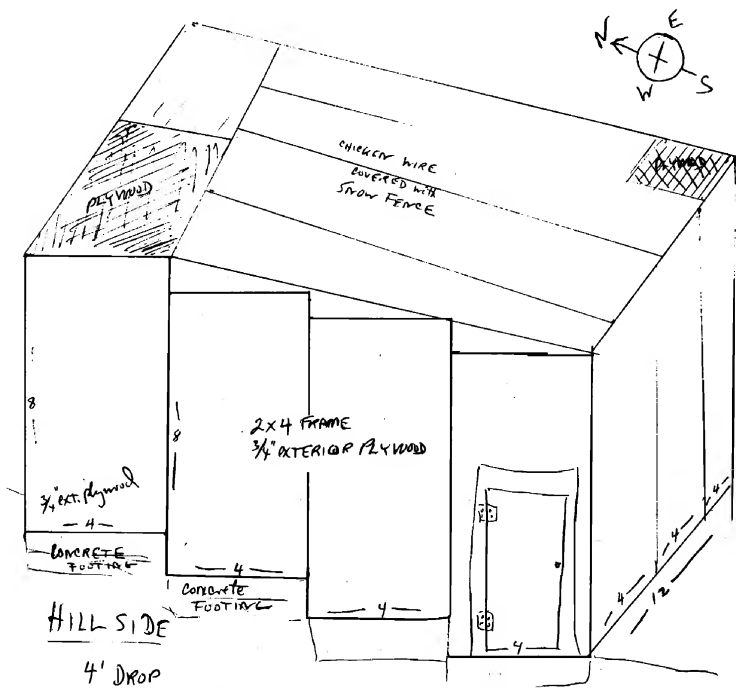
5. Female trapped September 27, 1969 in Rio Arriba County, New Mexico.

Male trapped December 18, 1969, Santa Fe County, New Mexico. 37 and 35 degrees N. Lat.

6. Eyrie of foster young in Rio Arriba County, New Mexico near 37 degrees N. Lat. and near place where female was trapped.

7. The haggard female was trapped September 27, 1969, manned, trained and flown at game, but only bagged quarry was taken. She was not flown free after the tiercel was trapped December 18, 1969. Tiercel was manned until February 1, 1970, but was not flown free. The foster (F1) male and female were taken up from the breeding pen July 26, 1970 and manned until September 8, 1970, 44 days.

8. See sketches. The pens are built on a hillside, sloping from north to south, with a four foot drop N. to S. The walls are smooth, unpainted $\frac{3}{4}$ " exterior plywood with a few 1" peepholes. The top is 2x4 frame with chicken wire over snow-fence. There are 4x4' and 2x2' plywood roofs over the nesting ledge in the northwest corner and in the southeast corner. Each pen is 12x16x8, and with the slope of the hillside an effective 12' height. There are no windows.



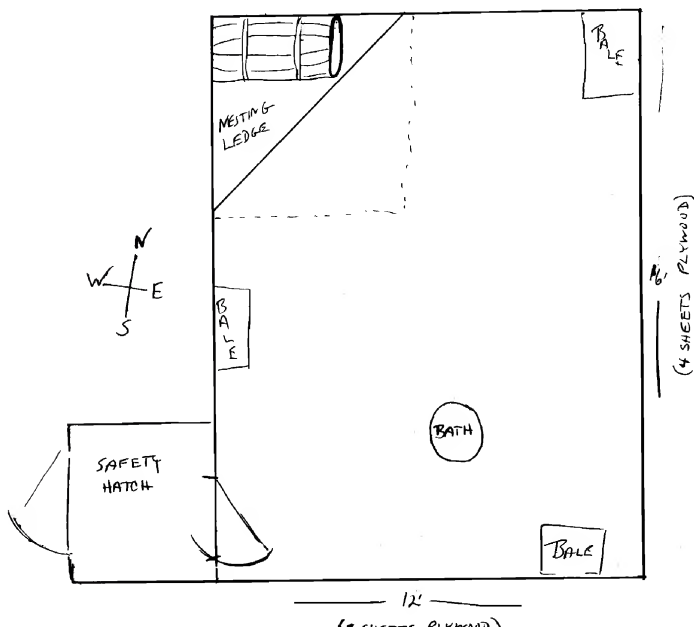
9. No.

10. Unpainted plywood. The outside is painted adobe brown.

11. For the 1970 season, a 4' shelf in the northwest corner about six feet above the floor, faced with carpet and covered with several inches of sand. For the 1971 season a wooden barrel with a padded opening, and containing several inches of sand was placed on the shelf.

12. The male and female had been weathered on adjacent round perches for several days; they were given full crops and placed in a 4x6x8' free mews on the night of December 27, 1969, where they shared a small shelf perch. They were fed together without conflict and on February 1, 1970 the slots were cut off their jesses and they were released into the new breeding pen. We did not observe any conflict, even when they were fed one undivided pigeon. Usually the falcon would eat first, but occasionally the tiercel would get first seating.

13. The pair invariably roosted side by side on the edge of the nesting ledge although numerous other perches were available and used during the day. They



engaged in various forms of courtship display, and we were able to photograph some of these from the observation peepholes. They would rouse and warble and make several types of clucking sound as they would approach each other on the ledge. The falcon would frequently crouch into a horizontal stance with her ventral pericloacal tuft fluffed out.

14. Only the falcon was seen making a scrape, but either bird would sit in the scrape, with or without eggs. A shallow scrape was observed in mid-April, 1970; it was deep by May 1, 1970. In 1971 there was a good deep scrape in the barrel by mid-March.

15. Pigeon has been the staple diet with the occasional use of chicken, rabbit, mouse, rat, or squirrel. The birds don't seem to like chicken backs, in fact the young adopted pair will completely ignore them. Feeding time is late afternoon and each bird receives $\frac{1}{4}$ to $\frac{1}{2}$ pigeon; there is seldom any excess. The haggard pair has been very reluctant to kill a live pigeon in the pen; we have tried this a few times when we were going to be away for a few days, and have usually returned to find the pigeon alive and well. The falcon would threaten the tiercel when he attempted to steal food, but no real crabbing was ever observed.

16. No hormones were used.

17. On the afternoon of April 6, 1970 the tiercel made a series of squeaking calls and was seen to mount the falcon briefly but she shook him off gently. The pair was under observation only a very small portion of the day.

18. No.

19. Egg No. 1 March 30, 1971. Egg No. 2 April 1, 1971. Egg No. 3 April 6, 1971 and egg No. 4 April 9, 1971.

20. Incubation was begun after egg No. 2 on April 3-4. On April 8, one egg was discarded and I was able to recover only about $\frac{1}{4}$ of the very thin shell under the nesting ledge. On April 11, another egg disappeared and no trace of it was found. We were trying to avoid any disturbance or confusion around the pen, so observations were made through peepholes, and the pen entered only when we felt it was absolutely necessary. On April 18, 1971 the two remaining eggs were removed, candled and both were infertile. They measured 52x40 mm and 53x40.7 mm. The female did not recycle and no more eggs were laid.

21. Unknown.

22. No.

23. During the 1970 season our falcon laid no eggs, so in May 1970 I placed a painted small brown chicken egg in the scrape; it was ignored for about ten days, and by the last week of May the falcon was incubating it steadily. By June 1, 1970 the tiercel was taking his turn on the egg. On June 10, 1970 we substituted a 2+ oz Prairie tiercel from a local wild eyrie for the egg, and he was immediately brooded by the falcon. However, she would not feed it for several days and we had to feed it until she took over. On June 27 a sibling female was placed on the ledge and was immediately adopted by the haggards. These young birds were raised by the foster pair until they were fully fledged.

24. Infertile.

25-26. -

27. No.

28. Foster young were fed pigeon by both parents (foster).

29. None.

30. Foster young were left with adults until fully fledged and were taken up July 26, 1970 and manned until September 8, 1970 when they were placed in the second pen.

31. See above.

32. The foster young which are our almost F1 generation have spent a completely uneventful 14 months in their pen, which is identical to their foster parent's. We have observed no conflicts; they molted perfectly and are a very handsome pair.

33. We are attempting to raise local birds under as simple natural conditions as possible. On June 22, 1971 our haggard tiercel died suddenly. There were no obvious lesions of any sort except evidence of marked weight loss. Weight immediately after death was 15 oz. He had weighed 19 oz when he was put in the breeding pen and had certainly gained on his generous pigeon diet. An autopsy was done the same day by Dr. James Prine, a Veterinary Pathologist at the Los Alamos Scientific Laboratory, and a hard 2½-3 cm mass was found obstructing the thoracic esophagus. Microscopic study and bacterial stains reveal this to be a granuloma, probably bacterial in origin and probably secondary to a perforated esophagus from a bone spicule. There were incidental findings of probable nematode larvae in the lungs and kidney. We hope to get another haggard tiercel in the near future.

34. -

B.P.I.E. No. 36. Prairie Falcon.

1. a. Canadian Wildlife Service (Richard Fyfe). b. 10015 103rd Ave., Edmonton, Alberta, Canada. c. Not confidential.

2. a. November 15, 1971. b. December 1970 through spring and summer of 1971. c. None.

3. a. *Falco mexicanus*.

4. Both birds three years old.

5. Male "Sandy" taken as five week old eyas. Female "Philesa" taken as four or five week old eyas.

6. Male latitude 503 x longitude 1050 Alberta. Female latitude 491 x longitude 1050 Saskatchewan.

7. Male hand fed and flown on line to lure up to 30 feet for 2 weeks. Female flown at game by several falconers.

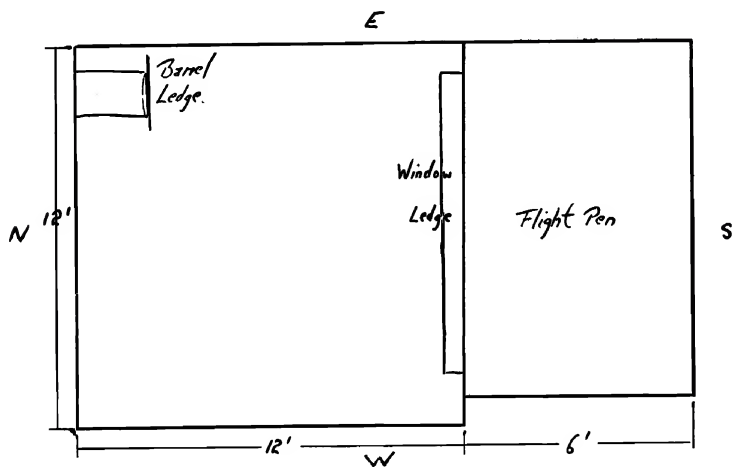
8. Pair housed in a wooden room built onto the north side of a barn. Dimensions 12 feet wide, 27 feet long; roof 12 feet high sloping to 6 feet. "Fylon" translucent corrugated fiberglass was used in the ceiling and on two of the largest windows. All windows had a log or branch perch placed at the base and the large west window had a branch placed along upper half of entire length of window to eliminate the birds flying into the ¾" mesh weld wire.

9. Total natural daylight—no artificial light.
10. Walls painted white non-toxic latex paint.
11. Two nesting ledges provided one flat ledge 2'x4'x2" one "barrel type"—covered with plywood dome 20"x30"x16" both approximately ten feet above the floor and filled with clean dry river gravel. Flat ledge was used.
12. Both birds placed in temporary pen together and then into breeding pen December 1970.
13. Birds quiet in breeding pen. February 1 female "cached" when pen entered. February 26 male heard "chirping." No animosity between birds. April 5-8, both birds calling. April 9, copulation observed for first time.
14. a. Yes (female not observed making nest scrape movements until day of second egg). Male started April 9.
15. Freshly killed coturnix quail, thawed pheasant, rodents. Fed twice daily in cold weather. No artificial dietary supplements.
16. Not used.
17. Observed for first time April 9, 9:00 AM. Male flew directly from perch onto back of female and copulated with her.
18. Not used.
19. First April 15; second April 17. Eggs three and four not seen until April 22.
20. a. April 19. b. Most incubation carried out by female.
21. Not taken.
22. Not used.
23. Not used.
24. Hatched.
25. a. May 28 three newly hatched young and one egg seen. May 29 fourth egg hatched. b. Both birds would, and did, strike an intruder when given the chance to do so.
26. All eggs hatched.
27. All eggs hatched.
28. Food as in No. 15. Both parents fed young.
29. -
30. Both adults appeared to take almost competitive interest in the care of the young. June 18 at exactly three weeks of age, two of the young females were removed to be hand raised. June 24 remaining female removed. Last remaining chick (a male) removed from adults on June 27.
31. Turned loose in holding pen.
32. Four young birds maintained at breeding project site.

B.P.I.E. No. 37. Prairie Falcon.

1. a. Canadian Wildlife Service (Richard Fyfe). b. 10015 3rd Ave., Edmonton, Alberta, Canada. c. Not confidential.

2. a. November 15, 1971. b. Spring and summer 1971. c. None.
3. a. *Falco mexicanus*.
4. Male "Homer" three years old; female "Toba" same.
5. Male taken as an eyas from southern Saskatchewan; female same.
6. Male latitude 491 x longitude 1050; female same.
7. Male kept extremely tame and flown at times; female raised as falconers bird.
8. See sketch. Pair housed in room 10'x12'x6' with 8'x6'x6' enclosed wire flight pen.
9. No artificial light used.
10. Interior painted white.
11. One nesting ledge provided—barrel type 20"x30"x16" in northeast corner of room—2" of river gravel.
12. Pair put into breeding room February 12, 1971.
13. "Chirp" calls heard but no copulation observed.
14. Nest scrape made—not known if male participated.
15. Freshly killed coturnix quail, thawed pheasant and rodents made up the food. During cold weather they were fed twice daily. No dietary supplements were used. Excess food removed except during breeding season.
16. Not tried.
17. Not observed.
18. Not tried.
19. May 20—first egg. May 23 three eggs noticed, May 27 five in nest scrape.
20. May 20.
21. Not taken.
22. Not tried.



- 23. Not used.
- 24. Eggs not fertile.
- 25-26. -
- 27. Not analyzed.
- 28-32. -

B.P.I.E. 38. Peale's Falcon.

- 1. a. Canadian Wildlife Service (Richard Fyfe). b. 10015 103rd Ave., Edmonton, Alberta, Canada. c. Not confidential.
- 2. a. November 15, 1971. b. Spring and summer of 1971. c. None.
- 3. a. *Falco peregrinus*. b. *pealei*.
- 4. Both birds five years old.
- 5. Male "Joey" taken as eyas; female "Charlotte" taken as four week old eyas.
- 6. Male Queen Charlotte Islands latitude 541 x longitude 1330; female same.
- 7. Male raised as falconer's bird. Flown at lure and quarry; female same.
- 8. See sketch. Pair housed in loft of wooden barn. Dimensions 27'x28' and 18 ft high at peak of roof sloping to 8 ft of eaves. Three-quarter inch weld wire covered three windows in east south and west walls and in roof.
- 9. Total natural daylight—no artificial light.
- 10. Walls painted white non-toxic latex paint.
- 11. Three nesting ledges—platform ledge, 2'x4' and 12 ft from floor, placed on east wall. Platform ledge 2'x3' and barrel ledge (plywood dome cover) 20"x30"x16" both on south wall. All were filled with two inches of clean dry river gravel.
- 12. Charlotte and Joey were first put into their loft during the early spring of 1970. Two clutches of infertile eggs were eventually produced and they were given two young Swainson's Hawks to raise. Charlotte and Joey remained together during the fall and winter of 1970-71.
- 13. March 15th both birds very restless, vocal calls to each other—'wailing' and bowing. Feeding of the female by the male seen at this time. Male appeared to "distrust" female and avoided coming in contact with her throughout the season.
- 14. March 26 female observed making nest scrape movements April 1 male observed making nest scrape movements.
- 15. Freshly killed coturnix quail, thawed pheasant, rodents. Fed twice daily in cold weather. No artificial dietary supplements.
- 16. Not used.
- 17. April 7—attempt at copulation observed. No actual copulation seen—male appeared "timid."
- 18. Not used.
- 19. Eggs first seen on April 12. April 14—four eggs removed and placed in artificial incubator. April 26—first egg of second clutch laid. April 28—second

egg laid. Five eggs eventually found.

20. a. Partial incubation with two eggs. b. Both male and female observed incubating. May 28—eggs candled and proved infertile—removed.

21. Not taken.

22. Yes—but eggs proved infertile.

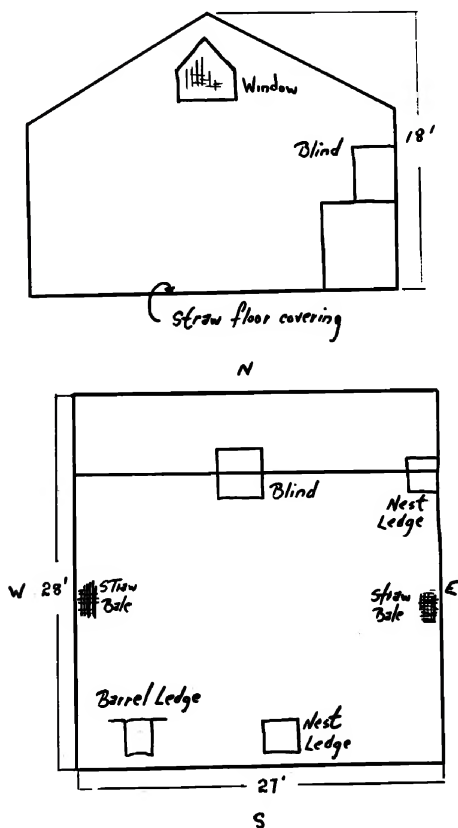
23. Not used.

24. Infertile.

25-26. -

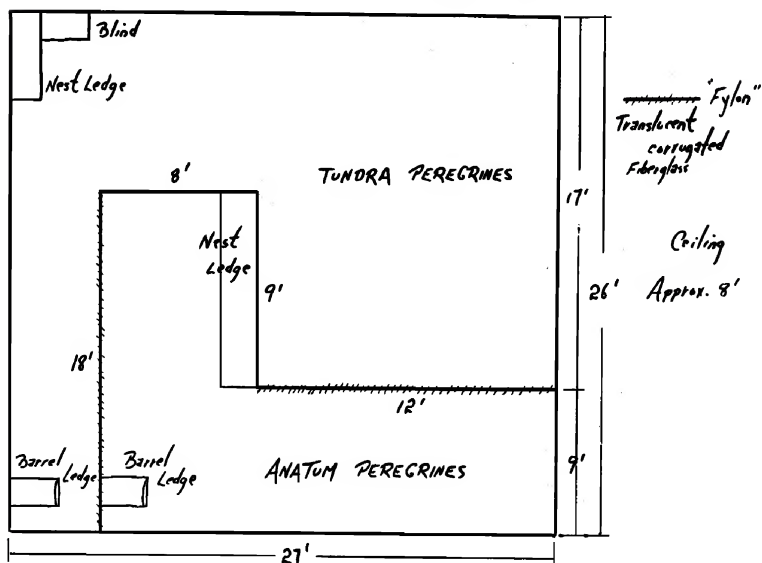
27. No.

28-32. -



B.P.I.E. No. 39. Peregrine Falcon.

1. a. Canadian Wildlife Service (Richard Fyfe). b. 10015 3rd Ave., Edmonton, Alberta, Canada. c. Not confidential.
2. a. November 15, 1971. b. Spring and summer 1971. c. None.
3. a. *Falco peregrinus*. b. *tundrius*.
4. Male "Benjy" two years old; female "Attee" seven years old.
5. Male taken as an egg in July 1969 from Frobisher Bay, Baffin Island, North West Territories; female taken as 3-4 week old eyas from Coates Island, North West Territories 1963.
6. Male latitude 634 x longitude 682; female latitude 625 x longitude 815.
7. Male raised from egg and flown daily for several months; female also flown free.
8. See sketch. Pair housed in a room on ground floor of barn.
9. Artificial light not used.
10. Interior of room was painted with white non-toxic paint.
11. Two nesting ledges were provided—ledge type 2'x3' in northwest corner, barrel type 20"x30"x16" in southwest corner both contained approximately 2" of clean dry river gravel.
12. Pair introduced to pen in January 1971.
113. No signs of courtship or any other possible breeding behavior were ever observed between this pair.
14. In late June and July the female was seen lying down on a hay bale but



no eggs resulted. The male was not involved.

15. Freshly killed coturnix quail, thawed pheasant and rodents made up the food. During cold weather they were fed twice daily. No dietary supplements were used. Excess food was removed except during breeding season.

16. Not tried.

17. Not observed.

18. Not tried.

19. None.

20. See 14.

21-22. -

23. Molt of this pair started late but then was completed normally. Female seemed to exhibit territorial behavior towards humans.

B.P.I.E. No. 40. Peregrine Falcon.

1. a. Canadian Wildlife Service (Richard Fyfe). b. 10015 3rd Ave., Edmonton, Alberta, Canada. c. Not confidential.

2. a. November 15, 1971. b. Spring and summer 1971. c. None.

3. a. *Falco peregrinus*. b. *anatum*.

4. Male "Pach" one year old; female "Kappa" two years old.

5. Male taken as eyas in 1970 from Labrador; female taken as eyas in 1969 from Alberta.

6. Male —; female latitude 533 x longitude 1140.

7. Male handled to limited degree—not flown; female not flown.

8. See sketch on page 40. Pair housed in room on ground floor of barn.

9. Artificial light not used.

10. Interior of room painted white.

11. Two nesting ledges provided—platform ledge 2'x9' in north central part of room, barrel ledge 20"x30"x16" in south west corner. Both contained river gravel.

12. Male was introduced to female in March 1971.

13. Birds showed no hostility towards each other.

14. No nesting activity was observed.

15. Freshly killed coturnix quail, thawed pheasant, and rodents made up the food. During cold weather they were fed twice daily. No dietary supplements were used.

16. Not tried.

17. Not observed.

18. Not tried.

19. None.

20. None.

21-22. -

23. No results were expected of this pair since a mature male *anatum* Peregrine was not available at that time.

REPORT: FIRST CONFERENCE ON STATUS OF NORTH AMERICAN OSPREY

Proceedings of the recent North American Osprey Research Conference are now in preparation for expected distribution in late summer to interested subscribers as well as the 80 participants. The group met in mid-February at the College of William & Mary, Williamsburg, Virginia, where Dr. Mitchell A. Byrd, head of the Biology Department, presided as host and resident chairman.

Serving with Dr. Byrd on the committee for organization of the conference were John C. Ogden, Research Biologist currently engaged in studies of Ospreys and Bald Eagles at Everglades National Park, Florida; and Robert S. Kennedy, a candidate for a doctorate at Louisiana State, who last year earned his M.A. under Dr. Byrd's tutelage in work involving Osprey reproduction in nearby Chesapeake Bay. His technique of inducing second clutches in Ospreys by removal of the eggs immediately after completion of the first clutch proved successful.

Besides papers by Mr. Ogden and Mr. Kennedy, twenty-four other dissertations were read. The speakers were concerned and active workers in Osprey survival studies and projects throughout the nation. Their ranks revealed a wide spectrum of backgrounds and occupations, reflecting governmental, scholastic, amateur and professional interest. The enthusiastic 3-day gathering was the first of its kind; a proposal is being considered for the scheduling of this meeting on an annual or biennial basis.

At the conclusion of the sessions the participants elected an American Osprey Committee from five general regions of the United States to publish the Proceedings; to implement the aims and activities of the group; to seek federal cooperation in promotion of direct and indirect protective measures for the species; and to stand to serve in an advisory capacity to the Bureau of Sport Fisheries and Wildlife with respect to future work on this species. It is expected that at a later date two representatives from Canada will be invited to serve, as well.

The National Committee is presently comprised of Dr. Byrd, from the Central East Coast region; Mr. Ogden from the Southeast; Gilbert and Josephine Fernandez of Dartmouth, Massachusetts, for the Northeast; Sergej Postupalsky, of Royal Oak, Michigan, for the Great Lakes region; and Dr. James Koplin, of Humboldt State College, Arcata, California, representing the West.

Dennis Puleston, Chairman of the Board of Trustees of the Environmental Defense Fund, recounted the shocking record of Osprey decimation in the Long Island area, especially on Gardiner's Island where, from a high of over 300 pairs in 1948, the population has dwindled to 34 pairs, with a concurrent drop of the reproduction rate from 2.2 average per nest to a .5 rate in 1971. Describing the lack of predation or human disturbance there, he ascribed the disaster to the effects of DDT and derivatives and to PCBs, now found at high levels in fish of the area. Now retired after 23 years as head of the Information Division of

Brookhaven National Laboratories, Mr. Puleston found among fellow conferees firm affirmation of his conclusion. They added an ominous suggestion that combining elements, now scarcely distinguishable because so new, may constitute additional contributory factors not yet realized.

Control techniques for increasing the number and success of viable Osprey eggs will be used in the East this season, where inroads on the breeding population have reached nearly disastrous proportions in Connecticut; and in Massachusetts last season it was documented that more than 50% of the breeding females in the main colony had to share the services of males because of a sudden decline in the male population.

Other reports and/or surveys revealed conditions in southern Maine, southern New Jersey, the Potomac River area, central and southern Chesapeake Bay, the Eastern Shore, Virginia, North Carolina, Michigan, Idaho, Oregon, California, Montana, and Wisconsin. In addition, two papers included studies of areas in Ontario, Canada.

An over-all survey of National Wildlife Refuges was described by J. C. Oberheu of the Bureau of Sport Fisheries and Wildlife; and Dr. Charles J. Henny read a comprehensive paper on "Wintering Areas of Ospreys from Various Areas of North America, Based on Band Recovery Data," which he co-authored with Ted Van Velzen and Brian Sharp, all three of whom are associated with the federal Wildlife Research Center at Laurel, Maryland. The paper sparked some interesting discussion questions and hypotheses.

A noteworthy and popular feature of the convention was the inclusion of open discussion sessions on directed topics. Mr. Ogden conducted the first of these, concerned with the regional and continental status of the Osprey. Paul Spitzer, of Old Lyme, Connecticut, a graduate student at Cornell University, presided for the evaluation of present and future techniques of Osprey research; and Stanley N. Weimeyer spearheaded the third discussion, concerning environmental contamination as it affects Osprey reproduction. Mr. Weimeyer is currently engaged in environmental studies at Patuxent Wildlife Research Center in Laurel. Summaries of these open discussions will be included in the published Proceedings.

One highlight on the conference was the report by Alexander Sprunt IV of the National Audubon Society and Tavernier, Florida. He described sightings of Ospreys and nest locations in eastern coastal regions of Mexico, the Yucatan, and Belize. Hitherto virtually unknown, these may comprise a resident race comparable to the birds of South Florida.

Individuals or institutions wishing to receive a copy of the paperbound, published *Proceedings of the First North American Osprey Research Conference* may do so by writing to Dr. Mitchell A. Byrd, Department of Biology, College of William & Mary, Williamsburg, Virginia 23185. Sale price is expected to be no more than \$2.00. Requests for copies need not be accompanied by prepayment; a bill will be sent at the time the order is filled. *G. F. Fernandez, P. O. Box 53, Dartmouth, Massachusetts 02714.*

BOOK REVIEW

Harkness, R., and C. Murdoch. 1971. *Birds of Prey in the Field*. London: H. F. & G. Witherby, Ltd. 208 pp. 8½"x5½". 243 sketches and 60 photos. Price: 2.25 English pounds.

This is a field guide to the diurnal birds of prey of Europe which has almost no use in North America and little scientific merit in general. *Birds of Prey in the Field* presents useful field observation techniques for the least experienced amateur bird watcher, but it is based on the incorrect premise that the greater one's experience at identifying raptors, the more he appreciates the problems. To the contrary, the problems disappear with experience and one wonders what the difficulty was originally.

Harkness and Murdoch spend a great deal of time actually telling the reader what the book is *not*. The illustrations are *not* accurate portraits of the species; no artistic merit is claimed. The drawings are *not* to scale, because the authors stress shape, pattern and flight attitudes. The authors do *not* attempt to describe plumages in detail, their objective being to emphasize only field characters. The book does *not* include range maps because, for one thing, "The status of many raptors is changing so fast that unless one has up to the minute local information from *all* range extremities for *all* species, there is a serious possibility of the maps being misleading" (p. 57).

On the whole, these negative aspects shadow any usefulness the book might have. Overemphasis of field characters distorts the shapes, patterns and attitudes depicted to the point of their being unrealistic. The suggestion of extensive use of field notes and sketches is a good one, but most amateurs will not, and professionals need not, go into that detail. Perhaps the best part of the book is a three page essay on why birds of prey are difficult to identify, but even this should be obvious to most amateurs. *Richard R. Olendorf*.

NOTICE OF PUBLICATION

Glutz von Blotzheim, Urs N., Kurt M. Bauer, Einhard Bezzel. 1971. *Handbuch der Vogel Mitteleuropas. Band 4. Falconiformes*. Frankfurt am Main: Akademische Verlagsgesellschaft. 943 pp. 9¼"x6½". 128 pen-and-ink sketches, 3 color plates, 23 tables. Price: about \$44 U. S. funds.

This enormous work is entirely in German and is complete with keys and detailed species accounts of the diurnal birds of prey of Europe. A bibliography is included at the end of each species account. The sketches are excellent and show behavioral attitudes, underwing patterns, flight postures and certain morphological characteristics. Anyone who reads German and has access to a copy is invited to review this major contribution to the ornithological literature for *Raptor Research*. *Richard R. Olendorf*.

NOTES, NEWS, AND QUERIES

Editorial Notes. A policy on recording dates of receipt of papers and of publication has been established. Each paper on publication will bear the date of its receipt by one of the Editors. Each issue will report on the publication date of the preceding issue. We will attempt to keep the period of time from submission until publication to a minimum. Some of the papers in this and the next issue were a backlog of papers received before the new format was planned so the average publication interval should be shortened. Publication dates of the 1971 volume of *Raptor Research News* were: 5(1) April 7, 1971; 5(2) August 9, 1971; 5(3) January 3, 1972; 5(4) April 7, 1972; 5(5-6) June 24, 1972.

NOTICE. Conference on Raptor Conservation Techniques. The Raptor Research Foundation in cooperation with the Department of Fishery and Wildlife Biology, Colorado State University, is sponsoring a symposium on the status of wild populations and on captivity breeding of birds of prey, to be held at Fort Collins, Colorado, 18-21 March 1973. Papers on the following topics are invited: Population inventories, Productivity studies, Investigations of the effects of biocides and industrial wastes (PCB's) on raptor populations, Population management and conservation, and Captivity breeding of raptors by individuals, academic institutions and zoological gardens. The scope of the conference is worldwide and contributions from abroad are expected. Anyone wishing to present a paper or to attend should contact Dr. Richard R. Olendorff, 3317 Olympus Drive, Bremerton, Washington 98310 U.S.A., or Dr. Byron E. Harrell, Raptor Research Foundation, Inc., c/o Biology Department, University of South Dakota, Vermillion, South Dakota 57069 U.S.A. The deadline for submitting abstracts is October 15, 1972.

C.B.S. Airs Raptor Conservation Film on "Animal World." A very informative and well-produced half-hour television program about birds of prey was aired February 20, 1972, on "Animal World," a semi-popular C.B.S. network series. The three-part program was filmed on location in Alaska and at the Cornell Laboratory of Ornithology.

The first part dealt with the Seward Peninsula Gyrfalcon and Rough-legged Hawk work of David G. Roseneau and Wayman "Skip" Walker, both students of Dr. L. G. Swartz of the University of Alaska Department of Biology. Field biology and the significance of the studies were emphasized.


The second part was about Goshawk studies undertaken by the Alaska Department of Fish and Game in southeast Alaska. Scenes depicted locating Goshawk nests from light aircraft by Jerry McGowan, a biologist with the Alaska

Department of Fish and Game, and banding young Goshawks by McGowan and Terry Bendock, an assistant from Seattle, Washington.

The last seven or eight minute segment opened with the 1971 Colville River trip of James D. Weaver, Stanley A. Temple and Paul Spitzer of the Cornell Laboratory of Ornithology. The footage was excellent and showed the research in progress, including the finding of thin-shelled Peregrine eggs and young Peregrines dead in an eyrie. A statement by Temple brought the conservation message to the audience quite well.

The program ended with discussions of eggshell thinning with Dr. David Peakall and a prognosis for the future of the Peregrine by Dr. Tom Cade, Research Director of the Cornell Laboratory of Ornithology. Cade's statements centered around the possibilities of captivity breeding.

The staff of C.B.S. and all of the researchers involved deserve a great deal of commendation for the excellent film they prepared. We must get our message to the public in this or similar ways if we expect any action to be taken with regard to protecting the birds of prey. The "Animal World" program reaches a major segment of the American public.



Predator Control and Related Problems. The Senate Subcommittee on Agriculture, Environmental, and Consumer Protection of the Committee on Appropriations held four days of hearings in 1971 on the killing of Golden and Bald Eagles in Wyoming last summer. The proceedings of these hearings are available free of charge from the United States Government Printing Office through Senator Gale W. McGee of Wyoming, the Chairman of the Subcommittee. Simply request them from Senator Gale W. McGee, United States Senate, Committee on Appropriations, Washington, D. C. 20510.

It would be difficult even to summarize the contents of this 218-page document. The following is a listing of some of the more pertinent testimonies. I emphasize that nearly the whole document concerns eagle problems.

The first two days of the hearings, June 2nd and 3rd, 1971, involved the deaths of eagles from thallium sulfate poisoning. Included in the testimony of June 2nd is an evaluation of the legal status of interstate shipment of certain poisons and a discussion of pending legislation concerning governmental control of pesticide marketing. These matters were handled by William D. Ruckelshaus, Administrator, Environmental Protection Agency. A team from the Department of Interior headed by Nathaniel P. Reed, Assistant Secretary of the Interior for Fish and Wildlife and Parks, testified about the actual killings in Wyoming. Included are discussions of thallium sulfate and 1080 as predator control poisons, autopsy reports of the eagle carcass analyses, and the status of federal laws concerning eagles. Dr. Charles Loveless made statements concerning the ranges of Bald and Golden Eagles; population estimates and migratory habits were also discussed. Charles H. Lawrence, Chief, Division of Management and Enforcement, told of the federal investigations being carried out at that time in Wyoming. The incredible testimony regarding the misuse of thallium

makes interesting, but sad, reading.

The afternoon of June 2nd included an analysis of sheep losses to predators by Francis J. Mulhern, Associate Administrator, Agricultural Research Service. Tables show that 15,000 lambs and 200 sheep were killed by eagles in Wyoming in 1969 and 1970 according to the sheep ranchers reports to the Cooperative Crop and Livestock Reporting Service and the Department of Agriculture. Several people from various protectionist groups also testified that afternoon. Mrs. Barbara Dobas of the Murie Audubon Society of Casper, Wyoming, gave a statement on the status of eagles in Wyoming. Alexander Sprunt, IV, Director, Research Department of the National Audubon Society, testified concerning studies of eagle-sheep relationships in Texas and presented a prepared statement of position from the National Audubon Society. Similar testimony from a number of other sources continued on June 3rd, 1971.

The second part of the hearings was held on August 2nd and 3rd, 1971. They involve the shooting of nearly 800 eagles from aircraft in Wyoming. The whole two days were taken up primarily by the testimony of James O. Vogan who was employed as a helicopter pilot to fly gunners on eagle and coyote killing forays. The testimony is very descriptive and even includes photostats of Mr. Vogan's tally sheets of eagles and coyotes killed and money paid by ranchers as bounties.

I would very much encourage those interested in this matter to request a copy of the document. It is a storehouse of information and a monument to the inequities existing in the current laws and management practices relating to predators. By obtaining a copy and commending Senator McGee for his work on this issue, you can let Senator McGee know your position (briefly) and get a lot of valuable information in the process.

Raptor Banders—Organize! Anyone interested in information about an organization for raptor banders please call or drop a card to the following organizers: William S. Clark, 7800 Dasset Court, Apartment 101, Annandale, Virginia 22003 (Ph. 703-941-5324) or Robert Wilson, Clover Lane, Randolph Township, New Jersey 07081 (Ph. 291-895-2259).

A questionnaire will be sent to you by return mail.

We want to know what raptor banders want from such an organization before we proceed. Possibilities at present are to set up a separate organization, establish a raptor banding organization under Raptor Research Foundation, or the combined regional banding journals (if they combine), or to drop the idea completely if no one is interested.

The purpose of such an organization would be the interchange of information on raptor trapping techniques, results, and studies. Also a raptor banding ethic will be established through editorials and article content. *William S. Clark.*

[Editorial Note: The Banding Committee of Raptor Research Foundation under its first Chairperson, Dr. Frances Hamerstrom, prepared a number of reports including an important one in the U. S. Bird Banding Laboratory *Memo*

to *All Banders* (MTAB 14; also see RRN 5(3):79-80, 1970). We hope that the Committee might be considered as the mechanism for such cooperative efforts. —B.E.H.]

Bird Treaties Signed with Japan, Mexico. The U. S. Government recently signed a bilateral agreement in Tokyo to protect 189 species of birds that fly between the Japan and the U. S., mainly from Alaska. The treaty, which provides preservation of migratory habitats and sets a ban on the import and export of birds that are considered endangered, is hoped to curtail some of the alarming decline in Japanese migratory birds.

While 76 percent of the 424 species of Japanese birds are migratory, a recent survey by the Japanese Government's environmental agency reported that the migratory bird population was down significantly. For instance, the survey reported that only 5,000 wild geese had been sighted in 1971, a tenth of the number recorded in 1953. The survey also pointed out that heavy industrial encroachment in Japan had reduced the number of traditional wintering places for the birds from 149 to 27.

Among the species that fly between the two countries and are endangered are the Short-tailed Albatross, the Peregrine Falcon, and the Aleutian Canada Goose.

In ceremonies held in Mexico City on March 10, the U. S. and Mexico formally ratified amendments to the 1936 Migratory Bird Convention which extends extra protection especially from wanton shooting, to 32 new families of birds.

Included are the six families that contain all the birds of prey. Also, the amendments now give the U. S. government authority to arrest persons caught taking any of the following endangered species: American and Arctic Peregrine Falcon, Brown Pelican, California Least Tern, California Condor, Hawaiian Crow, Hawaiian Dark-rumped Petrel, and Florida Everglade Kite.

The amendments increase from 31 to 63 the families of birds protected under the treaty with Mexico. Among the new families added, 11 were already protected in the U. S. under the 1916 Migratory Bird Treaty with England, acting for Canada. Also, some of the species were protected already under individual state laws.

Assistant Secretary of the Interior Nathaniel Reed emphasized that "the amendments will, in effect, provide for much needed uniform protection all across North America, including Mexico." He pointed out, however, that some species, such as crows, magpies, and horned owls, may require population control under certain nuisance. The treaty also provides for the use of certain raptors in the sport of falconry. (From *Conservation News* 37(9):13, 1972.)

RAPTOR RESEARCH FOUNDATION, INC.

in care of Biology Department
University of South Dakota
Vermillion, South Dakota 57069
U.S.A.

The **RAPTOR RESEARCH FOUNDATION, INC.** is a non-profit corporation whose purpose is to stimulate, coordinate, direct, and conduct research in the biology and management of birds of prey, and to promote a better public understanding and appreciation of the value of these birds.

Publication has been a major area of activity. From 1967 to 1971 *Raptor Research News* was published; in 1972 publication was continued under a new name, *Raptor Research*. A series of occasional longer publications was started in 1971, *Raptor Research Report*. *Raptor Research Abstracts*, initiated in 1972, is a quarterly bibliographic service.

The Raptor Research Foundation has had a number of informal meetings and in 1971 sponsored the first of its conferences on specific topics on raptors. This one was entitled "Special Conference on Captivity Breeding of Raptors," and another planned for 1973 is entitled "Conference on Raptor Conservation Techniques."

The interests of the Foundation are indicated by the titles of its committees: Editorial, Captivity Breeding, Population, Banding, Bio-telemetry, Pathology, Pesticide, Ecology and Ethology, Systematics, Education and Conservation, Bibliography, International Coordination, and Finance and Investment.

MEMBERSHIP

Membership in the Raptor Research Foundation is open to all who contribute. *Raptor Research* is sent to all who contribute a minimum of \$3.00 per year; those who wish to receive both *Raptor Research* and *Raptor Research Abstracts* must contribute a minimum of \$5.00. These minimal rates have been established to encourage all who are interested to join. Other activities are financed by the generosity of members who contribute more than the minimum. Such contributions are encouraged.

PUBLICATIONS

All previous publications are still available.

Raptor Research News each issue 50 cents.

1967-1969, Vols. 1-3, 4 issues each; Analytical Index, Vols. 1-3— 50 cents.

1970-1971, Vols. 4-5, 6 issues each; Vol. 5, issues 5-6 combined, \$1.00.

Raptor Research Report No. 1, Richard R. Olendorff, "Falconiform Reproduction; A Review. Part 1. The Pre-nesting Period." February 1971, 111 pp., 6" x 9", \$2.50 (\$2.00 to members).

Additional copies of current issues of *Raptor Research* are \$1 each. For price of additional copies of the Supplements, apply to Raptor Research Foundation.