

# RAPTOR RESEARCH NEWS

Volume 5

Number 1

January-February 1971

Editors: Byron E. Harrell,  
Donald V. Hunter, Jr.

Raptor Research Foundation, Inc.  
c/o Biology Department  
University of South Dakota  
Vermillion, South Dakota 57069 U.S.A.



NOTES, NEWS, AND QUERIES .....	2
Raptor Research News .....	2
Raptor Research Abstracts .....	2
Raptor Research Report No. 1 .....	2
Owl Call Tape Recording Wanted .....	2
Raptor News from Finland .....	3
Two Important Publications on Captivity	
Breeding of Birds of Prey .....	3
Bird protection in USSR .....	4
Poachers Punished .....	4
U. S. Strikes Blow for the Condor .....	4
Birds Protected in Texas .....	4
For Our British Readers .....	4
DDT Wiping out Maine Eagles .....	4
PCB's .....	5
California Condor .....	6
BLM Wants to Save Idaho Raptor Stronghold .....	7
DDT Residues Reduced by Drug for Epilepsy .....	8
Great Eagle Owls .....	9
BREEDING PROJECT INFORMATION EXCHANGE	
(17, 26) .....	11
PEREGRINE FALCON POPULATION SURVEY, ASSATEAGUE ISLAND, MARYLAND, FALL, 1969 (Robert B. Berry) .....	31
AN ACCOUNT OF PRAIRIE FALCONS BRED IN CAPTIVITY-1970 (James H. Enderson) .....	44

## NOTES, NEWS, AND QUERIES

**Raptor Research News.** Although this issue is behind schedule, the material for the March-April issue is in hand, and we should be able to get it out within the second of those two months. We hope our readers will send us notes of things going on of interest. Harrell has returned from four months in Europe and wishes to thank Lee Eberly for his aid in getting the *News* out in his absence. We hope to have his position filled in the near future and hope you will bear with us until we get more help. Our index plans have changed, but we plan to send out with the next issue a cumulative index for volumes 1-3 and an annual index for volume 4. We have made wider margins this year to make binding easier.

**Raptor Research Abstracts.** We are gradually accumulating material for the first issue and contacting volunteers with their assignments. Those who have indicated an interest will hear from us by the time you receive this or shortly thereafter. We plan to have this first issue in the mail about the same time as the next issue of the *News*.

**Raptor Research Report No. 1.** Those who have ordered this paper should have received it before this issue of the *News*. This 111 page report, "Falconiform Reproduction: A Review. Part 1. The Pre-nestling Period" by Richard R. Olendorff is available for \$2.00 for members, \$2.50 for others.

**Owl Call Tape Recordings Wanted.** In the Department of Systematic Zoology and Zoogeography a special research is being made on the systematics, the distribution and the ecology (including audiophysiology and sound spectrography) of owls. Hence, a collection of tape recordings of owl calls from all over the world is being built up for comparative purposes. But though we have met with great sympathy and considerable help from various private persons and institutions in Europe and overseas, recordings of owl calls (primarily territorial song and contact calls) of a large number of species are still lacking. Of other species, with a large distribution, we are still in need of more

recordings than we already have because of geographical variation in voice, which is an object of our studies too.

We therefore would like to kindly request anyone interested in helping us to complete in as much as possible a varied collection of owl calls from all over the world.

The following list gives some geographical regions, with the corresponding owl genera of which (more) recordings are still needed. **South and Central America:** *Speotyto*, *Ciccaba*, *Strix*, *Glaucidium*, *Otus*, *Lophostrix*, *Bubo*, *Pulsatrix*, *Asio*, *Pseudoscops*, *Aegolius*, *Gymnoglaux*. **North America:** *Strix*, *Otus*, *Nyctea*, *Aegolius*, *Surnia*. **Africa:** *Phodilus*, *Otus*, *Jubula*, *Scotopelia*, *Asio*, *Glaucidium*, *Athene*, *Ciccaba*, *Bubo*. **Asia South:** *Glaucidium*, *Ninox*, *Athene*, *Bubo*, *Ketupa*, *Otus*, *Strix*, *Phodilus*. **Asia North:** *Glaucidium*, *Athene*, *Asio*, *Nyctea*, *Surnia*, *Otus*, *Strix*. **Australasian region:** *Otus*, *Ninox*.

The under-signed persons, who are more particularly doing this research will appreciate any help and cooperation and will, as a matter of fact, give full acknowledgement to all authors of recordings. Dr. Tjalling van Dijk and Dr. Wouter van der Weijden, Biological Laboratory, Free University, De Boelelaan 1087, Amsterdam Buitenveldert, Netherlands.

**Raptor News from Finland.** Although no data have been systematically collected, Dr. Tuevo Suominen writes that it seems likely that about 10 pairs of Peregrines have been breeding since 1966, frequently successfully. White-tailed Sea Eagles continue to decline in numbers. Accipiters and Ospreys seem to be doing well.

**Two Important Publications on Captivity Breeding of Birds of Prey.** The *International Zoo Yearbook* Volume 10 (1970) contains a special 37 page section on "Birds of Prey in Captivity." The volume is published by the Zoological Society of London (Regent's Park, London, NW 1) for 135s + 3/6 postage in UK and Eire or \$21 incl. postage Overseas.

*Captive Breeding of Diurnal Birds of Prey* Volume 1 Number 1 (1970) released by The British Falconers' Club and The Hawking Club of Great Britain has 22 pages of reports. Abstracts of the papers in these two publications will appear in the March-April issue of *Raptor Research News*. We hope to have an address and price for the second publication at that time also.

**Bird Protection in USSR.** The killing of birds of prey is now prohibited in Lithuania. In 1970 spring shooting was forbidden throughout the Russian Federation, and June was the traditional "month of silence" in the forests of the Ukraine. [From *Kingfisher* 5(5):6, May-June 1970]

**Poachers Punished.** Three well known German poachers of bird of prey nests, who have already helped to exterminate the lammergeier in Italy, have been sentenced in absentia to six months' imprisonment and a fine of 165,000 lire by a judge at Gaeta, Italy, for trying to rob a peregrine's nest there last year. A second group of poachers are shortly to be tried at Lauria. (Information: Italian National Appeal, WWF). [From *Kingfisher* 5(5):6-7, May-June 1970]

**U. S. Strikes Blow for the Condor.** The Interior Department has recommended the shelving of a project that would have inundated 1,300 acres of the Los Padres National Forest, last surviving haunt of the very rare California condor, of which only 40-50 remain. The Ventura County authorities, promoters of the scheme, however, apparently remain unconvinced. One supervisor has suggested shooting the rest of the condors to clear the way for the dam complex. (*Audubon Leader* February). [From *Kingfisher* 5(5):7, May-June 1970]

**Birds Protected in Texas.** Texas has recently passed a law to protect 11 more birds: buzzards or vultures, roadrunners, several hawks, jays, sapsuckers, woodpeckers, shrikes and great horned owls. (*Audubon Leader*, April). [From *Kingfisher* 5(5):12, May-June 1970]

**For Our British Readers: Specimens Wanted.** Dead peregrines, sparrowhawks, kestrels, barn owls, herons, great crested grebes and kingfishers, for chemical analysis, to the Nature Conservancy, Monks Woods Experimental Station, Abbots Ripton, Huntingdon. Postage refunded. [From *Kingfisher* 5(5):12, May-June 1970]

**DDT Wiping Out Maine Eagles.** A National Audubon Society study has revealed the bald eagle appears to be headed for oblivion in the State of Maine.

In a recent aerial survey U. S. Game Management Agent William Snow and Audubon biologists Frank Ligas and Eugene Knoder found only 11 young eagles in 30 nests. Three nests contained twins, five a single eaglet each and 22 none, although the adult birds were still attending the nests in a futile attempt at reproduction. "At this rate," said Ligas, "it would take 100 pairs of Maine eagles to produce 35 young. In Florida, the same number of pairs would fledge about 70 offspring, while Wisconsin birds would average 98. Alaska leads the nation in eagle production with an average of 104 young per 100 pairs."

"I know we didn't find every nest in Maine," said Ligas, "but I seriously doubt that there are more than 50 nests remaining in the state. We may be seeing at least two thirds of them. We'd appreciate learning the location of any additional nests anywhere in the state." According to Knoder, unhatched eggs from Maine contain about 23 parts per million of DDT, while eggs from Florida show about 11, Wisconsin 5, and Alaska 2. "You notice" said Knoder, "The highest concentrations of pesticides occur in states with the poorest production of eagles. We have comparable information from various states going back to 1960, and the pattern is becoming very clear."

"It is more than coincidence," observed Ligas, "that two of Maine's most polluted rivers, the Kennebec and Androscoggin, flow into Merrymeeting Bay, and the eagles in that area lay eggs every year but have not hatched a single one since 1963."

In addition to DDT and dieldrin, whose effects on wildlife are well established, polychlorinated biphenyls (PCB's), sold under the trade name of "Aroclor," were more recently recognized as a widespread hazard. North of Maine, in New Brunswick, a Canadian Wildlife Service biologist, Peter Pearce, reports lethal or near-lethal levels of mercury in the eggs of red-breasted mergansers, cormorants, great blue herons and common terns. [From *Conservation News* 35(16):7, August 15, 1970]

PCB's. The Monsanto Company, the only U. S. producer of a group of environmentally persistent chemicals—polychlorinated biphenyls—has announced it is restricting their production and tightening controls over their handling and disposal.

The PCB's have been in use for over 40 years and have been showing up recently with alarming regularity in tests

run on wildlife. In these tests PCB's were confused for some time with DDT which they resemble in chemical structure.

As a result of the public outcry over the wide use of this persistent and possibly toxic chemical, Monsanto says it has stopped all use of the PCB's in what it calls "open systems." They include adhesives, sealants, chlorinated rubber, specialty paints and other like items.

Henceforth, Monsanto says it will use PCB's principally in "closed-systems" such as electrical transformers and capacitors. In addition the company has built a high-temperature incinerator to break down old PCB materials into harmless materials. Monsanto says it will offer its customers the use of the incinerator if they have no other means of disposing of PCB's safely. [From *Conservation News* 35(18):6, September 15, 1970]

**California Condor.** The California condor is not what you'd call a pretty bird. Its orange-colored head and part of its neck are bald. It is, in fact, an oversized relative of the turkey vulture and like turkey vultures everywhere, stuffs itself with carrion.

Its tendency to gorge itself on carcasses of livestock and deer leads to problems. Often an adult bird—weighing twenty to twenty-five pounds with a wingspread of nine feet or more—is unable to get airborne until a strong friendly wind blows along to give it a push. But once in the air its appearance on the ground is forgotten. Soaring on the thermal air currents high over the Sierra Nevadas the California condor is not so much orangey and bald as it is breathtaking and memorable. Should you be fortunate enough to see one, the fact that the U. S. Fish and Wildlife Service estimates there are not more than 60 to 85 California condors left may cause you to stare for a long time.

Part of the California condor's problem is its extreme sensitivity to noise. The slightest amount may drive the big bird permanently from its nest. The California condor's range once extended from Oregon's Columbia River south to northern Baja California, and eastward to southwest Utah and Arizona. But today it is found only in California's southern coast ranges from Monterey County south to the Transverse Mountains, and north in the Sierra Nevada foothills to Fresno County. Further complicating the California condor's plight is a lack of enthusiasm for reproducing itself. Normally, a condor pair raises only one young bird every other year. It develops slowly—flying finally

when it is about one year old—and remains with its parents for a total of three years.

Today about seventy-five percent of the bird's nesting sites are limited to the Sespe Condor Sanctuary which was officially designated a condor haunt in 1965. An annual condor survey was begun in October of the same year in coordination with a Condor Survey Committee representing the California Department of Fish and Game, the U. S. Forest Service, the Bureau of Sport Fisheries and Wildlife, the University of California, the National Audubon Society, and other condor-concerned conservation groups.

This year's survey, conducted October 21 and 22, confirmed why North America's largest land bird is high on the Interior Department's Endangered Species List. Though poor weather was cited as a factor in the sightings of only 28 individual birds, the fact that the big bird continues to be in big trouble is all too clear. Previous survey counts recorded 38 sightings in 1965, 51 in 1966, 46 in 1967, 52 in 1968, and 53 in 1969.

In March of 1970, Interior Secretary Walter J. Hickel reaffirmed condor privacy by halting all further oil and gas leasing in the Sespe Sanctuary. California penalties for shooting condor include up to a year in jail, a \$1,000 fine, or both. [From *Conservation News* 35(21):11-12, November 15, 1970]

**BLM Wants to Save Idaho Raptor Stronghold.** The Interior Department's Bureau of Land Management wants to establish a 26,000-acre Snake River Birds of Prey Natural Area along a thirty-mile stretch of the Snake River in Idaho. The area is all publicly owned, and now shelters the largest concentration of golden eagles and prairie falcons in the United States.

In order to protect the area, BLM proposed to "withdraw" the land from the omnipresent threat of mining under the carte blanche provisions of the archaic 1872 mining laws. The move is backed by conservationists who have watched pesticide-plagued raptor populations—eagles, hawks, falcons, and owls—dwindle along with their habitat. Approximately 24 pair of golden eagles and 49 pair of prairie falcons nest in the proposed Natural Area which was featured in Walt Disney's "Ida the Off Beat Eagle" and Wild Kingdom's "The Valley of the Eagles."

Resource development now threatens the raptor stronghold and BLM studies indicate that if current plans are

not challenged, the prairie falcon's habitat will be eliminated along with a portion of the golden eagle's feeding areas. The prairie falcons feed on rodents and small birds within the river canyon and nearby plateau lands; the eagles look for blacktailed jackrabbits and cottontails north and south of the Snake. The resource potential at stake is not overwhelming. Though good grade sand and gravel deposits may lie along the river, their inaccessibility makes development a bad economic bet. Recovery of small gold deposits along Snake River bars is not thought worthwhile, and present records don't indicate substantial oil or gas deposits. According to the BLM, "Withdrawal of the land from location and entry under the mining laws, and from leasing under the mineral leasing laws, would have no serious effect on the local economy."

The withdrawal proposal is in fact backed by the Bureau of Reclamation, the Bureau of Sport Fisheries and Wildlife, the Idaho Wildlife Federation, the Idaho Environmental Council, and Idaho Governor Cecil Andrus. But the endangered raptor populations of the Snake River canyon country aren't home free yet. BLM officials have reported "widespread interest" from many comments both for and against the proposed withdrawal. So the big birds' future will be tossed about during February 26, 1971, hearings in Boise, Idaho. Though statements should be filed by February 24 with the State Director, Bureau of Land Management, Room 334 Federal Building, 550 W. Fort Street, Boise, Idaho 83702, don't hesitate to mail your letter because you can't meet the deadline. It's your land, and the Utah State Director, as well as the BLM Director in Washington, wants to know what you think. Send Washington letters to Boyd L. Rasmussen, Director, Bureau of Land Management, Department of the Interior, Washington, D.C. 20240 [From *Conservation News* 36(6):13-14, February 25, 1971] [The Raptor Research Foundation sent a supporting letter.]

**DDT Residues Reduced by Drug for Epilepsy.** A medical researcher at the University of Miami, Dr. John Davies, says a drug commonly used in treating epilepsy can significantly reduce the residues of DDT and other organic pesticides in animals and humans.

Dr. Davies is presenting a paper on the subject at the American Chemical Society's Northeast regional meeting.

In an interview Sunday, he said the drug--phenytoin--could be used to reduce residues of DDT in cattle when the concentration exceeds U.S. Department of Agriculture

tolerances.

He said the discovery resulted from an attempt to find a link between mental retardation and high DDT residues in humans.

Dr. Davies said that in testing samples of blood and fat tissues from mental patients in the Miami area, his researchers found that DDT residues in some patients were drastically lower than those of the general population. [From *Vancouver Sun*, October 10, 1970; clipping provided by Steve Hennessey]

**Great Eagle Owls.** This species, *Bubo bubo*, is of the Old World, inhabiting the forests of Europe, North Africa and Southern Asia and occasionally the semi-deserts where rodents and smaller mammals provide staple fare wherever they are abundant. *Bubo bubo* will grow to about 27 inches.

While some European zoos have had success in breeding them, we are unable to learn of any births in North America. This zoo then becomes unique in this area as the colour photo on the back cover testifies.

Each year for the past three years, our female has laid eggs but none have hatched. On February 18th, 1970, she was observed seeking a suitable nesting site. Although a platform covered by a weather awning was offered, as in the past she rejected it and dug a 6-inch in depth hole in the ground at the rear of the cage where she settled. The keeper, Ralph Legge, then built a dyck around the nesting site to keep out the snow and placed a wooden box over her with one side open to protect her from the elements.

She also rejected all material left near her and instead pulled feathers from herself with which to line her nest.

Eggs were noted and, as the period of incubation is 34 to 36 days, March 29 was circled on the zoo's "stork" calendar. But to no avail! On April 14 the four eggs had to be removed and were found to be rotten.

But strangely enough, on June 21 she again was observed seeking a nesting site and she set to work digging a new hole. This is quite unusual for two nests to be dug in one year. Shortly, two eggs were observed.

On July 20, much to the keepers' surprise, the owl was seen feeding one chick, just a ball of white fluff with a black beak. Ten days later, a second chick was seen, being similarly treated, of course. The diet consisted of mice and chicks; the mother would feed pieces which she had torn up directly to the chicks.

While concern was felt that the earlier chick would get most of the food and the younger one would fail, our fears were proved groundless.

Also, it is noteworthy that the male, who usually kept watch up on his perch, would, on call, fly down to pick up food and take it to the mother owl.

Both chicks are now walking well. They are about one-third the size of the mother as at August 24th and are starting to show adult plumage. [From *Dinny's Digest* 1(5):14, September 1970; this item from the quarterly publication of the Calgary Zoological Society, St. George's Island, Calgary 21, Alberta, Canada, was provided by W. E. McKay, Director, Calgary Zoo.]

## BREEDING PROJECT INFORMATION EXCHANGE

The following questionnaire was sent to cooperators; B.P.I.E. 17-26 are the reports returned to the RRF Breeding Committee and represent the status approximately at the end of 1970.

### QUESTIONNAIRE

This data will be used to help the RRF and the NAFA Breeding Committees formulate procedures which are most likely to produce results in breeding captive raptors. As chairman of both these committees, I feel that so-called backyard projects, whether supported or unsupported, have sufficient merit to be counted strongly in the picture, but only if the experimentors are serious in cooperating and coordinating their efforts toward a common goal. Without this cooperation, a good case can be made for a large, exclusively governmental project. We greatly need your 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 in *RRF News*.

Please check: signature

Confidential

Not confidential, but not for publication in RRN

May be used in RRN

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. What you have done may be of real importance in helping solve the problems connected with captive breeding of raptors.

Sincerely,  
Donald V. Hunter

1. Species

Male

Female

2. Age

3. Origin:

a. Eyess

- b. Passage
  - c. Haggard
  - d. Unknown
4. Eyrie:
    - a. Latitude of origin to nearest degree
    - b. If not known, area of origin (e.g. Arctic, etc.)
    - c. Latitude trapped (date, too)
  5. Handling:
    - a. Hatched?
    - b. Manned?
    - c. Flown Free?
    - d. Flown at Game?
    - e. Disposition?
    - f. Imprinted?
  6. Sketch the facility in which the birds were kept, giving approximate dimensions, size of windows, and direction of exposure of such windows. Also a brief description of materials and construction.
  7. Was artificial used? (Wattage, number of bulbs, duration of light period, etc.)
  8. Color and texture of interior - e.g. white, black, unpainted wood, beams exposed, etc.
  9. Describe provisions made for nest.
  10. Describe how birds were introduced to facility and to each other.
  11. If not put in aviary together, which bird was first and by how long. Please give dates.
  12. Observations of behavior toward each other.
  13. Nest building?
    - a. Materials provided?
    - b. Did both birds build or 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)
  14. Food. Give a description of food provided, amount, when given, consumption and observations of behavior while eating. Excess or old food removed?
  15. 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.)

16. Eggs?  
Date for egg No. 1; No. 2; No. 3; No. 4; No. 5.
17. a. When did incubation start? Date  
b. Did both birds participate in incubation? Explain  
c. When did incubation cease? Date: Why?
18. Incubation temperatures: Did you take incubation temperatures? a. If so, what were they?  
b. Describe variations of air temperatures during incubation.  
c. Humidity?
19. Did you attempt artificial incubation?  
a. Describe incubator.  
b. Temperature?  
c. Humidity?  
d. Successful hatching? Describe, date in, date hatched, etc.
20. If you used a foster brooder, a. what kind?  
b. In what sort of nest?  
c. Successful hatching? Describe, as above.
21. If eggs did not hatch, a. were they fertile?  
b. If so, when did embryo die?  
c. Probable cause of death?
22. If parents did hatch eggs, a. dates for each  
b. Description of parental behavior.
23. If some eggs hatched and others did not, do you know which are which in respect to sequence laid? Explain.
24. Did you have unhatched eggs assayed or analyzed?  
Results.
25. Food. Describe food and feeding of young.
26. If death occurs to young, explain.
27. 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.
28. Final description of F<sub>1</sub> generation.
29. Any additional information that you think important.
30. Suggestions for improving questionnaire.

Note: It may be easier to prepare a narrative answering the questions in order. This would be very acceptable to us, but we would like you to answer the questions in the narrative in order but not necessarily referring to them in the text.

B.P.I.E. No. 17. Erich Awender, M.D. (1317 La Cresta Drive, Freeport, Illinois 61032) reports on Prairie Falcon breeding project and adds a few comments on a Peregrine

project.

1. Species: Prairie Falcon
2. Age: male—2, female—5.
3. Origin: male—captive bred F<sub>1</sub> eyass; female—eyass.
4. Eyrie: Latitude of origin to nearest degree: male—St. Louis, Missouri; female—42°.
5. Handling: manned; flown free; flown at game; disposition—average for both male and female; imprinted—no.
6. Facility: room 10x15', highest point of ceiling 11'; window 4'x5'—southern exposure; brick and redwood construction, concrete floor, inside wood paneling and exterior plywood.
7. Artificial light: 2 recessed 150 watt white light bulbs in ceiling, at 45° angle to each other. During breeding time, lights on all the time.
8. Interior: ceiling—light blue, sides—light green and light gray.
9. Provisions made for nest: corner nest, exposed ledge 4' wide, inside coarse sand, landing platform cocoa mat.
- 10, 11. How birds were introduced: tiercel put in first, was very familiar right away, because setup resembles his birthplace (Henry Kendalls') very much, male in early October, 1969, 2 weeks later female added.
12. Observations of behavior toward each other: very compatible right away, sleep together touching wings or breasts.
13. Nest building: female made scrape; a. Materials provided—coarse sand, nesting triangle 5' above ground; b,c. Scrape made only by female; d. Describe giving dates—scrape present since New Year 1970, male began moult 1-1-70.
14. Food: staple diet is fresh chicken necks with flamen oil; twice a week freshly killed, plucked and gutted pigeon; pheasant and rabbits in season or roadkills as available.
15. Was copulation observed? No, but female pushed herself under male many times, all during January 1970.
16. Date for eggs—No. 1, 1-16-70; No. 2, 1-18-70; No. 3, 1-21-70; No. 4, 1-23-70.
17. a. When did incubation start? 1-23-70, also begin of F moult; b. Did both birds participate in incubation; Only female; c. When did incubation cease; Feb. 1st (eggs removed—dummies).
18. Incubation temperatures: not checked; inside room 40-50°F.; Humidity—not checked, bath water open all the time.
19. Artificial incubation; Yes; a. incubator—commercial quail incubator; b. Temperature—around 100°F; c.

Humidity—75%; d. Successful hatching? No.

21. If eggs did not hatch, were they fertile? No.

24. Did you have unhatched eggs assayed or analyzed? Gross examination by Dave McKelvey: two eggshells normal thickness, two below normal.

29. Additional information: Jesses from both birds removed for good.

ADDENDA ON PEREGRINES: My second pair consists of a 1968 eyass Peale's tiercel and a 1963 passage Peregrine, looks like tundra falcon but is large; this pair made no nest and no eggs, the male acts broody, but the hen is very indifferent, sometimes chases him off his perch; they are a beautiful pair, I hope something will happen next time, they are perfectly moulted and ready for anything, but don't like each other like the Prairies do; I even had a second tiercel in with them, for jealousy, but no results, so I took him out last month; my third pair consists of the tiercel just mentioned, a three year old large intermewed passage tundra tiercel, and a two year old large intermewed passage tundra falcon; the falcon is pugnacious toward me, the male on the shy side.

B.P.I.E. No. 18. Robert B. Berry (Yellow Springs Road, Chester Springs, Pennsylvania 19425) reports on a Peregrine Falcon breeding project and adds a few comments on a Goshawk project.

1. Species: Peregrine Falcon (*tundrius*).

2. Age (Spring 1971): male-4, female-6.

3. Origin: b. Passage

4. Eyrie: c. Latitude trapped—Assateague Island, October.

5. Handling: b. Manned? male and female; c. Flown Free? female; d. Flown at Game? female; e. Disposition? male-nervous, female-tame (feeds readily from fist).

6. Facility: Open plastic wire enclosure 30x15x20 high—1 shelf 2x4 of sod with south and east exposure, frequented by birds in early a.m., shelf otherwise open to elements. Second shelf with south exposure against a building with overhang several feet above the ledge. Both shelves filled with sod. Virtually no activity this spring—some chattering by the female. Last fall, both birds very noisy, often facing one another with head down, tail elevated. Inspection of open air shelf disclosed a scrape of 1 to 1½ inches deep and 6 inches in diameter—don't know which bird responsible. Altered concept and placed birds in enclosed chamber 12x12x9 with open screened top in July of 1970. At sight of a strange Peregrine, both falcons were extremely territorial and aggressive, even with raptor at a distance. If I walk by their

pen with Peregrine or strange Gyr on my fist, female flies against the wire, male just screams. Feel even though they have apparently established territory that too much stress in open chamber. They are not aggressive towards me.

7. Artificial light: used 8 300 watt bulbs last spring, photoperiod increased in p.m. to allow up to 3 additional hours in March and April.

8. Interior: cedar posts, plastic coated IMCH wire mesh.

9. Provisions made for nest: sod-grass growing in shelves 2x4x4" high-plywood bottom with cedar sides (rounded tops).

10. How birds were introduced: no elaborate introduction, just placed in chamber.

11. If not put in aviary together: female preceded male by 1 year.

12. Observations of behavior toward each other: female first hostile towards male—during past 3 years, attitudes changed, male appears dominant, then female; they now display a casual dislike for one another, both cover with food when keen and never offer food to one another.

13. Nest building; single scrape fall 1969; a. Materials provided? sod; b. Did both birds build or make scrape? unknown.

14. Food: has varied from chicken heads and pigeon in 1967 to virtually all chicken and horse meat since 1968—prior breeding season in 1969 and 1970—mostly chicken (fresh cockrels 4-20 weeks of age) supplemented vionate and in 1970 vionate and vitamin E (wheat germ concentrate).

15. Was copulation observed? No

16. Eggs? None

30. Suggestions: excellent questionnaire

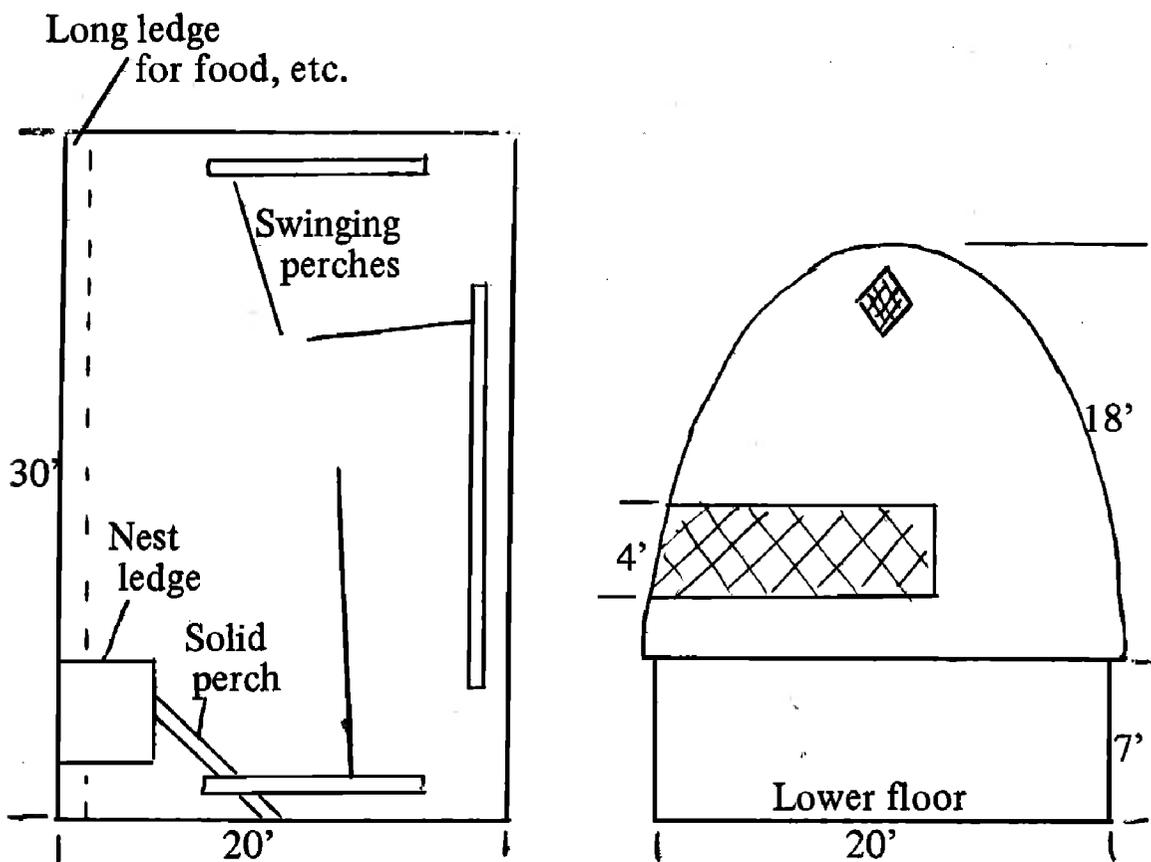
ADDENDA ON GOSHAWK: got four fertile eggs via artificial insemination. One embryo died age five, second age 12, she (hen gos) broke one egg, and fourth egg was  $\frac{1}{4}$  piped when chick mysteriously died. This chick along with a 12-day embryo were incubated by a bantam, others by gos. Hen gos given Sparrow Hawk which she raised and successfully fledged. Chicken incubation temperature approximately 1 degree F warmer than Goshawk. Further information will be forthcoming.

B.P.I.E. No. 19. R. Fyfe (Ft. Saskatchewan, Alberta, Canada) reports on Peregrine Falcon breeding project.

1. Species: Peregrine Falcon (*pealei*).

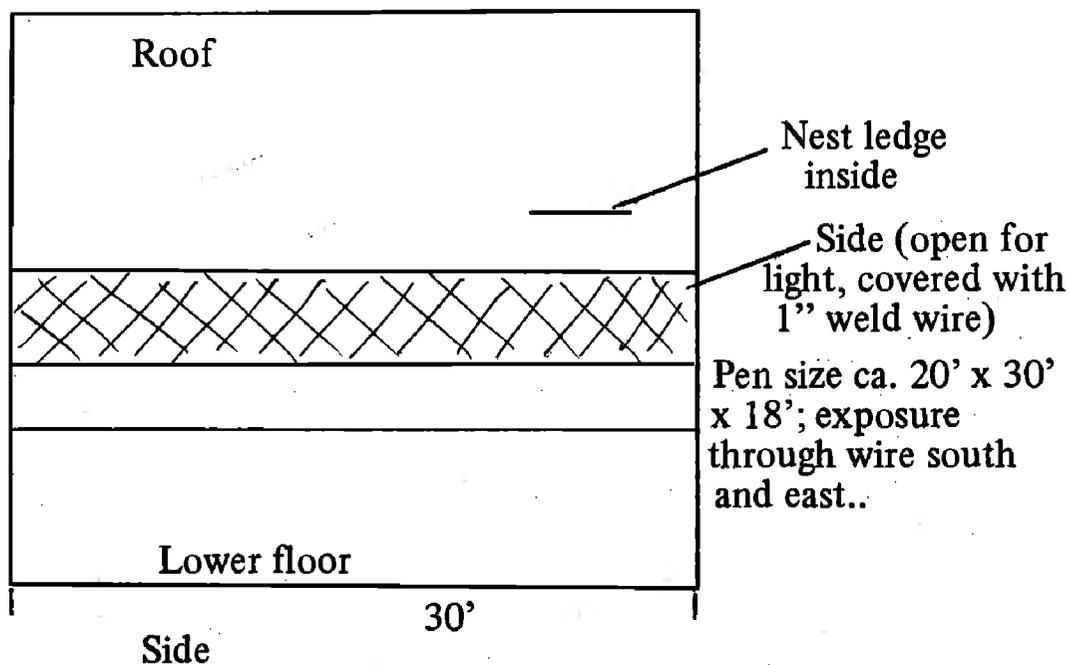
2. Age: both 4 years.

3. Origin: Eyass.
4. Eyrie: a. Latitude of origin to nearest degree—53°N.
5. Handling: b. Manned—both; c. Flown Free—both; e. Disposition—both put up at 1 year.
6. Facility: pen size approximate 20'x30'x18', exposure through wire—south and east (see sketch).



Top

End



Side

7. Artificial light: no.

8. Interior: unpainted wood.

9. Provisions made for nest: nest ledge approximately 2½'x5', filled with gravel.

10. How birds were introduced: together from 3-4 weeks of age, moved into pen in August of previous year; put in together.

12. Observations of behavior toward each other: calling; courtship feeding by male; attracting female to nest by calling and behavior; mutual calling at nest; nest exchanges for incubation.

13. Nest building: several scrapes made in the one ledge; observed female making scrapes; a. Materials provided? gravel; b. Did both birds build or help with building or making of scrape? unknown, male definitely seemed to initiate use of ledge, female only observed making scrape.

14. Food: whole pheasants through winter, parts of pheasants in the spring.

15. Was copulation observed? No; however, back feathers of female disarranged several times.

16. Eggs? Date for egg No. 1, April 26; No. 2, April 28; No. 3, April 30; No. 4, May 2; second clutch No. 1, May 17; No. 2, May 19; No. 3, May 21; No. 4, May 23.

17. a. When did incubation start? May 24 (first clutch removed at fourth egg, incubation refers to second clutch); b. Did both birds participate in incubation? Yes; c. When did incubation cease? July 10; Why? when we removed eggs and provided young hawks for the pair to raise; eggs were found to be infertile and removed a few days after the normal incubation period.

18. Did you take incubation temperatures? No.

19. Did you attempt artificial incubation? Yes (eggs infertile).

21. If eggs did not hatch, a. were they fertile? No.

24. Did you have unhatched eggs assayed or analyzed? No.

25. Food, describe food and feeding of young (young introduced were downy Swainson Hawks): as above—pheasant.

27. How long were surviving young kept with parents? until fledged.

29. Additional information: The most obvious indication of nesting and I think the most important aspect in captive breeding is the acceptance of the pen as an acceptable breeding territory which is defended by the adults. This, of course, cannot be achieved unless both birds are in harmony

with the captive situation, human intrusion, and one another. The first two can be altered in pens (size, shape, furnishings, food, etc.) and more or less human intrusion.

30. Suggestions for improving questionnaire: more room for behavior of adults.

**B.P.I.E. No. 20.** Lou Gaeta (12591 Heath Rd., Chesterland, Ohio 44026) reports on a Golden Eagle breeding project.

1. Species: Golden eagle.
2. Age: male - 11 years; female - 12.
3. Origin: male - haggard; female - passage.
4. Eyrie: male - unknown; female - Forsyth, Montana (trapped in fall of 1958, 1st week in October).
5. Handling: male - unknown; female - manned, flown free, flown at game, disposition nasty.
6. Facility: room was 15' x 10' x 8' with sliding doors with large holes for viewing.
7. Artificial light: Yes, three 150 watt lamps from 6:00 a.m. to 6:00 p.m. and a 25 watt blue lamp used from 11:00 p.m. to 6:00 a.m.
8. Interior: The walls were unpainted plywood and the ceiling beams were exposed. The main garage door was white and nailed securely closed.
9. Provisions made for nest: the platform was built 6' off the breeding room floor. It was 4' square and 2" deep. Straw, hay, and small evergreen branches were provided for her disposal.
- 10, 11, 12. Introduction of birds: February 20, 1968. For the first time, I put the male and female together. At first, the female wasn't too sure what to make of the male. The male did not pay any attention to the female, but it was different with the female. She would hold her head feathers very tight, and stretch her beak and neck. After about half an hour, she started to relax. Then she would raise the feathers on her neck and head and kept looking over to the male. She would then arch her neck and ruffle her head feathers only and place her beak in her chest. This went along very well until the male made a move and then the female took one dive at him. I then stepped into the room and once she saw me, she jumped back on her perch again. Both birds were a little nervous after that. After about one hour of this, I turned the lights out. I left both birds untied in the same room, but on different perches. I will return again in about an hour. After I returned, I noted that the female was the aggressive one; she jumped on the same perch with the male

and for about twenty minutes they just observed each other—they did not fight.

February 21, 1968. Things have been the same. February 25, 1968. I put the male in with the female again, and again she just chased him all over—did not appear too interested in him. February 28, 1968. The male started making vocal noise in the room next to the female. The female would hear, but could not see him. She did start to show interest. I did not put the male in where she could see him.

13. Nest building: a. Materials provided—evergreen branches (2-3 feet long); also straw and hay; b, c. Building—the female did all the preparation in building; d. Dates—March 9, 1968, built on platform.

14. Food: consisted of adult chickens, adult pigeons, beef and beef hearts, horse meat and rabbits. The amount given was  $\frac{1}{2}$  to  $\frac{3}{4}$  pound daily, once a day, early in the morning hours.

15. Copulation observed: no.

16. First egg laid April 5, 1968 (6 oz.); second egg laid April 8, 1968 (6 oz.).

17. Incubation: because there was not copulation, there were no fertile eggs laid. April 14, 1968, three fertile Red-tailed Hawk eggs were placed in the nest in exchange for her eggs. The first Red-tailed Hawk egg hatched April 26. The second egg hatched May 2. May 4, she left the nest and ignored the third egg.

18. Incubation temperatures: Did you take incubation temperatures? No. b. Variations of air temperatures during incubation—air temperatures varied from warmest of  $75^{\circ}$  on April 14, 1968, to  $50^{\circ}$  on April 26, 1968. c. Humidity—unknown.

22. Female Golden Eagle hatched two Red-tailed Hawk eggs—a. April 26, 1968, May 2, 1968; b. Parental behavior—female eagle was extremely protective over the young hawks but did not know how to feed them; hence, the young hawks were removed from the nest.

25. Food: young Red-tailed Hawks were hand raised on beef hearts, beef liver, and dead day-old chicks.

27. Parent-offspring behavior: In relationship to young Red-tailed Hawks, the eagle was very, very protective. Would not allow myself or anyone else to come near nest at any time. The female eagle's attempts to feed the young hawks were unsuccessful and within twenty-four hours the chicks became very weak. All the lights in breeding room were turned off and the use of only a flash light and protective gear, worn by myself, was exercised so that the young hawks

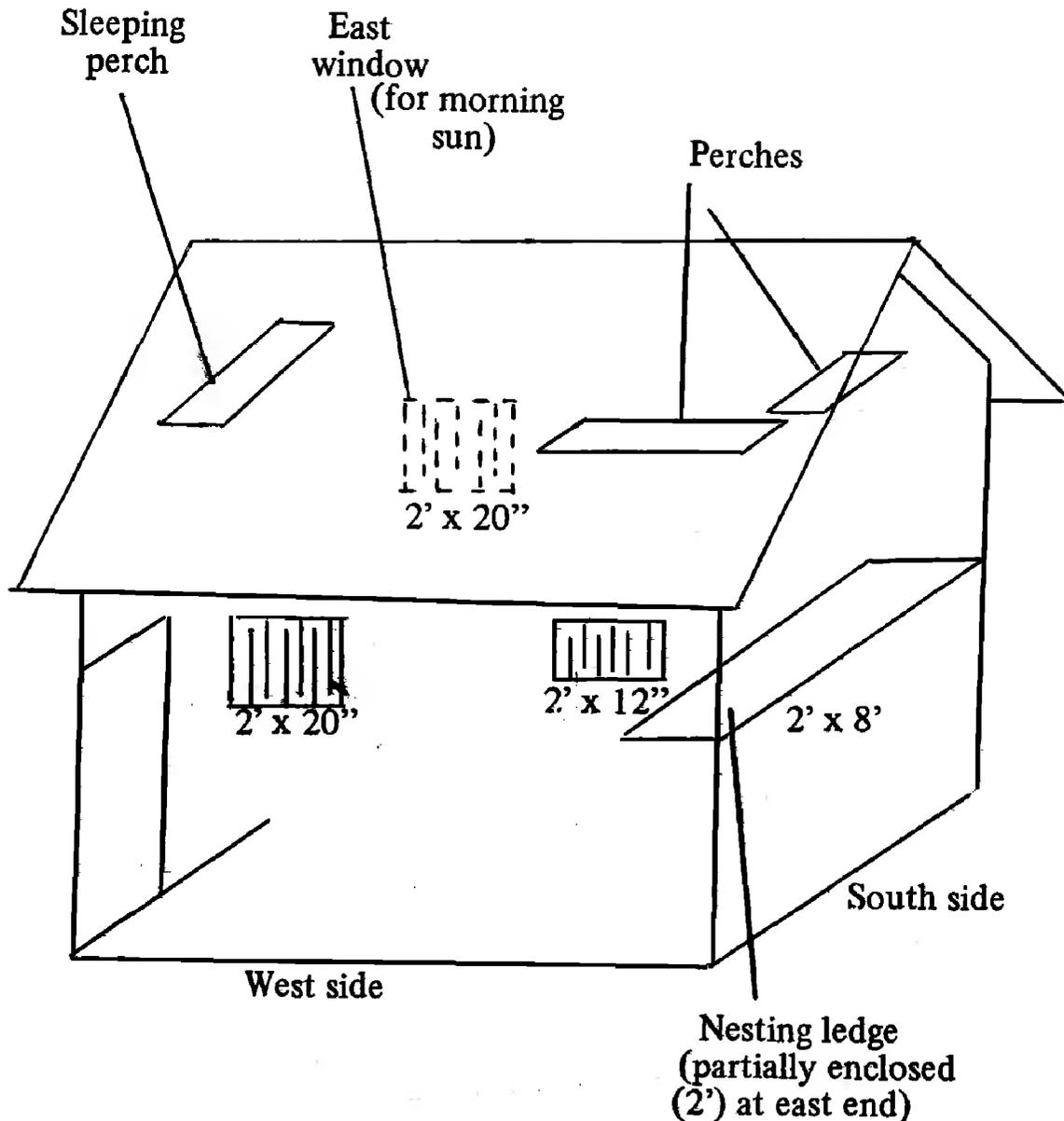
could be hand-raised.

29. Additional information: It was my feeling that even though I was not able to obtain fertile eggs of another bird of prey, I did not break the reproduction cycle of which the eagle had well adapted to in captivity. Even though she was not successful at feeding the young, I feel that the young hawks were so much smaller than her normal off-spring would be that if they were of her own species, she would have been successful.

A day-by-day narrative and photographs are on file in the Raptor Research Foundation office.

B.P.I.E. No. 21. Richard A. Graham (Colorado Springs, Colorado) reports on a Peregrine Falcon breeding project, and adds a few comments on projects with Prairie Falcons and Gyrfalcons and a second one with Peregrines.

1. Species: Peregrine Falcon (*brookei*).
2. Age: male—1968, female—1967.
3. Origin: Eyass.
4. Eyrie: Madrid, Spain
5. Handling: b. Manned—male-no, female-yes; c. Flown Free—no; d. Flown at Game—no; e. Disposition—male-very gentle, female-tame, but aggressive; f. Imprinted—male-unknown (but possible, taken by farmer out of nest at undetermined age); female-no.
6. Facility: 12' x 8' building; 12' high at peak, 8' basic height. See sketch.
7. Artificial light: no.
8. Interior: unpainted wood, beams exposed.
9. Provisions made for nest: two foot wide ledge running x-wise at end of building—8 feet across; this inset with three inches of loose dirt and sand mix; partial screening of ledge for two feet at one end.
10. How birds introduced: birds were placed in room together; previously they had spent the year together. Tiercel was one year younger than female; male (flightless because of broken feathers) was put with female at about 5 months of age—female had at this time completed first moult; female clucked, etc. the following spring and “pushed” the first year tiercel; he did not respond in any way, her action was for two-week period before starting moult.
12. Observations of behavior toward each other: in 1969 birds moved to Colorado in November; tiercel and female both finished their first and second respective moults; in February of 1970, female began to cluck and display nesting behavior; back and forth to nesting ledge; tiercel can only be



Floor of wood covered  
with pine chips

described at this time as “innocent”; he seemed not to be as interested as she; both birds fed together on same food carcass and spent much time inches apart; at this time birds began to roost side by side which was a change from previous behavior; female continued active behavior; as the male started into moult he began to give the impression of maturity; half way through 2nd moult, tiercel began to make trips back and forth to nesting ledge—falcon’s interest had waned to this point, but she now made a scrape; no eggs, no additional behavior; both birds started moult in March or early April and were complete in September—hard penned.

13. a. Materials provided: only a bath was provided which was used; b. Did both birds build or help with building or making of scrape? not observed, but assume female only.

14. Food: Food was primarily that used by H. Kendall

previously, i.e., four-week old chickens raised on high protein diet; other birds also given, but for most part only chickens; skin color increased remarkably during spring period, though food remained the same; in July or so, coloration of feet and cere diminished; tiercel almost orange at one time, falcon very waxy yellow.

15. Was copulation observed? No.

ADDENDA On Prairie Falcon, Peregrine Falcon, and Gyrfalcon. In addition, there were a pair of old (four year) Prairies which H. Kendall had and which laid eggs in their third year. I received birds February 12, 1970. Birds went wild in new cage. Cage was room with south and west windows, 12 foot high, ten foot long and 7 foot wide. Birds finally calmed down about June, and female started clucking in June and extremely so in July. Built four or five very nice scrapes—but no eggs as in previous year. She is still clucky today, tiercel now also—not previously. No nest making since August or so. Lesson learned is that birds are very attached to old home. I had to put falcon in another room to work on lighting system last month as she would attack me, and she went absolutely wild in room next door. When put back in her “eyrie” she clucked and clucked, went to her nesting ledge and really seemed to relax. Quite a sight—anxiety is certainly a problem.

Second pair of Peregrines—nothing, but then female made a scrape of sorts, not as good as the other birds made. Her tiercel got out in May or June and has never been seen. She was wild in cage unlike other birds. Room same as for Prairies, except east and south window. This bird now being flown and handled on leash, and is taming down, etc.

Gyrs together my three year white and H. Kendall 3 yr grey. The white female would not accept the male on any terms. Scream, grab and very anxious anytime Jerkin was near her. Jerkin went nuts for two weeks when taken from Kendall and put in new mews. Size 14 by 10 by 12 ft. high. Both birds moulted clean by September. White was passage, Jerkin was eyas.

**B.P.I.E. No. 22.** Frances Hamerstrom (Plainfield, Wisconsin 54966) reports on a Golden Eagle breeding project.

1. Species: Golden Eagle.
2. Age: male—±9; female—±8.
3. Origin: a. Eyass.
5. Handling: b. Manned, both; c. Flown Free, female; d. Flown at Game, female; e. Disposition, variable; f. Imprinted;

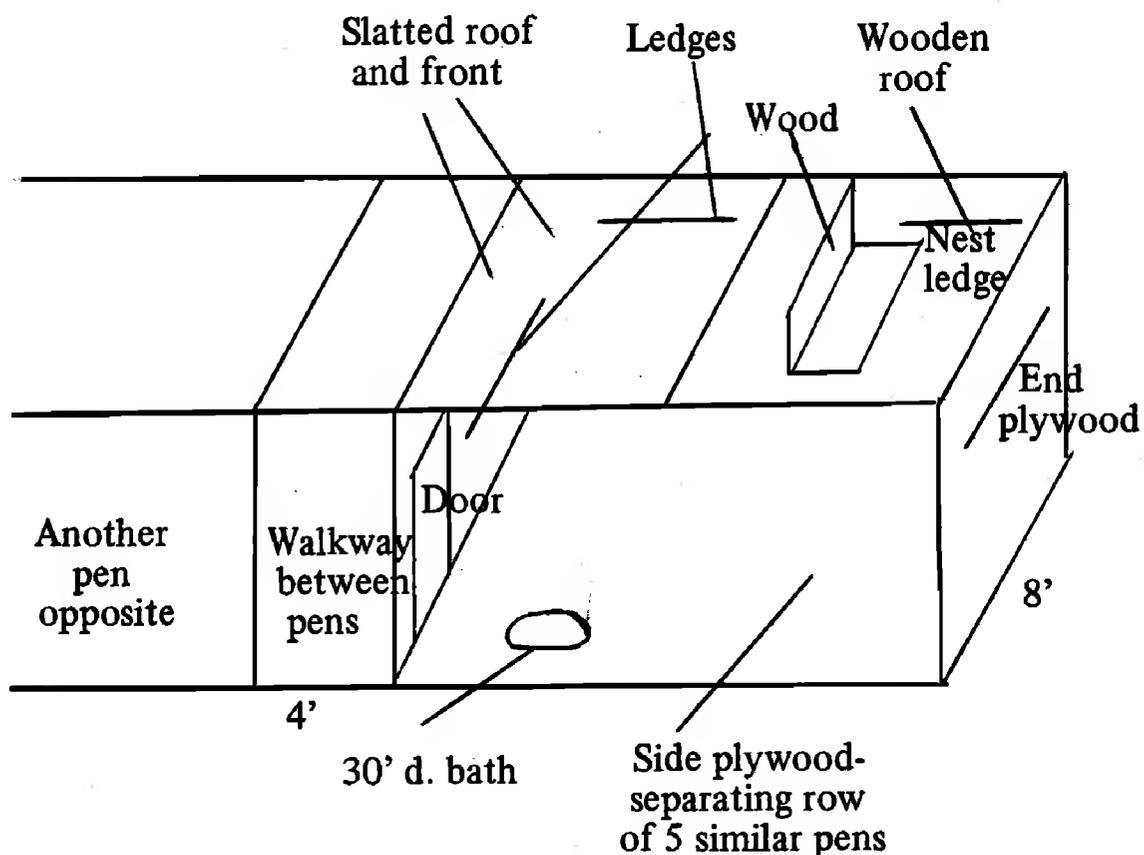
who knows?

6. Facility: described in *An Eagle to the Sky*.
8. Interior: unpainted wood, beams exposed.
9. Provisions made for nest: platform.
11. If not put in aviary together, which bird was first and by how long: tried male first, then tried female first.
12. Observations of behavior toward each other: hateful.
13. Nest building: excellent by female, sloppy by male; a. Materials provided: sticks, hay, etc.; b. Did both birds build or help with building or making of scrape? yes, but not the same nests.
14. Food: chickens and road-killed mammals; excess or old food was not removed.
15. Was copulation observed? male mounted female every day after breakfast.
16. Date for egg No. 1, Mar. 19 or 20; No. 2, March 23; No. 3, Mar. 27.
17. a. When did incubation start; Mar. 19 or 20, 1970; b. Did both birds participate in incubation? only female had a chance to; c. When did incubation cease? May 17, Why? finally lost interest.
19. Did you attempt artificial incubation? a. Describe incubator, only for 5-40 minutes each day in a 1 doz. hen egg incubator; b. Temperature? 99°F.
21. If eggs did not hatch, a. were they fertile? unknown; c. Probable cause of death? a period of traumatic disturbance; I threw Chrys some dead 1-day cockerels and she tried to adopt one.
29. Additional information: see question 22, I think this may be important.
30. Suggestions for improving questionnaire: add questions on artificial insemination.

B.P.I.E. No. 23. David Hancock (The Wildlife Conservation Centre, Saanichton, British Columbia, Canada) reports on breeding project with three pair of Peregrine Falcons (Peale's).

1. Species: Peregrine Falcons (Peale's).
2. Age (June 1970): pair 1-3; pair 2-male 3, female 2; pair 3-male 1, female 8.
3. Origin: a. Eyass-pair 1, 2; b. Passage-pair 3.
4. Eyrie: pair 1, 2-unknown; pair 3-male, Arctic, female, unknown.
5. Handling: c. Flown Free-pair 2 female, pair 3 female; d. Flown at Game-pair 2 female, pair 3 female; e. Disposition-pair 1 female, aggression; pair 3 female, gentle.

6. Facility: nest ledge is 24x60" and 4' off ground, end has plywood panel separating ledge from main open area and people servicing pen from walkway; all pens similar; see sketch.



7. Artificial light: no.

8. Interior: unpainted wood, beams exposed.

9. Provisions made for nest: 24x60" platform, 2x2" laid around edge, 2 buckets of gravel placed on top.

10. How birds introduced: just placed in their facility; pair 1. male and female put together into new pens, 1967; pair 2. 1967; pair 3. male given pen 1 month first, then female placed in December 1969.

13. Nest building; pairs 1 and 2 both made scrapes by late February, pair 3 no attempt at scrape; a. Materials provided? gravel; b. Did both birds build or help with building or making of scrape? unknown.

14. Food: excess chicken (heads and chopped up whole bodies) plus vitamins; sometimes removed daily—when on eggs not disturbed at all and none removed.

15. Was copulation observed? pair 3 seen "possibly" mating by assistant; female on nest ledge with wings

outspread.

16. Eggs? Pair 1 (first clutch). May 15—1, 2 eggs, May 19—3 eggs present and removed; (second clutch). June 6—3 more eggs observed and left. Pair 2. May 3, 4 eggs (1 on ground and 3 spread on ledge), May 14, 7th egg found today.

17. Incubation: I have no exact dates on incubation. b. Did both birds participate in incubation? don't know; I only saw female on eggs.

19. Did you attempt artificial incubation? Yes, b. Temperature? 102-103°F at top of egg and 99° at bottom; c. Humidity: atmosphere, but increased by addition of water at 3 days to anticipated hatching; d. Successful hatching; None.

21. If eggs did not hatch, a. were they fertile? Not fertile.

24. Did you have unhatched eggs assayed or analyzed? Not yet, but have made arrangements.

**B.P.I.E. No. 24.** Frank Kish and Gary K. Clarke (Topeka Zoological Park, 635 Gage Boulevard, Topeka, Kansas 66606) report on a Golden Eagle breeding project.

1. Species: Golden Eagle.

3. Origin: b. Passage female; c. Haggard male.

4. Eyrie: U.S.

5. Handling: e. Disposition? male timid, female tame, aggressive when breeding.

11. If not put in aviary together: male first, then 2 females, and female Bald Eagle; 1 female and bald eagle removed at first breeding.

13. Nest: b. Did both birds build or help with building or making of scrape? male carried bulk of nesting material to female which arranged material, male kept bringing nesting material throughout incubation period while female was incubating.

15. Copulation: b. Time of day—mostly 4 p.m., beginning 2 weeks before 1st egg laid; c. Brief description—log perch next to nest, once on ground.

16. Eggs? 3 eggs laid in 1970, artificially incubated—no hatching: 2 eggs incubated by same parents right after first 3 eggs were removed. No hatching from last 2 eggs either.

19. Artificial incubation: a. Describe incubator. American, Lincoln Model 96 forced air cabinet; b. Temperature? 99½-99¾°F; c. Humidity? 86%.

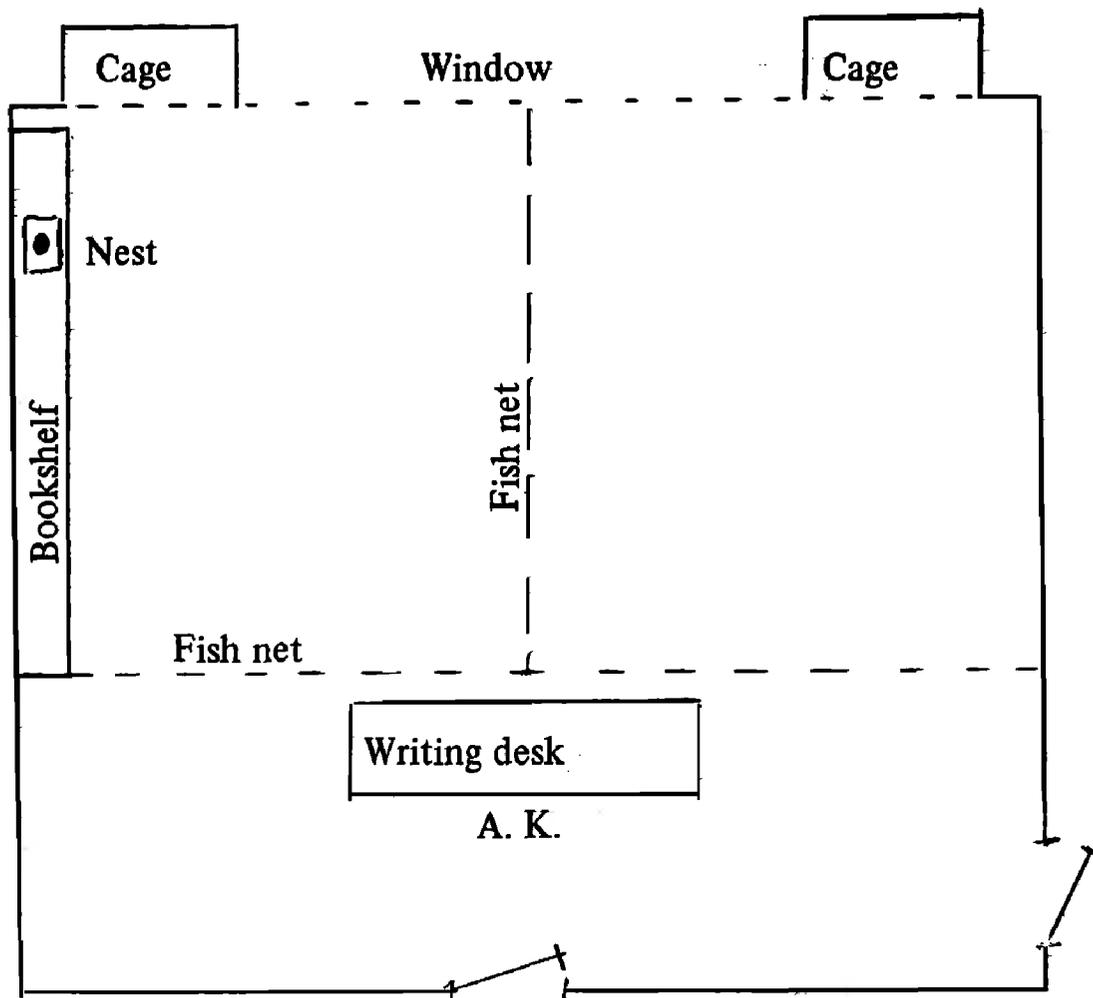
21. If eggs did not hatch, a. were they fertile? could not tell, eggs were rotten.

29. Additional information: See *International Zoo Yearbook* 10:26-29, 1970 (Frank Kish—Egg laying and incubation in American Golden Eagles *Aquila chrysaetos*

*canadensis* at Topeka Zoo).

B.P.I.E. No. 25. Frau Amelie Koehler (Zoologisches Institut, Albert Ludwigs Universitat, Katharinenstr. 20, 78 Freiburg im Breisgau, Germany) reports on a Red-headed Falcon breeding project.

1. Species: Red-headed Falcon (*Falco chicquera*).
2. Age: both 3 years
3. Origin: b. Passage, both.
4. Eyrie: probably India;
6. Facility: part of my office, 260x200x280 cm, whole room twice as large, fish net partitions, window 280x140 cm, with cages outside before the window, accessible to the birds at any time 60x35x95 cm. See sketch.



7. Artificial light? 200 W, other lamps in the back of the room, not accessible to the birds. Day length 12 hrs, birds active at dusk too, never absolutely dark at night.

8. Interior: nearly white, but bookshelves, cages and so on covering most of the walls.

9. Describe provisions made for nest. cardboard box with wood shavings on the uppermost bookshelf.

10. How birds introduced: living together from their first winter.

11. If not put in aviary together, which bird was first and by how long: aviary—male July 8, female Sept. 2, 1967; separated later for about 4 weeks, the female being ill; reunited in my lab in mid October; again the male lived there for some time already, when the female came in. Male courted and fed the female, moved the nesting place. Sitting very often together near the nesting site outside before the window.

13. Nest: probably both birds made the scrape.

14. Food: mice and one day old chicks, rarely crickets or locusts. Excess food removed but generally given no more than they would eat, 1-2 chicks or 2-3 mice or a handful of baby mice each bird.

15. Was copulation observed? too shy, probably once heard from a neighboring room.

16. Eggs? Date for egg No. 1-Jan. 27, No. 2-Jan. 29(?), No. 3-Jan. 31(?), No. 4-Feb. 2(?).

17. a. When did incubation start? Jan. 31; b. Did both birds participate in incubation? Yes, first days mainly the male, then mostly the female, the male relieving her generally twice a day in the forenoon and late afternoon.

18. Incubation temperatures: air temperatures during incubation: 20-25°C. c. Humidity? not enough at hatching though the room was then sprayed with water at least once a day.

19. Did you attempt artificial incubation? no.

22. If parents did hatch eggs, a. dates for each—4 young, March 4-8. Had to help the second. b. Description of parental behavior—male very active at apportioning food, very much interested in the young, but the first young was not fed during the first day, only after the second one had hatched. In the beginning only the female, afterwards both parents fed the young.

25. Food: same as the parents.

27. How long were surviving young kept with parents? hand raised from 15-19 days of age, but parents would have raised them as well.

28. Final description of F<sub>1</sub> generation: 2 male, 2 female, very healthy, given to the owner of the old ones on June 1st, where the two males escaped through a hole in the aviary.

29. Any additional information that you think important: parents stay with me.

30. Questionnaire: questionnaire seems all right.

B.P.I.E. No. 26. Daniel P. Mannix 4th (Sunny Hill Farm, RD No. 2, Malver, Pennsylvania 19355) reports on a Bald Eagle breeding project.

1. Species: Bald Eagle.

2. Age: male 5 years, female 32 years.

3. Origin: a. Eyass—male; b. Passage—female, first year but flying.

4. Area of origin: male, Alaska; female, New Jersey.

5. Handling: b. Manned? yes; c. Flown Free? yes; d. Flown at Game? male- no, female-yes; 3. Disposition? male nervous, female tame and aggressive; f. Imprinted? No.

6. Facility: see sketch.

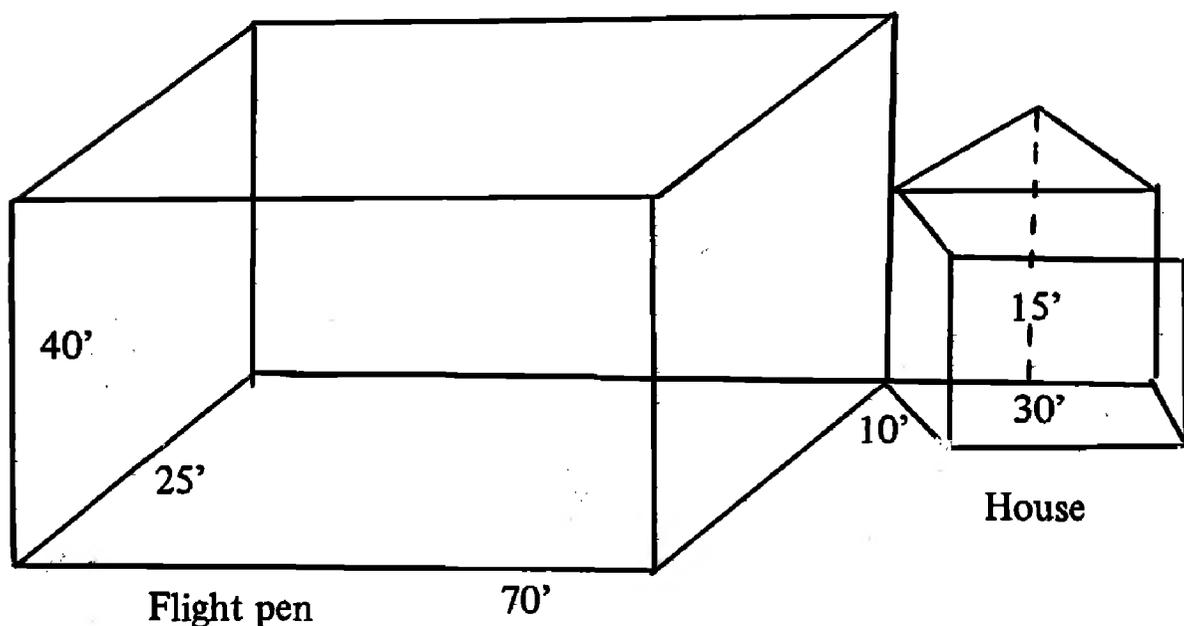
7. Artificial light: no.

8. Interior: white.

9. Provisions made for nest: straw, small branches, dead leaves.

10. How birds were introduced: kept on adjoining blocks for a month, then male liberated in flight cage; female put in three weeks later.

12. Observations of behavior toward each other: female



tended to bully male; still does but to a much less extent and only over food. Female very aggressive, attack me when I tried to enter the house; during most of the year, the male never entered the house even in bad weather; from Feb. until April spent most of his time there; when first egg laid, sat on perch at entrance to house but did not enter.

13. Nest building? nest on floor of house; a. Materials provided: straw, small branches, and dead leaves. b. Did both birds build: no, only female. d. Describe giving dates: female nested since 1968; this year (1970) she started nest building April 10; used only straw on floor, making a depression but did bring in a few small sticks from flight cage and some dried grass; first egg laid during night of April 11-12.

14. Food: Fed daily at five; each bird eats about a pound a day, the male slightly less; rabbit, chicken, beef hearts, fish (once a week) and occasionally a pigeon; vitamins on beef hearts. Food put in at opposite ends of flight pen or female will drive male off. Also, she is much tamer than he is; only in last few months will he come to me when loose in flight cage; female comes instantly, even attacks.

15. Was copulation observed? I never saw copulation definitely completed; I don't have the dates, but in early April or late May he would attempt to mount the female while she was on a horizontal perch; she was nervous but not aggressive.

16. Eggs: 3; Date for egg No. 1 April 12, No. 2 April 14, No. 3 April 17.

17. a. When did incubation start? April 9; b. Did both birds participate in incubation? no; c. When did incubation cease? May 16, female buried eggs in straw and deserted nest, apparently realized eggs weren't fertile.

18. Incubation temperatures: none taken. b. air temperature during incubation: light frost some nights, up to 70° during day. c. Humidity? don't know but humidity is generally high.

29. Additional information: Big problem, as usual, is that female is stronger and more aggressive than male. He is a little afraid of her. Ordinarily she does not bully him and sometimes he even assumes a dominant role and she submits but in general he is nervous with her. The birds were first put together in March 1968 but never observed attempts at copulation until this year. Incidentally, in case you're curious I have a federal permit to keep these birds for experimental purposes. I have had the female since 1939 when she was two years old.

**PEREGRINE FALCON POPULATION SURVEY  
ASSATEAGUE ISLAND, MARYLAND  
FALL, 1969**

**by Robert B. Berry  
Yellow Springs Road  
Chester Springs, Pennsylvania 19425**

**Introduction.**—The purpose of this paper is to document the fall migration of the Peregrine Falcon over a narrow stretch of beach on Assateague Island, Maryland. All observations of the species have been recorded and are presented here, along with known factors affecting migration with appropriate commentary. It is hoped that this initial data will provide a body of statistics that will aid in assessing future population dynamics of this species.

**Historical Comment.**—It seems imperative to review briefly the history of falcon trapping on Assateague Island before embarking upon a discussion of the Fall 1969 Peregrine Falcon migration.

Assateague Island is one of a series of small barrier islands which closely parallel the Mid-Atlantic coast. It is approximately 35 miles long and scarcely more than a mile wide throughout most of its length. The northern two-thirds of the island lie in Maryland, the southern one-third in Virginia. In 1938, the year in which falconers discovered Peregrine Falcons on Assateague, the island was a pristine wilderness of barren beaches, dunes, and marshes. Dune and marsh grass and bayberry were, and continue to be, the predominant vegetation, separated by scattered stands of small pines and hardwoods. Periodic storm tides regularly swept over the beaches, leaving vast wash flats called "levels" extending from ocean to bay. These were the favored hunting and resting places for the Peregrine Falcons during their annual flight south.

In 1943, the Chincoteague Refuge was established south of the Maryland-Virginia border. It was primarily a sanctuary for wintering waterfowl. A fence was erected at the border, but it was not until 1961 that access to the southern end of Assateague Island was completely closed. The available trapping area was effectively reduced to 20 miles of beach and levels.

In the early 1950's, "progress" reached Assateague Island.

A real estate syndicate began a campaign to develop large tracts of barren seashore. Road signs dotted the levels and houses appeared at an increasing rate until hurricane Hazel lashed the beaches in 1954, destroying most of the new houses and dampening the spirits of potential builders.

It was not until 1964, with the erection of a bridge intersecting the new State of Maryland Park, that progress posed any threat to the falconers or to the Island wilderness. A year later, the area south of the State Park was designated Assateague National Seashore. Extensive parking and camping facilities brought hordes of people to visit the Island. Falcon trapping, however, like hunting and fishing, continued within the scope of acceptable recreational activities. The trapping area was now reduced to 11.2 miles of beach and levels.

Falconers have adapted well to the many changes imposed over the years. Prior to the 1950's, virtually all falcons were trapped by the traditional "dig in" technique. To be successful, lots of room and very little interference was required. It was fortunate for the falconers that the "noose pigeon" technique came into vogue in the early 1950's, as the number of trappers, fishermen and property owners was increasing at a fantastic pace. The new technique required less time, less skill and was infinitely more effective than the traditional "dig in." With the recent (after 1964) designation of large areas as off-limits to vehicle trapping and the congestion created by scores of sightseers, picnickers, bathers, and fishermen, falconers have been forced to seek the sanctuary of the levels and bay areas. 1969 marks the serious introduction of the stationary trapping sight—the use of a blind, lure pole and bow net.

In 1963, the State of Maryland recognized falconry as a legal field sport and implemented a permit system to allow the taking and possession of 2 raptors. Recent mass media publicity on falconry and easy access to Assateague increased the number of falconers to nearly two dozen individuals, double that of the prior decade. Maryland's permit system was designed to regulate and control the trapping activities. The state had thus formalized a code of ethics long established and enforced by a hierarchy of "old guard" falconers on Assateague. Commercial trapping of raptors never existed on the Island.

On November 3, 1969, all trapping or taking of raptors, except for scientific purposes, was banned on the Assateague National Seashore. Since the regulation was conceived nearly a year prior to any formal discussion to place *Falco*

*peregrinus tundrius* on the Federal Endangered Species List, it appears that the restriction arose from the alleged misuse of the Island by falconers and certain personality conflicts between National Seashore administrative officials and individual falconers.

**Documentation of the Data.**—Table 1 represents the sum total of raw population data collected during twenty-five days under observation within the period September 24, 1969, to October 26, 1969. A majority of the data was personally gathered from 27 individual observers during or at the end of each trapping day. All of the material brought together in this paper has been generously contributed by falconers—all are experienced amateurs, skilled in the subject matter at hand.

The initial major column of the table is entitled **Weather**. Beneath this major heading are three separate subheadings—sky, wind, and temperature. The sky is described as either clear or cloudy, the wind as northerly or southerly, the temperature as the reading at mid-day in degrees Fahrenheit. The weather for the 25-day period recorded may be summarized as average for the period, without extended periods of heavy rain or temperature extremes.

The next column entitled **Parties** is sub-divided into two sections—Vehicles and Stationary. The sub-headings depict the two basic techniques used in trapping on Assateague. The number of trapping parties are recorded on a daily basis in each section. Totals in each category indicate the number of trapper days for the season—121 trapper days by vehicle and 25 trapper days in the stationary trapping site.

The heading entitled **Sighted** gives the daily number of individual Peregrine sightings by age and sex. Additional columns are included for Unknowns, Total Sightings including Duplications, Average Sightings per Trapper Day, Known Duplication, and Total Sightings excluding Duplications. Totals under the **Sighted** columns document 43 immature females, 19 immature males, 12 adult females and 1 adult male. Eighty-six sightings fall into the “unknown” group, producing a seasonal total of 161 sightings. Duplicate sightings are included in these figures. There were only 18 known duplicate sightings, indicating the possible observation of 143 separate Peregrine Falcons.

My final major heading is entitled **Trapped**. It has been sub-divided to provide daily totals of birds trapped, including their sex and age and ultimate disposition. Thirty-four

Table 1. Summary of Field Data, 1969

Date	Weather		Parties		Sighted										Trapped								
	Sky	Wind	°F	Veh	Sta	AM	AF	IM	IF	U	TDS	A/P	DUP	TS	AM	AF	IM	IF	U	T	B	F	
9-24				1					1		1	1.00		1									
9-27	Clr	10S	75	7			1		1		2	.28		2									
9-28	Clr	15N	70	9					1														
9-29	Clr	10N	70	4					2														
9-30	Cld	15S	70	6	1			3	2	14	3	.75	2	3			2	2		4			4
10- 1	Cld	5N	70	8	1				2	6	20	2.86	2	18			1			1			1
10- 2	Cld	10SE	65	8	3			1	1	2	9	1.00		9			1			3			1
10- 3	Cld	10SW	70	11	3			2	10		8	.73	3	8			1			3			1
10- 4	Clr	20N	60	7	3			2	2	8	16	1.14	3	13		2	2			4			3
10- 5	Cld	25N	60	6	2			2	2	26	10	1.00	10	10						7			6
		10NW									31	3.87	10	21		1	2	4		7	1		
10- 6	Clr	5S	65	4	1			1	1	4	7	1.40		7				1		1			1
10- 7	Cld	10S	70	4	1				3	4	7	1.40		7						3			3
10- 8	Cld	10S	70	9	1				2	6	8	.80	3	5						2			2
10- 9	Clr	10N	70	7	3				4	4	8	.80		8						3			3
10-10	Clr	10N	70	5	2			1	4	4	9	1.28		9						2			1
10-11	Clr	10N	70	7	2			2	2	5	7	.77		7				2		2			1
10-12	Cld	15N	70	2	2				1		1	.25		1						2			1
10-14	Clr	10SW	70	2																			
10-15	Clr	15N	65	2				4	1		5	2.50		5									
10-16	Clr	5NW	65	2				1			1												
10-17	Cld	25NW	60	2					1	2	3	1.50		3			1			1			1
10-18	Clr	10SW	70	2				1			1	.50		1									
10-19	Clr	10SW	70	2				1			1	.50		1						1			1
10-25	Clr	5SW	50	2					2	1	3	1.50		3									
10-26	Clr	5SW	65	2																			
Totals	Clr	N-8		121	25	1	12	19	43	86	161	1.08	18	143	3	12	19		34	6	6	28	
	Cld	N-4																					
	Clr	S-7																					
	Cld	S-5																					

Veh --trapping from a vehicle  
 Sta--trapping from a stationary blind  
 TDS--total sightings, including duplications  
 A/P--average sightings per trapper day  
 TS--total sightings, excluding duplications  
 B--banded and released  
 F--falconry or scientific purposes

falcons were captured, including 19 immature females, 12 immature males and 3 adult females. Twenty-eight falcons were taken for falconry or for scientific purposes. The 3 adult falcons, 2 immature males and 1 immature female were banded and released.

**Evaluation and Interpretation.**—Table 2, entitled “Success Ratios,” has been developed to facilitate a comparison of the data for the various trapping periods during the current season and to provide a base for future analyses. The data have been standardized on a per trapper day basis to minimize bias from variations in the number of trapping parties.

I have divided the fall migration of the Peregrine into four periods: 1) Pre-season—mid September thru September 27; 2) Early season—September 28 thru October 5; 3) Late season—October 6 thru October 12; and 4) Post-season—after October 12. Historically, the major flight passes Assateague Island during the two-week period of the Early and Late seasons. A few sightings are made in the Pre-season, but never more than two or three birds in a given day, and then only during exceptionally favorable weather. Post-season observations of more than a dozen birds in a day have been recorded in past years. The Post-season migration appears, however, to be unpredictable regardless of weather.

Pre-season statistics document only 3 days of observation but with 17 trapper days. Only 3 sightings were recorded, producing a sighting ratio of 0.18 birds per trapper day. Post-season observations were far more productive with 14 birds sighted in 16 trapper days, for a sighting ratio of 0.83 birds per trapper day. Less than half the number of sightings per trapper day were made in the combined Pre and Post seasons than in the “Peak season” [defined as the combined Early and Late seasons]—0.51 compared to 1.27 sightings per trapper day.

The Early season finds virtually all available trappers competing for what appears to be the largest numbers of birds. A total of 63 trapper days was represented during this seven-day period as opposed to 50 trapper days in the Late season. The 63 trapper days accounted for 97 sightings or a sighting ratio of 1.54 birds per trapper day. Of these, 19 were captured, or about one in five observations.

In addition to a possible higher quality trapper who is able to record proportionally more sightings than the average trapper, the Early season generally appears to offer more favorable weather conditions—balmy overcast days and

Table 2. Success Ratios

	Trapper Days	Total Sightings	Sightings per Trapper Day	Total Trapped	Trapped per Trapper Day	Percent Trapped
Sept. 19--Oct. 5 (Early Season)	63	97	1.54	19	.30	19.5%
Oct. 6--Oct. 12 (Late Season)	50	47	.94	13	.26	27.6%
Sub-Totals	113	144	1.27	32	.28	22.2%
Sept. 24, 27, 28 (Pre-season)	17	3	.18	0	0	0
Oct. 14-19, 25, 26 (Post-season)	16	14	.87	2	.12	.14%
Sub-Totals	33	17	.51	2	.06	.12%
TOTALS	146	161	1.08	34	.23	21%

southerly winds and a noticeable absence of the cool clear northeaster. The current year's data proved no exception with five of the seven days being cloudy and four of these boasting a southerly wind. These factors undoubtedly did bias the sighting ratios toward the high side in comparison to Late season results.

The Late season produced 47 sightings, less than half the number recorded for the Early season, and a sighting ratio of 0.94 birds per trapper day. Of the 47 sightings, 13 falcons were captured, producing a success ratio of one bird trapped for every four sighted.

The deterioration in the Late season sightings may indicate that the major flight passed, or may be the result of weather and fewer highly qualified observers. The weather pattern for this period was largely unfavorable for sightings, with four clear days, three with north winds, one cloudy north and two cloudy south winds.

The success ratios in Table 2 may be criticized as they do not provide for the all-important effects of weather. I have, therefore, constructed a table that confirms what falconers have long suspected regarding the effects of weather on falcon sightings—namely, that cloudy skies are better for observation than clear skies and that the south wind produced relatively more trapping success than the north wind.

Table 3, entitled "Weather—Success Ratios," documents the average number of birds sighted and trapped for each of the four major weather conditions, thereby depicting the relative influence of weather. The data indicates that the greatest number of birds are sighted and trapped during inclement weather on a north wind—1.95 birds sighted per trapper day and 0.38 birds trapped per trapper day. The worst weather for trapping appears to be the north wind under clear skies, with less than half the birds sighted and trapped. The results of inclement weather with a south wind are roughly similar to the northerly wind, with fewer birds sighted, but a higher proportion trapped. With only one day in the data, the south wind—clear sky combination is inconclusive.

Logic tends further to confirm the influence of weather. North winds hasten the migration and a greater number of birds may be expected to pass the island on a given day. Many, however, pass over at extreme heights or far out to sea. As the weather deteriorates and the cloud cover descends, so do the falcons. Inclement weather appears to bring the birds in toward the beaches. Finally, when

Table 3. Weather—Success Ratios

Wind	Sky	Number of Days*	Average Trapper	Number of Trapper Days	Sighted	Trapped	Sighted per Trapper Day	Trapped per Trapper Day
North	Clear	5	8.0	40	37	7	.93	.18
North	Cloudy	3	7.0	21	41	8	1.95	.38
South	Clear	1	5.0	5	7	1	1.40	.20
South	Cloudy	5	9.4	47	59	16	1.26	.34
TOTALS		14	29.4	113	144	32	1.27	.28

\*Data included for the period September 29 thru October 12.

confronted with a headwind, the pace of the migration is retarded with fewer birds passing the Island. These are, however, concentrated and fatigued, often seeking resting places on the beaches, creating an ideal situation for both observation and trapping.

It is reasonable to assume that in a normal Peregrine population, one will find a high proportion of immature members. The data included in Table 4 on the numbers of Peregrines sighted indicates a very healthy 5 to 1 ratio of immatures over adults. Out of 75 observations, 13 were positively identified as adults. Subjective examination of the data suggests an even higher ratio may exist. Of 161 observations, only 43 were aged and sexed. I suspect that most of 86 unidentified falcons were immatures as adults are generally obvious. Ratios on the order of 10 to 1 immatures to adult sightings seem more likely.

Historical data indicate that our observations are not producing a representative sampling of the migrant Peregrine population. It is significant to note that only 6 adult males have been trapped in the past 31 years—and few more have been positively identified. Adult females are on the other hand relatively common—the current year's data indicating 1 adult in 5 sightings. Undoubtedly, a few observations of adult females are in fact males, but the fact remains that the adult male is Assateague's rarest prize.

There does appear to be a reasonable explanation for the noticeable absence of adult falcons. Any falconer who has flown the passage falcon through two or more seasons or has made lengthy observations of both passage and adult falcons on migration is acutely aware of their relative physical prowess and hunting expertise. The adults' superior powers of flight enable a rapid and continuing movement southward. I have observed them catch and consume their prey in flight. I suspect that many never alight during their journey, pressing southward both day and night.

Closely correlated with the superior physical prowess of the adults is their ability to capture easily both water and passerine birds. The immatures on the other hand, unable to catch the fast flying shore birds, depend largely upon passerines which are taken over the ocean. Variations in the number of passerines at sea, often caused by adverse weather, force the immatures to hunt over the land areas, increasing the probability of observation.

The theory of an accelerated migration for adult Peregrines is supported by the data in Table 1. Eleven of the 13 adults sighted were observed before October 4, leaving nearly two-thirds of the immature population still to come.

Table 4. Age Ratios

	Sighting Ratios		Trapping Ratios	
	Adults vs. Immatures	Male vs. Female	Adults vs. Immatures	Male vs. Female
Sept. 24, 27, 28 (Pre-season)	1 of 3 or 33%	0 of 3 or 0%		
Sept. 29—Oct. 5 (Early-season)	11 of 41 or 27%	8 of 41 or 20%	3 of 19 or 16%	8 of 16 or 50%
Oct. 6—Oct. 12 (Late-season)	1 of 20 or 5%	5 of 20 or 25%	0 of 13 or 0%	2 of 13 or 15%
Oct. 14-19, 25, 26 (Post-season)	0 of 11 or 0%	7 of 11 or 64%	0 of 2 or 0%	2 of 2 or 100%
	13 of 75 or 17%	20 of 75 or 27%	3 of 34 or 9%	12 of 31 or 39%

In summary, the effects of fatigue, weather and the availability of prey species exerts far greater pressure on the immatures than on the adults, explaining in part the disproportional numbers of immature falcons sighted and captured.

Referring again to Table 4, 20 of 75 sightings, or 27% of the observed Peregrines, were identified as males. It is worthy to note that 7 of 11 sightings occurring in the Post-season were males—a time which historically calls for the immature female.

Trapping ratios in Table 4 disclose only 3 of 34 birds trapped as adult females. No adult males were taken. Twelve of 31 immature birds taken were males, amounting to 39% of the total.

Table 5, entitled "Trapping Data," may be the only historical group of statistics in existence which might be considered relevant to Peregrine Falcon population analyses on the eastern seaboard. Unfortunately, the data only include the number of birds trapped, those taken for falconry or scientific purposes, and the number banded and released. The 34 falcons captured in the current year compare favorably with the eleven-year average of 37 birds per year. It is, however, impossible to assess the effects of variation in the numbers of trapper days, the weather, and in the actual trapping area.

If we examine Table 5 for the period 1965 thru 1969, we have a measure of consistency in available trapping area and the number of trappers. During the past two years, the numbers of birds trapped have dropped significantly. There is, however, no scientific justification to support these figures as being indicative of the population as a whole.

**Summary and Conclusions.**—The data presented in this paper represent the combined efforts of a group of dedicated falconer-conservationists who are concerned with the welfare of the Peregrine Falcon. Their cooperation has made possible the accumulation of records for twenty-five days during the period September 24 to October 26, 1969. Included in the data are daily totals for the number of trapping parties, and the number, age and sex of birds sighted and trapped. A total of 146 trapper days were represented, accounting for 161 individual sightings records. Only 86 of these records were by age and sex, producing 1 adult male, 12 adult females, 19 immature males and 43 immature females. The observed ratio of adults to immatures was slightly less than 1 in 5. These figures are thought to be conservative, actual sighting ratios

are estimated to be closer to 1 adult to 10 immatures.

Of the 161 recorded sightings, 18 were known to be duplications resulting in 143 potential individual birds sighted. These figures are probably exaggerated by at least 20%.

A total of 34 birds were captured, 6 were banded and released, and 28 were taken for falconry or scientific purposes. These totals do not compare unfavorably with the ten-year average of 37 birds trapped per year.

It may be significant to note that 9 of the 34 birds trapped in the current year and 5 of the 30 falcons trapped in 1968 were taken from stationary locations. Few, if any, falcons were trapped by this method in prior years. It is

**Table 5. Trapping Data, 1959-1969**

Year	Banded- Released	For Falconry	Trapped
1959	21	26	47
1960	5	18	23
1961	15	12	27
1962	15	20	35
1963	26	17	43
1964	16	17	33
1965	18	12	30
1966†	18	27	45
1967†	22	41	63
1968†	6	24	30*
1969†	6	28	34**
Totals (11 years)	168	242	410
Percentage (11 years)	40.9%	59.1%	100%
Average per Year	15.3	22.0	37.3

\*Data include 5 taken in stationary site

\*\*Data include 9 taken in stationary site

†Respective numbers of falconers trapping per year during entire season—17, 27, 23, 29.

Data documented by James N. Rice II and Robert B. Berry

doubtful that many of the birds taken in stationary sites would have been otherwise taken, creating an inflated bias in the numbers trapped in 1968 and 1969. These figures call for close scrutiny in future years.

The success ratios disclose that the average trapper saw 1.08 birds per trapper day throughout the entire season. In the Peak season, he saw 1.27 birds per day, 0.18 birds in the Pre-season, and 0.87 birds were noted in the Post-season. The average trapper captured 22.2% of the birds he sighted in the peak season and only 12% of the sightings in the combined Pre and Post-season for a seasonal average of 21% or 1 bird trapped for every 5 sighted.

The effects of weather on the numbers of birds sighted and trapped cannot be overstressed. Peak season success ratios disclose 1.95 birds are sighted per trapper day under cloudy skies with a north wind, compared to less than half or 0.93 sightings for each clear day with a north wind. Ratios for the southerly winds were in between these extremes, 1.26 sightings for the overcast day compared with 1.40 sightings per day for the clear-south wind combination. It is, however, widely accepted that the southerly winds compare even more favorably with the inclement north wind. The data also suggest that there is a close correlation between the numbers of birds sighted and birds captured.

Any attempt to reach other than subjective conclusions regarding the status of the current migratory Peregrine population would be presumptuous. It has, however, been demonstrated that the effects of weather can be of critical importance to the number of birds sighted and captured. It also is obvious that observed age and sex ratios are not representative of the population as a whole.

General impressions of the flight range all the way from optimism to despair. My own personal impression, as confirmed by most observers, is that there were fewer birds seen on passage in the 1969 flight than in some previous years. Only a continuing study will confirm or disprove this impression.

# AN ACCOUNT OF PRAIRIE FALCONS BRED IN CAPTIVITY—1970

by James H. Enderson  
Biology Department, Colorado College  
Colorado Springs, Colorado 80903

In the spring of 1970 at Slaterville Springs, New York, a pair of captive Prairie Falcons produced two clutches of eggs, in which eight were fertile. Two grown young survived. The adults in question were a three-year-old male and a ten-year-old female (UFO), both taken as nestlings. The birds had been together in the previous spring when one clutch with two fertile eggs was unsuccessful.

The breeding chamber in 1970 consisted of a wired-off section of an alley-way in a large barn. Since the barn was very loosely constructed, some light entered through cracks between boards, a fair amount through two small windows in the breeding cage and a good deal of light through large sliding doors at the entrance to the alley-way. The breeding cage itself was constructed of one inch chicken wire and its dimensions were 12 by 7 by 14 feet high. Four bales of hay were hung on the sides of the cage and provided the only perches, and a large wooden barrel with its end nailed against the wall high in one corner provided the nesting cavity. Fine gravel was placed on the floor of the barrel. One 150 watt floodlamp was placed within four feet of the bale of hay in front of the barrel. The flight cage was in visual range of other falcons tethered on blocks in the barn.

The birds were placed in the flight cage in early February and appeared to adjust well to the wire cage. Rarely did either bird fly against the wire. The ready availability of perches on the wire in the form of bales of hay may have solved that potential problem. On 1 March 1970 neither bird showed strong sexual activity nor any particular orientation to the nesting barrel, except occasionally the female roosted near its opening. Up to that time the large double doors at the entrance to the alley-way were opened early in the morning and usually closed after dark. Beginning on 1 March the floodlight was turned on at 7:00 a.m. and off at about 9:00 p.m. each day, giving a photoperiod of about 14½ hours. By 8 March both birds had shown a very pronounced increase in sexual behavior, attended by a good deal of bowing and clucking, and a scrape was now present in the

barrel. By mid-March, the female was in such high sexual condition that she would cluck upon hearing any outside disturbance, such as a door slamming on a car or house. By 17 March her abdomen was clearly distended and I could feel the presence of eggs. The eggs were laid at two-day intervals beginning on 21 March and ending on 29 March. Diet throughout the spring was mainly horsemeat and day-old chicks with occasional multiple vitamins.

Each egg was removed as it was laid and replaced with a dummy. The removed eggs were placed in a homemade incubator and held at 101° to 102°F. All but the first egg were fertile. On 29 March the four fertile eggs were placed in a forced air incubator at 99.2°F. and a humidity of 75%, and were automatically rotated 150 degrees every three hours. The eggs were held with their large ends up in the incubator. The second egg to be laid stopped development on about April 10. On 23 April the three remaining eggs were placed in a portable incubator. Egg No. 3 pipped on the 35th day of incubation, but eggs No. 4 and No. 5 died after about 32 days of incubation, before pipping. On 1 May the chick in the No. 3 egg was helped out of the shell. The yolk sac was not clearly absorbed, and the umbilicus was still fleshy. That chick died on the fifth day. It was strongest on the second day of life and ate by itself, though it was force fed at all other times. There was a rapid decline in its condition on the night of the second day and it was very weak on the third and the fourth. Brooding temperature was held at 95 to 98°. On the fourth day the chick was given oral tetracycline in an amount normally used to sterilize developing eggs. Autopsy showed that the yolk sac was still unabsorbed and it was suggested that the chick died of a bacterial infection of the yolk sac.

In the meantime, the Prairie Falcons started a second clutch. The five eggs were laid on 17, 19, 21, 23, and 26 April. As soon as egg No. 2 was laid, it and No. 1 were put in a portable incubator and were replaced with dummies in the barrel. Each of the remaining eggs was taken as it was laid and put in the incubator, except for egg No. 5. On the 26th of April the dummies were removed and No. 1 and No. 4 were returned to the nest barrel. Egg No. 2 was mysteriously cracked, and it was held in an incubator until 5 May. At that time the crack was covered with a small amount of paraffin and it was returned to the nesting barrel, but the embryo disintegrated within ten days. Egg No. 3 was infertile.

Time-lapse motion pictures taken of the nest barrel in this period showed that the female incubated the eggs steadily. Egg No. 1 pipped on 24 May and I removed small pieces of

shell to facilitate the final hatching on 26 May. At that time the chick and the other two eggs were maintained under artificial conditions during our return to Colorado Springs. Egg No. 4 pipped on 27 May and hatched en route to Colorado Springs in Ohio on 29 May in a 12-volt incubator in the car. This chick received no help and hatched suddenly about 60 hours after the first pipping of the egg. Egg No. 5 pipped on 29 May and hatched on its own on 1 June. Humidity was kept as high as possible by means of absorbent material in a shallow pan of water in the bottom of the incubator, and the incubator temperature was held at 97-98° F. Despite the fact that we traveled over 1500 miles during the latter stages of incubation, the only problem encountered was with a bleeding umbilicus of chick No. 1 (the chick that we helped from the shell). The umbilicus lost two or three drops of blood freely and after that was swabbed with ethanol three times the next two days. As soon as the chicks hatched, they were removed to a cooler part of the incubator near the bottom, where the temperature was between 92 and 94 degrees for the first day or two of life. After that the temperature was lowered to 88 degrees.

All three chicks ate without forced feeding. Although no record was kept for chick No. 1, chick No. 4 ate five hours after hatching, and chick No. 5 ate on its own accord seven hours after hatching.

Upon arriving in Colorado, the chicks were maintained at about 85-90° F. for five or six days, but it appeared that if chicks are to be held at room temperature, they may not need added heat after the fifth day, but may be covered with a light cloth.

The chicks were all fed lean dove muscle (very little fat) until the third day, when finely crushed leg bones were added. The diet changed to pigeon after the first week, and a good deal of finely crushed bone from the pigeons was given at every feeding.

Chick No. 5, the last to hatch, died on the sixth day after apparently gaining weight normally. No clearcut cause for its death could be found. The other two chicks were fed by hand until they were near fledgling size and were always given all they could eat. Despite the fact that both chicks were fed by hand until six weeks of age, neither is tame. Both are males, in excellent health, and are virtually identical. Both are in excellent health as of 18 November 1970.

In early July 1970, the adult birds were placed on eight hours photoperiod by closing their old quarters until 11 o'clock in the morning. The birds were kept on eight hours of photoperiod until 16 October 1970, when artificial light was

turned on at 4:00 a.m. and off at 8:00 a.m. such that the total length of day was near fourteen hours. Artificial light was added by means of two 150 watt outdoor spotlights mounted within 3½ feet of the two straw bales used for perches. Hence there was no way in which the birds could avoid the light. The size of the breeding room in this case is 6 by 8 by 8 feet high.

At the time that the photoperiod was increased in the fall, neither bird showed obvious sexual behavior. Within two weeks both birds were clucking a good deal and a scrape, which had been intermittently present during late summer and early fall, was now regularly attended. At this writing (20 November) both birds appear to be in full breeding condition, and grease marks have been seen on the back of the female, suggesting that copulation has taken place. The abdomen of the female appears slightly distended.

A few general comments perhaps are in order. First, success in this case was achieved with a pair of birds that appear to be very well adjusted to each other and very tame in regard to people. Secondly, it does not appear—at least in this case—that intense light is necessary. The breeding cage in New York was fairly dark, with light below that necessary to take color photographs without a flash. The presence of other birds tethered about on blocks did not seem to disturb the nesting pair. It appears to be a mistake to try to aid the hatching chick; the result can well be hemorrhaging. Prairie Falcon eggs do not appear to develop well in incubators designed for hens eggs. I did place a thermistor in a dummy egg and place it under the incubating female falcon. At no time did the temperature exceed 95° F. in the center of the egg, although the tests were of too short duration to be conclusive. Young prairie falcon chicks can be reared by hand, although it is a task of inordinate demand. Finally, a pair known to be capable of successful breeding can be brought into full reproductive condition in the fall by the manipulation of photoperiod. Whether or not eggs can be produced from such a situation remains to be seen.

**Addendum.**—The following comments regard the outcome of the attempted induction of fall breeding in the above pair of prairie falcons. By 2 December 1970, the abdomen of the female had not become significantly distended, and the birds were returned to natural photoperiod. Despite the fact that both birds reached full behavioral condition in the six weeks between mid-October and the first of December, neither bird began a molt nor did the female become clearly gravid with eggs.

**RAPTOR RESEARCH FOUNDATION, INC.**  
in care of Biology Department  
University of South Dakota  
Vermillion, South Dakota 57069  
U.S.A.

Non-Profit Org. U. S. POSTAGE PAID Vermillion, S.D. Permit No. 37
---

**RETURN POSTAGE GUARANTEED**

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.

A major activity to date is the publication of *Raptor Research News* which has appeared quarterly since 1967 and which is bi-monthly beginning in 1970. Back issues are available at \$0.50 an issue. A new bibliographic service will be started in 1971 known as *Raptor Research Abstracts* to appear monthly with a detailed annual index.

The interests of the Foundation are indicated by the titles of the committees which have been or are in the process of being formed: Editorial, Captivity Breeding, Population, Banding, Bio-telemetry, Pathology, Pesticide, Ecology and Ethology, Systematics, Education and Conservation, Bibliography, International Coordination, Finance and Investment.

Membership in the Raptor Research Foundation is open to all who contribute; the *News* is sent to those who contribute a minimum of \$3.00 per year, the *News* and *Abstracts* for a minimum \$5.00 contribution. Since these minimal contributions barely cover costs, larger donations are necessary to finance expanded activities of the Foundation.