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

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

For membership and publication costs see inside back cover.

RADIO-TAGGING FALCONIFORM AND STRIGIFORM BIRDS

by
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This paper describes techniques for radio-tagging and monitoring birds of prey. Several recent papers briefly discuss radio-telemetric techniques for studying behavior of raptorial birds. Nicholls and Warner (1966, 1968) commented on the use of radio-telemetry for studying the natural history of Great Horned Owls (*Bubo virginianus*), Barred Owls (*Strix varia*), and Saw-whet Owls (*Aegolius acadica*). Southern (1963, 1964, 1965) commented on radio-tagging and tracking of wintering Bald Eagles (*Haliaeetus leucocephalus*). These authors briefly discussed problems of tagging and monitoring but little information was given comparing different receiving systems or concerning methods of harnessing other raptors.

Applications of the Technique

By using radio-tagging one can gather data on raptorial birds without visual contact. As with banding, color-marking, or tagging by other means, the investigator must realize that the data are from a tagged subject. A radio-tagging study must be planned carefully before it is initiated in order to avoid loss of equipment or life of the subject.

The radio-telemetric techniques described in this paper can be used to determine: (1) territory and home range, (2) daily activity rhythms, (3) habitat utilization, (4) nest location, (5) physiological measurements such as heart rate, core temperature, and respiration rate, (6) feeding habits, (7) post-fledging activities such as family relationships, dispersal, migration, and survival, (8) pesticide and parasite fluctuations in time, and (9) interspecific and intraspecific interactions.

Transmitters

I radio-tagged 17 species (56 individuals) of captive or wild raptors (Table 1) with self-pulsed, crystal-controlled transistor oscillators operating at frequencies above 100 MHz. Continuous signal transmitters were also used in this study but were found to be inferior in regard to life and sensitivity to the bird's body movements.

Transmitters can be purchased or built to suit one's needs. Commercially-available circuitry is frequently changed and varies with the supplier. The transmitter circuitry used in my study was similar to that used by Cochran (1967).

Transmitter weight, size, and shape varied with the components, harness materials, and amount of embedding material. The smallest transmitter that I used

Table 1. Package types, harness materials and sizes, and package weight to body weight ratios for radio-tagging 17 species of raptorial birds.

Scientific name	Package type	Harness material*	Harness loop sizes (in)		Mean % package weight to body weight	
			neck	body	male	female
Accipiter striatus	BP	1/8 in	**	**	6	4
Accipiter cooperii	BP	1/8 in	**	**	2	2
Accipiter gentilus	BP	1/4 in	5½	7¾	3	2
Buteo lagopus	BP	20 ga.	7	9½	6	5
Buteo swansoni	BP	20 ga.	8½	9½	6	5
Buteo platypterus	BP	1/8 in	7 3/8	9 3/8	6	7
Buteo jamaicensis	BP	1/4 in 18 ga.	8¼	11½	4	3
Circus cyaneus	BP	1/4 in	5½	7¼	6	6
Falco sparverius	BP	1/8 in	**	**	4	4
Otus asio	BP BRP	1/8 in	**	**	7	5
Asio flammeus	BP	1/4 in	6¾	8½	7	6
Asio otus	BP	1/4 in	6¾	8¾	7	6
Strix varia	BP BRP	1/4 in	9¾	12¾	6	6
Bubo virginianus	BP BRP	1/2 in 18 ga.	10	12¾	5	4
Nyctea scandiaca	BP	1/2 in	**	**	4	3
Pandion haliaetus	BP	1/4 in	**	**	4	3
Haliaeetus leucocephalus	BP	1/2 in	20 19	22 22	3	2

*Flattened width of woven teflon tubing or ga. of stranded wire with rubber insulation.
**Single adjustable body loop.
BP Back package; BRP breast package.

weighed three grams and the total package weight (transmitter, antenna, harness, and embedding material) of all my radio-tags varied from five to 118 g. All package weights were less than seven percent of the bird's total body weight (Table 1). My transmitters were embedded in acrylic or epoxy. The transmitter shape varied depending upon the application and components. I found it best to streamline the whole package. Most of my packages were small enough to be placed under the feathers. I painted the packages in cryptic color patterns with acrylic paints (RamCote) and placed them under the feathers to minimize sibling pecking and also to keep them warmer.

Transmitter life is a function of battery type and energy consumed. My transmitters had actual field lives that varied from 31 to 510 days. Range varies with frequency, transmitter antenna length, numerous environmental factors, and with the receiving system. In general a transmitter with a whip antenna operating above 100 MHz has greater efficiency than one with a small loop antenna.

Harnesses

Two harness designs were used. A double loop harness (Figs. 1 and 2) was used to hold back or breast packages on all species except Sparrow Hawks (*Falco sparverius*), Cooper's Hawks (*Accipiter cooperii*), Sharp-shinned Hawks (*Accipiter striatus*), and Screech Owls (*Otus asio*). The preferred package type is

Figure 1. A completely assembled pre-fitted back package showing double loop harness, cross strap, whip antenna. This package weighed 40 grams and had a life of 230 days.

Figure 2. Back package in proper position at anterior margin of wings and showing spring at base of whip antenna and cryptic coloration to blend with back color of Rough-legged Hawk (*Buteo lagopus*).

given in Table 1.

The double loop harness was modified after that of Nicholls and Warner (1968). They used 12-ga. insulated solid strand wire for harnessing Barred and Great Horned Owls. I found that this was too rigid for comfort, caused callouses on the skin, broke body feathers, and damaged developing feathers during molt more than did flexible stranded wires.

I used stranded 18 gauge wire with rubber insulation to harness all larger hawks and owls (Table 1). Twenty and 24-ga. wires were used to harness the smaller hawks, owls, and falcons. However, teflon tubing was preferred. Red-tailed Hawks (*Buteo jamaicensis*) easily broke the smaller gauge wire.

The harnesses were prefitted in the laboratory and adjusted for close fit while in the field. The neck-loop end of the cross strap was adjusted and sewn or rivetted in the field. I used fine steel wire or cotton thread to sew this junction when I wanted the package to drop off after the power supply failed. When these materials decomposed, the package either dropped off or the bird pulled it off. This also minimized the chance of the body loop-cross strap junction breaking first which could cause strangulation by the neck loop. Dead transmitters were removed from the birds that could be recaptured in live traps.

I used a single body loop harness to attach relatively short-lived back packages to small Accipiters, Sparrow Hawks, and Screech Owls. A body loop of narrow teflon tubing or small gauge wire was fitted in the field. The field life of these transmitters was about 30 days and therefore they had to be replaced often. One wild female Sparrow Hawk was retagged seven times and her activities were monitored continuously for 187 days.

All harnesses were loose enough to allow a 4 mm diameter rod to pass between the harness and the skin. This minimized the chance of restricting breathing or blood circulation, or causing strain or damage to muscles. It also allowed for some change in body size during molt.

Woven teflon tubing was superior to insulated wire for attaching back packages with whip antennas. This material is more flexible at temperatures below freezing and is stronger and softer than insulated wire. The flat widths of tubing that I used are given in Table 1.

Harness material was embedded into the package and a nylon cushion was glued to the surface of the back package adjacent to the skin. The cushion minimized abrasion and moisture accumulation. Sponge rubber did not serve this purpose well because of its absorbent qualities and rapid rate of decomposition.

Transmitter Antennas

I used transmitters with either loop or whip antennas depending upon the mounted position of the transmitter and the harness material.

Whip antennas were used on all back package transmitters and loop antennas were used on all breast packages. A combination whip and loop antenna was used on transmitters that had wire harnesses.

The resonant whip antenna gave a stronger signal than the loop antenna when used on transmitters with the same circuitry. Transmitters with the combination whip and loop antennas gave a signal as strong as the whip antenna. This combination was the most sensitive to the bird's movements and gave the best signals for remote interpretation of activities.

Gold or copper-plated steel wire (.006 in diameter or larger) was used for whip antennas. The diameter varied depending on the size of the bird. The optimum antenna length depended on transmitter frequency. The smallest diameter wire was used for tagging birds weighing less than 150 g. The smaller wires minimized the rebounding action to sudden movements by the bird while perched or in flight.

A small spring was embedded into the package at the base of the antenna (Fig. 1). This minimized the chance of the bird breaking the antenna. All birds preened or pulled on the antennas occasionally but none broke off.

The type of loop antenna wire for the breast packages was determined by the harness material (Table 1). The stranded rubber insulated wires that I used were more flexible and of smaller gauge than that used by Nicholls and Warner (1968) and about as efficient.

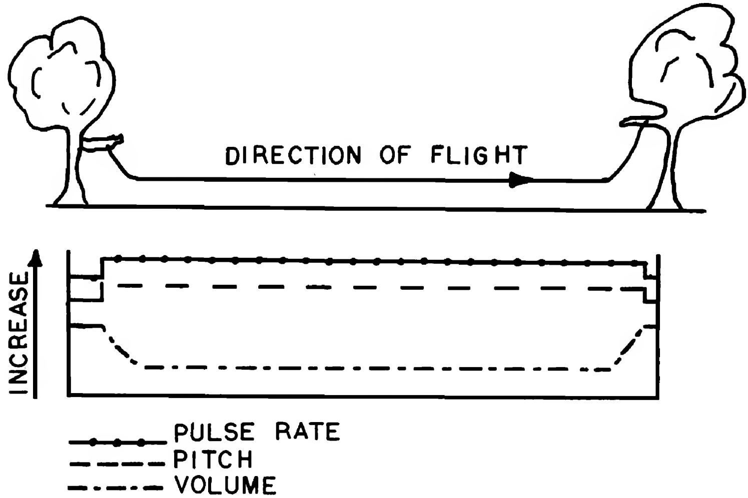


Figure 3. Diagram of flight path of Great Horned Owl and simultaneous signal changes that result from the spreading of the two loop antennas that also serve as a harness. Distance, direction, and speed of flight and location of the bird can be determined remotely by audio signal change. From Dunstan, 1970.

Receiving Systems

I used four different receiving systems that varied in ability to be moved and receiving and directional characteristics. My comments will be based on the use of several Model 11-S Tracking Receivers (AVM Instrument Co.) working above 100 MHz. Changes in signal strength, pulse rate, and frequency detected by the receiver enabled me to determine the occurrence of flight (Fig. 3), preening and feeding from a perch, in addition to orientation to the receiving system. A signal of constant pitch, pulse rate, and frequency indicated that the bird was stationary.

Four receiving systems were used: (1) hand-held portable, (2) temporary fixed station, (3) receiver-equipped ground vehicle, and (4) receiver-equipped aircraft (Fig. 4).

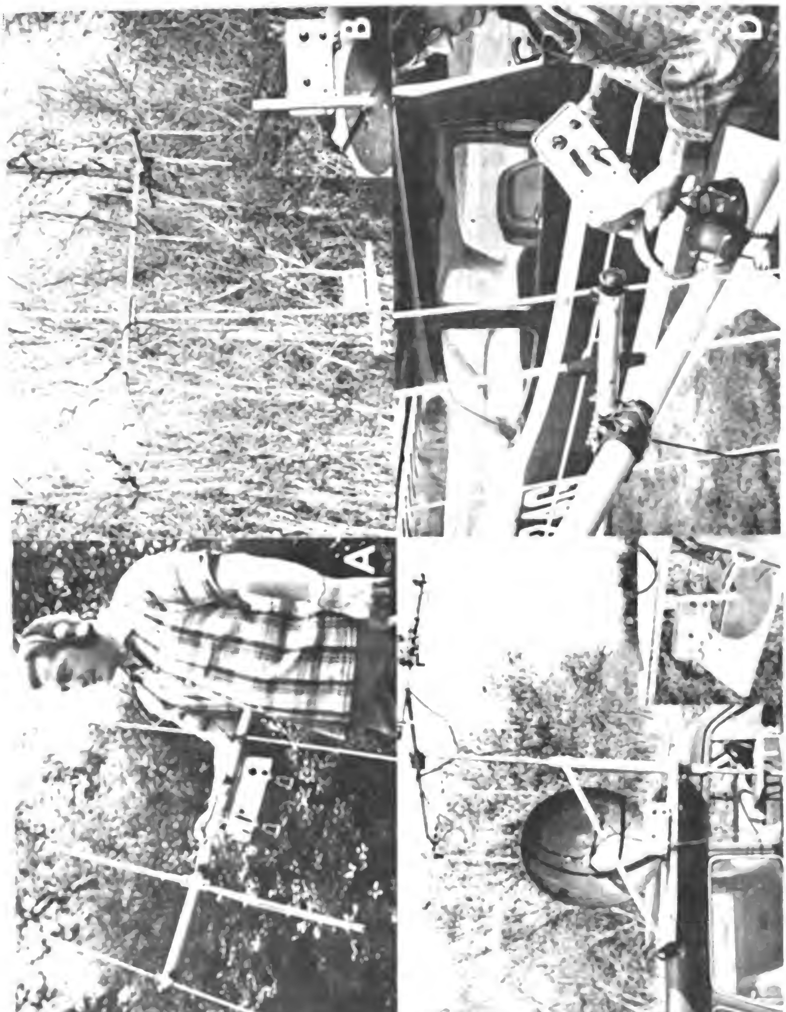
The hand-held system (Fig. 4a) consisted of a receiver and a three-element yagi antenna. This system was used when working from a blind, canoe or boat, or when on foot, and gave the poorest reception and directivity. Birds were detected at distances up to 1½ miles.

The temporary fixed stations (Fig. 4b) had two three-element antennas wired for a signal null or one eight-element antenna. The antennas were supported by vertical masts of various heights. A compass rose and needle were built into the support structure and oriented to true north. Stations were positioned at elevated places around the periphery of the study area. For example stations for Bald Eagles were spaced within two miles of the active nests and antennas were placed on top of tall red or white pine trees (*Pinus resinosa* and *Pinus strobus*, respectively), forest watch towers, and on 40-foot masts positioned on high hills. Readings were taken simultaneously from different stations by a team of field personnel and the locations of birds were determined by plotting two intercepting lines. These fixed stations provided accurate locations and readings were more consistent than those from other systems. Signals were received up to 20 miles.

The receiver-equipped ground vehicle system (Fig. 4c) can be moved more rapidly and provided accuracy of one degree at ¾ mile. Either two three-element yagi antennas wired for a null signal or one 14-foot eight-element yagi was mounted on an automobile. The nulling arrangement was used for monitoring activities of birds within a territory or home range and gave sharper directivity than two yagi antennas wired for a signal peak. The single eight-element antenna was used for tracking high flying birds over long distances and for this purpose was superior in reception and directivity to the double antenna arrangement.

The increased mobility was necessary for following low flying birds such as owls over long distances. Birds flying above tree top level (approximately 80 feet) such as the buteos were easily followed and signals were received at ranges up to 20 miles. Signals from soaring hawks and eagles were good at 15 miles and the rhythm and tightness of the circle flights could be determined by counting the signal peaks per unit time.

A car-top carrier and antenna mounts can be fitted to almost any model of



vehicle. A compass rose and needle were attached to the window portion of the automobile and the antenna was turned manually (Fig. 4c).

The receiver-equipped aircraft was used to locate birds out of signal range. Either one or two yagi antennas were mounted on high or low fixed-wing airplanes (Fig. 4d). Occasionally an antenna was held out a window. Double antennas were directed forward and mounted at 30 degrees from vertical (Fig. 4d). When checking over large areas (100 square miles) the antennas were directed at right angles to the airplane. Antennas were wired for maximum signal reception and birds were located by maneuvering the airplane.

Birds nesting or roosting on the ground or hunting low in densely wooded areas or hilly terrain were sometimes difficult to detect without an airplane. Birds roosting within 10 feet of the ground and tagged with transmitters with loop antennas could be detected at a distance up to 12 miles from an airplane flying at an altitude of 2,000 feet. One Bald Eagle tagged with a transmitter with a whip antenna was detected soaring at an altitude of 300 feet. The tracking plane was 38 miles away and flying at an altitude of 2,000 feet. I seldom used an airplane except during the dispersal periods or when trying to locate birds temporarily out of signal range.

Acknowledgments

The author wishes to acknowledge the technical assistance of William W. Cochran during portions of the various radio telemetry studies that I have conducted. Financial support was provided by the Zoology Department of the University of South Dakota, the Department of Biological Sciences of Western Illinois University, the Western Illinois University Research Council, and the Frank M. Chapman Memorial Fund of the American Museum of Natural History. M. Kent Froberg and Steve Sample aided in field work. Byron E. Harrell provided constructive criticism on procedures and techniques during the initial studies on owls. E. Bruce Holmes read and offered constructive criticism of the manuscript.

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Figure on opposite page.

Figure 4. Radio-tracking systems used for raptor studies: (a) hand held system, (b) temporary fixed station, (c) receiver-equipped ground mobile, (d) receiver-equipped aircraft. Insets show compass rose and needle arrangements.

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(Manuscript received April 15, 1972.)

AN ACCOUNT OF TRIO NESTING BY YEARLING SNOWY OWLS IN CAPTIVITY

by
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In July, 1970, nestling Snowy Owls were collected on St. Lawrence Island, Alaska. They were two to three weeks of age at this time. They were acclimated to captivity (Flieg and Meppiel, 1971) and were easily sexed after they assumed their first plumage; the males were finely barred while the females were heavily barred with black. The birds, two males and four females, were first kept in a large aviary and then the six birds were transferred to a small aviary 15x10x12 feet. On June 8, 1971, an egg was discovered in the cage. Courtship feeding was observed. One male began dancing and hooting around the laying female, all the while holding a mouse in its beak. The courtship was consumated by feeding her the mouse. An egg was laid on June 9 and on June 12 four eggs were evident. On June 14 a second female began nesting but was courted only by the aforementioned male. Both females had the feathers of their rump disarranged although no copulation was observed. A total of six eggs were in the cage on June 14; there were 10 eggs on June 22. There was no aggressive behavior in the enclosure between the nesting birds and the other owls which paid no attention. The two nests were about 1½ feet apart and eggs were exchanged back and forth freely until the birds settled down to serious incubation.

The breeding male then began feeding another male. All eggs were infertile, but the age of the breeding birds is significant as to my knowledge this has never before been recorded. If there is any information on early breeding of Snowy Owls, I would hope that fellow members would kindly send your sources and observations to us at the address above.

Reference

Flieg, G.M. and P. R. Meppiel. 1971. Care and Feeding of Snowy Owls. *Game Breeders Gazette* 20(4)36, April 1971.

(Manuscript received August 30, 1972.)

UNUSUAL EGG PRODUCTION OF THE BARN OWL (*TYTO ALBA*) IN CAPTIVITY

by
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In 1969 I became Curator of Birds at the Brookfield Zoo in Chicago and at that time a pair of Barn Owls began to nest. In 1969 four clutches were produced in January, March, June and October, and 11 birds were produced out of about 28 eggs. In 1970 three clutches were produced and 16 young matured out of 18 eggs. In 1971 six young were produced from clutches in February and June.

In summary, nine clutches were produced in less than three years and 33 young were produced from about 70 eggs. This is indeed phenomenal considering that the young weren't removed from the parents until they were able to fend for themselves. In some instances the female was laying eggs with the juveniles present in the cage. No aggression was directed toward the juveniles by either parent during incubation.

(Manuscript received August 30, 1972.)

LETTER TO THE EDITOR: **POSSIBLE VACCINATION AGAINST ASPERGILLOSIS**

Sir:

A recent report from the Nuffield Unit of Comparative Medicine in London may possibly be of significance to those who keep raptors in captivity, whether for falconry or for research.

The report (*Journal of Zoology* 166(4):587, April 1972) describes successful attempts by Dr. G. R. Smith of the Nuffield Unit to produce immunity in mice to the fungus *Aspergillus fumigatus.* Dr. Smith achieved this by vaccinating the mice with either a sublethal intra-venous dose of washed living spores or a killed whole culture of *A. fumigatus.* The protection produced was only of short duration and depended upon the size of both vaccine and challenge doses but, nevertheless, the results are encouraging and suggest that effective vaccination of mice against aspergillosis might eventually be possible.

Aspergillosis is probably the commonest cause of death in captive birds of prey (Cooper, 1969; Keymer, 1972). Treatment with antifungal drugs has been tried with some apparent degree of success (e.g., Beebe and Webster, 1964; Glasier, 1968), but have been hampered by the difficulties of an accurate diagnosis (Cooper, 1972). Control has therefore largely depended upon prevention, mainly by reducing the *Aspergillus* spore content in the bird's environment and, also, to some extent, the prophylactic administration of an antifungal aerosol. Such measures are probably of value but are certainly not the answer to the problem.

The purpose of this letter is to draw attention to Dr. Smith's work and to suggest that similar investigations into the vaccination of birds against *Aspergillus fumigatus* might prove of value.

Such work could commence in poultry and, later, if results proved at all encouraging, might be extended to raptors.

Yours faithfully,

John E. Cooper
Veterinary Services Division
P.O. Kabete, Kenya 24th July, 1972

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TRANSLATION:
A BRIEF REPORT ON VIRUS HEPATITIS IN THE EAGLE OWL*

by
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Sweden

Breeding of Eagle Owls (*Bubo bubo*) started a few years ago at some places in central Sweden. The purpose was to try to re-establish the Swedish Eagle Owl population. During late years several deaths have occurred among the owls at these breeding stations and this has threatened to spoil the results of the activity.

An application of the breeders for a grant to be able to continue their activity caused us to make a survey of the material of dead Eagle Owls, sent to the National Veterinary Institute in Stockholm (SVA) for examination. This survey revealed the following.

During the time 1948-1971, about 85 dead Eagle Owls had been received at SVA for post mortem examination. Roughly three fourths of the owls had been found dead in nature, the remaining ones originating from breeding stations, zoological gardens, etc. The material consisted of about as many male as female birds.

Causes of death of different kinds were found among the owls, e.g. mercury (methyl mercury) poisoning (tables in other parts of the report), traumatic injuries, malnutrition, and infectious diseases.

Of particular interest concerning the breeding and releasing of Eagle Owls was the finding of a disease, characterized by miliary necroses in the liver and other intestinal organs. This disease was primarily found in owls from breeding stations.

The Eagle Owl disease is incompletely known as concerns ways of spread, etc. However, a disease morphologically similar to the Eagle Owl disease was briefly described a few years ago as a specific virus hepatitis in owls at Schonbrunn's zoological garden.

Among the Eagle Owls sent to the SVA, virus hepatitis was twice found in 1956, thus in one owl originating from the vicinity of the town Sala (ca 100 km northwest of Stockholm), and in one from the vicinity of the town Orebro (ca 200 km west of Stockholm). These two owls were obviously found dead in na-

***Editors' Note**: This is a translation of an appendix of an annual mimeographed report of The National Veterinary Institute, Stockholm, Sweden (Statens Veterinarmedicinska Anstalt, Verksamhetsberattelse för Viltforsknungen vid SVA, 1.7.1970-30.6.1970, Bilaga VI, pp. 1-3, 1971). Some data included were added after the report was issued. We wish to thank Dr. Joseph Hickey for sending us a copy of the translation and to Dr. Karl Borg for permission to print it.

ture. They were also the only ones in the SVA material, dead of virus hepatitis during the period 1948-1966. During this time, in all about 50 Eagle Owls were submitted to SVA for examination.

The incidence of Eagle Owls suffering from virus hepatitis increased considerably since 1967. Thus, during the period 1967-1971, about 35 Eagle Owls were submitted to the institute. Virus hepatitis was found in 13 of these, all of which originated from breeding stations or zoological gardens. They are listed below.

August	1967	2 from Dala-Floda (350 km northeast of Stockholm)
May-June	1968	3 from Skansen Zoo, Stockholm
January	1969	1 from Dala-Floda
June	1969	1 from Skansen Zoo
December	1969	1 from Grabo (outside Goteborg, west Sweden)
September	1970	1 from Grabo
December	1970	1 from Geijersfors (350 km west of Stockholm)
January	1971	1 from Geijersfors
June-July	1971	2 from Skansen

(As is the case with most material submitted to SVA, the examinations of these owls were unprejudiced and as far as possible complete, yet without anything else of particular interest being found. Bacteriological examination was negative and only low residues of e.g. mercury were found.)

A few years ago, some Eagle Owls were imported to Sweden from England (Norfolk). Temporarily those owls were placed at Skansen, later to be distributed to breeding stations or to be released.

For several decades, Skansen has had a considerable number of Eagle Owls. As far as known, no case of virus hepatitis has occurred until the Norfolk owls arrived. It has appeared impossible to obtain accurate information, but obviously one or two of the deaths at Skansen hit Norfolk owls. The breeding stations at Dala-Floda, Grabo and Geijersfors seem to have had contacts with owls from Skansen or England. The source of the virus thus seems to be the same even if an indigenous source may not be excluded for sure. The SVA examinations indicate that the virus hepatitis may constitute a great menace to the breeding of Eagle Owls.

From one of the Skansen owls (July 1971), we succeeded in isolating a virus. This has been classified as a herpes virus. This virus was injected intramuscularly in one Eagle Owl, one Tawny Owl (*Strix aluco*) and one Buzzard (*Buteo buteo*). In less than 14 days, the Eagle Owl died, post mortem examination revealing lesions typical of virus hepatitis. Neither the Tawny Owl, nor the Buzzard showed any signs of disease. Some four to six weeks after injection, they were sacrificed, post mortem examination being negative.

REPORT:
RAPTOR PAPERS PRESENTED AT THE 1972 MEETING OF THE AMERICAN ORNITHOLOGISTS' UNION

Six papers dealing specifically with raptors were presented at the Ninetieth Stated Meeting of the American Ornithologists' Union, Grand Forks, North Dakota, 14-18 August 1972. The abstracts of those papers follow. The Editors of *Raptor Research* wish to thank the authors of the papers for the permission to print their abstracts. Each author should be contacted before information presented here is quoted.

Paper 29. Development of prey-recognition and killing behavior in hand-reared Sparrow Hawks. Helmut C. Mueller, Department of Zoology, University of North Carolina, Chapel Hill, North Carolina.

Nine hand-reared *Falco sparverius* were tested with a variety of models ranging from a ball of tissue-paper to a live mouse. Six birds showed no response to models or dead mice. The three birds that responded to models did so irregularly and in a manner interpreted to be play behavior. All nine birds attacked live mice, five of these within ten seconds of the presentation of the first live mouse. First attacks on live mice were well oriented and performed with considerable expertise. The only improvement seen was that birds learned to release mice that were grasped poorly before being bitten by the mouse. Essentially no improvement in the capture of mice was seen after no more than six encounters in any of the birds. The results suggest that the recognition of mice as prey and the attack and killing behaviors are largely innate.

Paper 47. Desert wintering Bald Eagles in Utah. Joseph B. Platt, Department of Zoology, Brigham Young University, Provo, Utah 84601.

The Bald Eagle (*Haliaeetus leucocephalus*) is found along river drainages and lakes throughout the United States during the winter. Their food habits, as determined from the literature, reflect this close association with aquatic systems.

About one hundred Bald Eagles winter in the desert valleys of west central Utah. There is no extensive open water in the wintering ground and, therefore, they have a strikingly different food base than other Bald Eagles. The diet of these desert wintering Bald Eagles approximates that of the Golden Eagle (*Aquila chrysaetos*). Blacktail Jackrabbits (*Lepus californicus*) are a staple food. Their food habits in relation to their winter habitat were discussed. A high percentage of the pellets or castings analyzed contained lead shot.

Paper 48. Application of radio-telemetric techniques to studies of strigiform and falconiform birds. Thomas C. Dunstan*, Steve D. Sample, and M. Kent Froberg, Department of Biological Sciences, Western Illinois University, Macomb, Illinois 61455.

Radio-telemetric techniques were used to study various aspects of the life histories of 17 species of birds of prey.

Methods of attaching transmitters to subjects were: (1) double body loop harnesses for both breast and back packages, (2) sutured rump package, (3) tail feather package, and (4) leg jess package.

Territories and home ranges of both breeding and wintering raptors as well as interspecific spatial and temporal relationships, and post-fledging activities of juvenile birds were determined.

Nest sites were located by (1) tracking captured radio-tagged prey, and (2) by locating nests in winter from an airplane and marking the locations with transmitters.

Paper 49. A Great Horned Owl banding program in Saskatchewan. C. Stuart Houston, 863 University Drive, Saskatoon, Saskatchewan.

Since 1946, over 1,950 flightless young Great Horned Owls have been banded by the speaker in Saskatchewan. This has only been possible as a result of wide publicity, first through a personal nature program on the local television station and, subsequently, through the nature column in the largest western Canada farm newspaper.

This study depended on public cooperation in reporting nests (as far as 323 road miles from Saskatoon) and in the cooperation of successive young banding assistants. Some of the latter have gone on to careers in biology and four have graduated to full banding permits of their own. Increased public interest in raptors and an appreciation of their value has resulted in a number of Saskatchewan communities.

Food contents in nests have been recorded and recently have been correlated with pellet analysis by Hugh C. Smith. There is suggestive evidence of a cause-and-effect relationship between changing food availability and brood size.

One hundred and forty-eight banding recoveries have demonstrated an unexpected southeasterly movement of some of these supposed year-round residents (as far away as Iowa and Nebraska), confirming Swenk's 1937 conclusions based on plumage studies.

Paper 50. Population and behavioral studies of the Saw-whet Owl in Arizona. R. Roy Johnson* and Steven W. Carothers, Prescott College Ecological Survey, Prescott, Arizona.

The habits and distribution of the Saw-whet Owl (*Aegolius acadica*) have previously been poorly known in Arizona, as well as throughout the Southwest. The records, as reviewed in *The Birds of Arizona* (Phillips, Marshall and Monson) are scattered both geographically and chronologically, with nesting data practically nonexistent. Records for adjacent areas in New Mexico, Colorado, Utah, Nevada and southern California are equally scarce.

In the winter of 1968-69 we rediscovered this species in central Arizona. A study of population densities and distribution, both elevationally and geographically, as well as breeding behavior was extended throughout the state during the 1969-70 winter. Although the literature commonly reports this owl as "tame", we do not find this in Arizona. During the winter of 1969-70 population densities were commonly 15-20 pairs per square mile (usually 16 pairs in good habitat), and as great as 40 pairs per square mile in the pine-oak woodland of the Sierra Ancha. Although vocalization is common throughout winter (rare in summer), study is often extremely difficult and collection sometimes impossible. Food in mid-winter consists partially of moths. Densities remained high through the winter of 1970-71 and crashed in 1971-72.

Paper 70. Effect of man on the nesting of raptors in shortgrass prairie. Richard R. Olendorff, Department of Ornithology, American Museum of Natural History, New York, NY 10024.

The extent to which man has played a role in the distribution of nesting birds of prey on the Pawnee National Grassland in northeastern Colorado is remarkable. The homesteaders of the late 1800's and early 1900's planted trees near their houses. These trees, now long abandoned by the homesteaders, are used by birds of prey as nest sites. The early settlers also made use of windmills and the overflow provided water for trees. Elaborate but unsuccessful attempts at irrigation and water management were made decades ago and cottonwood trees got started along ditches and small water impoundments in usually dry stream beds.

These trees have had their greatest effect on birds of prey now nesting in pure grassland areas where trees did not exist before white men came to northeastern Colorado. About 68 percent of the Ferruginous Hawks nesting in pure grasslands nest in situations man has created in the last 100 years. Similarly, 98 percent of the Swainson's Hawks nest in trees man purposely or inadvertently planted in pure grassland areas. Considering all grassland habitats (grasslands, bluffs, creek bottoms, and cultivated land), 41 percent of the Ferruginous Hawks, 40 percent of the Swainson's Hawks and nine percent of the Golden Eagles now nest in situations created by man. None of the Prairie Falcons or Red-tailed Hawks do so in the area under study.

Quantitative analyses of differential utilization of the shortgrass prairie by nesting birds of prey and use of different supporting structures by the raptors were presented. The success (fledglings per nest) in each habitat, type of structure, and type of man-created situation was given.

Heintzelman, Donald S. 1972. *A Guide to Northeastern Hawk Watching.* Lambertville, N.J.: Privately published by the author. 64 p. 5¼x7¾". Paper covers. 11 photos, 5 figures and 7 maps. $1.75 postpaid. Order from Donald S. Heintzelman, 35 Church Street, Lambertville, New Jersey 08530.

We are provided within the covers of this new booklet with a service, i.e., with detailed travel directions to 22 good points for observing migrating birds of prey. Scattered from Maine to Virginia, these lookouts include such popular points as Hawk Mountain Sanctuary (Pennsylvania), Cape May Point (New Jersey), Assateague Island (Maryland), and little-known places such as Tuscarora Mountain (Pennsylvania), Mendota Fire Tower (Virginia) and many others. The descriptions of the lookouts are the strength of the publication.

Other portions of the work are extremely basic, yet adequate within one's general idea of a "guide." Brief discussions of spring and autumn hawk migrations, weather, field equipment, and identification will, perhaps, stimulate the casual hawk watcher to pursue this outdoor activity further.

Most of the 11 photographs are excellent, but one blurred shot of a Sharp-shinned Hawk should never have been published. Another illustrating the proper way to hold a pair of binoculars may insult most readers' intelligence. The figures and maps are well prepared, except for one very poor attempt to depict hawk silhouettes. One of the most useful suggestions is a "hawk migration data sheet" which is accompanied by directions for its use. Beginners (and some professionals) need such encouragement to take detailed, quantitative field notes.

In general, *A Guide to Northeastern Hawk Watching* is a booklet which people in the eastern United States will use not only en route to the lookouts, but at the observation points as well. If you are looking for a detailed technical discussion of hawk migration, this is not the place to look. If, however, you want to know when and where to watch hawks on migration, this publication is a must. *Richard R. Olendorff.*

REPORT:
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NOTES, NEWS, AND QUERIES

Publication Date of Summer Issue, 1972. Volume 6, Number 2, Summer 1972, of *Raptor Research* was officially published December 29, 1972. Supplements A and B were published the same day.

R.R.F.'s New Letterhead and Cover Picture for *Raptor Research.* Now that considerable discussion of our cover picture has developed, we would like to give you the details of its origin. This Prairie Falcon must be one of the most aggressive birds in Colorado. She was banded several years ago and occupies an extremely overhung eyrie near a paved highway. It is suspected that the accessibility of the cliff, but the inaccessibility of her offspring, has resulted in her aggressiveness. She is always successful at fledging young and meets every intruder with the attitude caught on camera by Babette Cranson of LaJunta, Colorado. Robert Katona of Denver, Colorado, used Miss Cranson's photograph as the basis for the drawing.

The falcon is in a banked turn which led to a low-angle stoop at the photographer. This gave a foreshortened appearance and the rounded, irregular shapes of the wings. We wish to thank both Babette Cranson and Robert Katona for their fine work in the field and in the studio, respectively.

Conference on Raptor Conservation Techniques, March 22-25, 1973. Members will have received further information on this conference by the time this issue is received. The program promises to be a very interesting one. Please note that the dates in March are different from those in our earlier notice.

Disease Transmission Problems in Raptors. An example of this general problem is shown in the translation of a report from the Swedish National Veterinary Institute on virus hepatitis in Eagle Owls reprinted on pages 104-105 of this issue. In this connection one of the authors, Dr. Karl Borg writes, "Because of these findings, I have advised our authorities not to permit further importation of Eagle Owls to Sweden, and as well recommend restrictions in releasing owls from the breeding stations." This and the import restrictions because of Newcastle's Disease point up the importance of this general subject to work on raptors.

Second Conference on Captivity Breeding of Raptors. The Raptor Research Foundation sponsored a two-day conference on November 25-26, 1972 at Sioux Falls, South Dakota. Notification was sent to all we knew were interested in the subject. It was decided to have the meeting separate from the Conference on Raptor Conservation Techniques in order to complete it before the initiation of the breeding season. A report on this meeting will be forthcoming.

Breeding Project Information Exchange—Change of Procedures. Those present at the conference on captivity breeding decided that we should revert to our earlier pattern of circulating reports in an informal manner as quickly as possible to interested members, and not to put them in *Raptor Research* except in a brief summary form; those that may be of general interest may be rewritten for formal printing.

Thirty-two reports sent out or distributed in connection with the conference were renumbered as BPIE 42-73. Four additional BPIEs (74-77) were sent to all our mailing list that we know or we thought might have special interest in captivity breeding along with a form to be returned to receive future numbers. Because of the expense involved, the BPIE can only be sent to those who contribute at least $2 above the minimum contribution when dues requests are sent out for 1973. Anyone who wishes to be on this list that we did not contact may send their request to the RRF office. Items for BPIE should be sent there also.

Request for Information and Assistance. I am trying to determine the whereabouts in captivity of egg laying Hawk Eagles *Hieraaetus spilogaster/fasciatus* (African or Bonelli's Hawk Eagle) as I would like to try artificial insemination from an imprinted male now in my possession. Anyone with information, a suitable bird, or interest in this project please contact: John C. Snelling, Cornell Laboratory of Ornithology, 159 Sapsucker Woods Road, Ithaca, NY 14850.

Dr. Cade Appointed Chairman of Captivity Breeding Committee. Donald V. Hunter, Jr., who has been Chairman of this Committee since its inception, has passed on the leadership to Dr. Tom Cade, RR 1, Dryden, NY 13053. BPIE circulation will continue from the office in South Dakota.

A Grazing Protest for the Eagle Killers. In hearings before Senator Gale McGee's (Wyoming) Appropriations Subcommittee last August, it was revealed that a number of powerful Wyoming wool growers had hired airborne gunners to shoot American Bald and Golden Eagles.

James Vogan, a pilot for Buffalo Flying Service in Buffalo, Wyoming, admitted to the Subcommittee that he had participated in killing of an estimated 570 eagles. In doing so, he implicated Herman Werner, owner of a number of Wyoming properties, including the Bolton Ranch, Inc., in Casper, where much of the killing was done. When the news broke, citizens throughout the country condemned the killings and demanded swift and adequate punishment for them.

A recent check of the records reveals that those primarily implicated in the killings of the country's national symbol have gone unpunished, although some minor functionaries have been minimally fined. Pilot Vogan, who was granted federal immunity in exchange for his testimony, is the only major participant who has thus far been affected. He has been charged under Wyoming State law, though it is questionable whether that charge will stand in light of the congressional immunity which he was granted. The main perpetrators of the killings (i.e. Werner and the other woolgrowers who hired the pilots and gunners), however, remain unpunished.

Another startling fact in the case is that Werner and the other involved woolgrowers hold grazing permits and licenses which confer grazing privileges on federally-owned land under provisions of the Taylor Grazing Act. Despite the fact that some, if not all, of the killings apparently took place on these federal lands, Werner and the rest continue to use the land just as they always have, without regard to the rules of the license.

In response to an application by Werner to renew his federal grazing rights, the National Wildlife Federation recently filed a petition of Intervention and Protest with the District Manager, Rawlins Grazing District, Bureau of Land Management in Wyoming, objecting to the renewal of a grazing license to Herman Werner and the Bolton Ranch, Inc. The protest is based on a Taylor Grazing Act clause which requires that the licensee comply with the "rules and regulations . . . approved by the Secretary of the Interior." Included in the rules are the laws prohibiting the taking of American Bald or Golden Eagles without a permit. Werner and the rest blatantly violated these rules by wantonly slaughtering a vanishing species. The National Wildlife Federation sees no reason why they should now be rewarded by the Government with the use of federally-owned lands.

Several interesting sideline developments may result from the situation. The Governor of Wyoming and the Wyoming Wool Growers Association have announced plans to conduct their own predator control program. This lands squarely on top of a recent announcement on the Dick Cavett television show by Interior Secretary Rogers C. B. Morton that will end the Federal Government's controversial program of killing predator animals by widespread poisons. "I think hopefully this year we will get . . . out of the killing business," Morton said. He added that a bill has been drafted and probably will go to Congress in "the first quarter of this year." (From *Conservation News* 36(27):11, February 1, 1972.)

Falconry Stirs Controversy in Hearings on Eagles. In testimony before the Senate Commerce Committee's Subcommittee on the Environment, June 29, 1972, almost every representative of the Federal Government and concerned organizations agreed on the need to provide stronger penalties for those who kill eagles. H.R. 12186 and S. 2547 provide stiffer penalties for assaulting eagles while H.R. 14731 provides enforcement power to prevent shooting or hunting from aircraft. But it was a provision in H.R. 12186, giving the Secretary of the Interior the power to permit the taking of Golden Eagles, their eggs or nests, "for the purposes of falconry," which stirred up a controversy.

Robert C. Hughes, Chairman of the Sierra Club's National Wildlife Committee, charged ". . . this provision is needless and completely violates sound wildlife protection principles." Cynthia Wilson of the National Audubon Society expressed concern that "this is a loophole which will be difficult to enforce and will encourage the use of Golden Eagles for falconry, particularly by taking young illegally from the nests."

Speaking to the unstated justification for the provision which allows that some eagles may be doing enough damage to persons and/or property to warrant their removal from their habitat—not by killing but by turning them over to falconers, she countered "If someone is going to take the trouble to capture a live Golden Eagle which is allegedly depredating livestock, why not 'transplant' it to some other area or give it to a zoo with suitable facilities for caring for it?"

Nathaniel P. Reed, Assistant Secretary of the Interior for Fish and Wildlife and Parks, seemed to be satisfied with the pending legislation when he testified "The legislation we have under discussion today would correct a number of loopholes and provide more effective protection for some of our majestic wildlife species." Calling the authority to allow the "use of Golden Eagles for the sport (of falconry) a significant step in progressive wildlife management," Reed urged passage of H.R. 12186.

Charles W. Harry, representing the American Falconers Association, observed that "The key to safe utilization of Golden Eagles in falconry appears to lie in the selection process determining who should possess them." In dismissing the threat of harm to persons coming in contact with the captive Golden Eagle, Harry claimed that unlike regular household pets, such as the dog, the "danger from an eagle is primarily pointed towards the owner or falconer." He concluded his testimony with statements from expert sources in the Federal Government and prominent conservation organizations, such as the National Wildlife Federation's Kenneth R. Hampton who said, "The National Wildlife Federation endorses in principle the sport of falconry provided it is properly regulated and does not involve the removal of endangered species from the wild except for specified purposes under permit." (Testimony before the Subcommittee on Fisheries and Wildlife Conservation of the House Committee on Merchant Marine and Fisheries with reference to the protection of hawks, eagles, and owls.) (From *Conservation Report,* 92nd Congress, 2nd Session, No. 23, p. 253, July 21, 1972.

Artificial Insemination of Raptors. The first successful artificial insemination of a Golden Eagle was recorded on May 18 by James Grier of the Laboratory of Ornithology, Cornell University. Appropriately on Mother's Day, a second artificially-inseminated egg hatched, this time through the research work of Dr. Frances Hamerstrom, a Wisconsin wildlife biologist. According to wildlife authorities, these successful hatchings herald a big breakthrough for the eventual re-establishment of various wildlife populations threatened with extinction. (From *Conservation News* 37(15):13-14, August 15, 1972.)

Bald Eagle Survives Shooting, Information Rewarded. An immature Bald Eagle has regained its freedom and a $500 reward for information leading to the conviction of a person for shooting the eagle has been given to a Wisconsin man by the National Wildlife Federation.

Gary Buss, of Colfax, Wisconsin, was awarded the money by the NWF after witnessing the October, 1971 shooting of a young Bald Eagle near his home. After observing the shotgun shooting of the bird, which was perched on a tree, Buss reportedly intercepted the defendant and informed him that he had shot an eagle. The defendant reportedly denied it, saying that "It was just a hawk." "After he had shot, however, he did not even look at the downed bird," Buss noted. Buss then notified U. S. Bureau of Sport Fisheries and Wildlife authorities. The defendant was later fined $100 in a Madison, Wisconsin federal court.

Unlike several other eagles that have been shot in the area in recent months, the fortunate eagle survived. The bird was immediately taken to nearby Chippewa Falls and its injured right wing was treated by Dr. Charles Kemper, an amateur ornithologist. Two months later, the healthy bird was released near the Necedah National Wildlife Refuge in Wisconsin.

The reward was the second to be given under a nationwide reward program started by the NWF in 1971. Although it has been against federal law to shoot Bald Eagles since 1940, the National Wildlife Federation reward program was started in 1971 as the result of the revealed mass slaughter of eagles in Wyoming.

According to wildlife management experts, the future for the nation's symbol is looking increasingly bleak. The total in the lower 48 states is estimated to be as few as three to four thousand birds and the use of hard pesticides and diminishing habitat continue to take their toll. The southern subspecies of Bald Eagle found in the eastern half of the United States is already classified as an endangered species by the U. S. Interior Department.

The National Wildlife Federation continues to offer a $500 reward upon verification that the claimant's information was substantial assistance in obtaining a conviction for shooting a Bald Eagle. The claimant must request the reward in writing to the National Wildlife Federation, 1412 Sixteenth Street NW, Washington, DC 20036, within six months after conviction. If more than one Bald Eagle was shot by the convicted person, $500 will be awarded for the one bird representing the total number shot. (From *Conservation News* 37(10):10-11, June 1, 1972.)

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