ONTARIO Bird Banding

VOL 6, NO.1 MARCH, 1970

Donated in memory of
John O.L. Roberts

ONTARIO BIRD BANDING ASSOCIATION

Officers for 1970

PRESIDENT	D. H. Baldwin, 47 Duggan Avenue, Toronto 7, Ontario.
VICE-PRESIDENT	G. Page, 5 Gordon Avenue, Agincourt, Ontario.
VICE-PRESIDENT	Dr.A.Salvadori, Dept. of Mathematics, University of Guelph, Guelph, Ontario.
SECRETARY	Miss A. Wasserfall, 22 Roycrest Ave. Willowdale, Ontario.
TREASURER	W.J.R. Wasserfall, 22 Roycrest Ave. Willowdale, Ontario.
OTHER OFFICERS	J.O.L. Roberts, 22 Rowanwood Avenue Toronto 5, Ontario.
	R. Cubitt, 28 Rockport Crescent, Richmond Hill, Ontario.
	D. Barry, Group 15, Box 17, R.R.#3, Bowmanville, Ontario.

The aims of the Ontario Bird Banding Association are the study of birds with emphasis on banding and other marking techniques, the promotion of ornithological investigations, the publication of scientific and educational papers pertaining to ornithology,and cooperation with organizations with similar objectives. Particular emphasis is placed on studies within the Province of Ontario. Focal points for field activities are the Long Point and Point Pelee Bird Observatories.

ONTARIO BIRD BANDING

Published quarterly by The Ontario Bird Banding Association.

Vol. 6, No. 1. March 1970

CONTENTS

BREEDING SEASON OBSERVATIONS OF SAW-WHET OWLS IN ALGONQUIN PROVINCIAL PARK
- by John G. Woods 1 - 5

DISEASES DIAGNOSED IN FREE-LIVING WILD BIRDS
- by Lars Karstad 6 - 17

THE EFFECT OF WEATHER FACTORS ON CARDINAL SINGING BEHAVIOUR
- by G. L. Holroyd 18 - 28

BREEDING SEASON OBSERVATIONS OF SAW-WHET OWLS IN ALGONQUIN PROVINCIAL PARK

John G. Woods

POST OFFICE BOX 115, GUELPH, ONTARIO.

The breeding biology of the Saw-whet Owl, *Aegolius acadicus* (Gmelin), is largely unknown. A few workers have made repeated visits to nests (Granfield, 1937; Santee and Granfield, 1939; and Terrill, 1931), but most published records are single observations of individual nests or of flightless young. No studies appear to have been conducted on a natural breeding population, nor have substantial populations been reported in the literature except in a commentary fashion. Therefore, it is of considerable interest that a potentially significant population of Saw-whet Owls exists in Algonquin Park (District of Nipissing) during the breeding season.

Although no systematic census has been made of this species in the Park, records of observations have been made of this species in Algonquin Park Nature Museum (now called the Visitor's Centre) operated by the Ontario Department of Lands and Forests since the 1950's. These records and my personal observations (1968-1970) are summarized in table one. Since there is little information on the timing of nesting in Ontario for the Saw-whet Owl the choice of presenting the data for the months of April, May and June is somewhat arbitrary. However, that this probably encompasses the main breeding period is evidenced by egg dates of five nests from Ontario County, Ontario, centring around the second week of April (unpublished data, J.A.Edwards, Ontario Nest Records Scheme) and by the one known nest in Algonquin Park with three eggs on May 29th, 1946.

MacLulich (1938) speculated that the Saw-whet Owl was probably more common in Algonquin Park than the few records at that time indicated. At present the irregular nature of the observations allows us to say little more except that these owls are at least fairly regular in some areas of the Park. Canisbay Lake is the only area to receive continuous attention for a number of years (1967-1970) and Saw-whet Owls have been located here each year during the breeding season. Since as many as three birds have been heard on a single night in the Swan-South Tea Lake region, the population may at times be relatively large. As is indicated in the table almost all of the records have been of calling birds. My observations indicated that calling is at a peak from May to mid-June although birds have been heard in the late summer and in the late winter (R.J.Rutter, personal communication.)

In light of the relative accessibility of this region by canoe, logging roads and highway 60, Algonquin Park would seem to offer a good location for population and possibly nesting studies of this species. Preliminary observations have shown that calling birds may be fairly easily located at night with a flashlight and that calling Saw-whet Owls may on occasion be attracted to tape-recordings of their calls. Data is badly needed in every phase of the life history of this species and studies of the population in Algonquin Park would undoubtedly prove exceedingly worthwhile.

I gratefully acknowledge the help of Mr. R. D. Strickland of the Department of Lands and Forests for access to the bird files of the Algonquin Park Nature Museum.

LITERATURE CITED

Granfield, William M. 1937. Nesting of the Saw-whet Owl. Condor 39(5) : 185-187.

MacLulich, D.A. 1938. Birds of Algonquin Provincial Park, Ontario. Contributions of the Royal Ontario Museium of Zoology 13 : 47.

Santee, Richard and William Granfield 1939. Behavior of the Saw-whet Owl on its nesting grounds. Condor 41(1) : 3-9.

Terrill, L MC I. 1931. Nesting of the Saw-whet Owl (*Cryptoglaux acadica acadica*) in the Montreal District. Auk 48(2): 169-174.

Saw-whet Owl, Long Point, Ontario, October, 1970.

Observations of Saw-whet Owls during April, May and June in Algonquin Provincial Park, Ontario.

Location	Date
Heron Lake (F)	late May, 1965
Mile 1.2, Hwy 60 (F)	5 May, 1969
Mile 2.2, Hwy 60 (F)	5-6 May, 1969
Mile 2.7, Hwy 60 (F)	30 May, 1967
South Tea Lake (P)	15 May, 1968
Swan Lake (P)	30 May- 1 June, 1968
Swan Lake (P)	5 May, 1969
Smoke Creek (P)	30 May, 1967
Rose Lake (P)	26 May-1 June, 1969
Rose Lake (P)	20 May, 1970
Burnt Island Lake (M)	11 June, 1965
Joe Creek (H)	11 June, 1965
Canoe Lake (P)	1 June, 1968
Mile 14, Hwy 60 (C)	7-11 May, 1969
Canisbay Lake (C)	1 June, 1967
Canisbay Lake (C)	1 June- 17 June, 1968
Canisbay Lake (C)	13-16 May, 1969
Canisbay Lake (C)	29 April- 28 May, 1970
Cache Lake (C)	May- June, 1962
Cache Lake (C)	15 May, 1969
Bat Lake (C)	24-29 May, 1946
Lake Sasajewun (C)	1 June, 1958

F = Finlayson Township
P = Peck Township
M = McLaughlin Township
H = Hunter Township
C = Canisbay Township

Observer	
?	(1) heard *
J. G. Woods	(1) heard **
J. G. Woods	(1) heard **
?	(1) heard *
?	(3) heard *
J. G. Woods et al	(3) heard **
J. G. Woods	(1) heard **
?	(1) heard *
P. Pratt et al	(2) heard **
Mike Bradstreet	(1) heard **
R. J. Rutter et al	(1) heard *
R. G. Tozer	(1) heard *
J. G. Woods	(1) heard **
J. G. Woods	(1) heard **
?	(1) heard *
J. G. Woods et al	(1) heard **
J. G. Woods et al	(1) heard **
J. G. Woods	(1) heard **
R. Oldham	(+) heard *
J. G. Woods et al	(1) heard **
D. Muir	nest *
G. Bennett	(1) trapped *

* = records of Algonquin Park Nature Museum

** = records and personal communications of J.G.Woods

DISEASES DIAGNOSED IN FREE-LIVING WILD BIRDS

Lars Karstad

SECTION OF ZOONOSES AND DISEASES OF WILDLIFE

ONTARIO VETERINARY COLLEGE

UNIVERSITY OF GUELPH, GUELPH, ONTARIO

Our laboratories provide diagnostic services in diseases of wildlife, both captive and free-living. Some specimens are submitted for examination, by members of the general public and by humane societies and zoological parks. Others are referred for examination by personnel of the Ontario Department of Lands and Forests.* The specimens on which diagnoses were made during the period 1961 to May, 1970, are summarized in Table I. Cases of no, or uncertain diagnosis, have been omitted. Disease conditions of relatively high prevalence, and some of unusual interest, are worthy of discussion.

SYSTEMIC BACTERIAL INFECTIONS

Salmonellosis: Salmonella typhimurium has been the most commonly identified bacterial pathogen. All cases of salmonellosis have occurred in House Sparrows, all in winter months, usually during periods of severe weather when birds are concentrated around backyard bird feeders. Specimens were submitted by persons who noticed ill and dead birds around their feeders. Ill sparrows were commonly described as being lethargic and "sitting huddled and fluffed out". Gross signs of

* The Ontario Department of Lands and Forest provides an annual grant to defray costs of this diagnostic service.

salmonellosis included skin pustules (Figure I) and abscesses in tissues of internal organs, especially the oesophagus, crop and intestines. It was often mentioned that other species using the same feeding stations were not affected. Most of the strains of S. typhimurium isolated were of a certain, relatively rare, phage type. This is evidence to support the idea that strains of this bacterium have become adapted to sparrows. The same phage type has been found associated with sparrows in Great Britain. Recently published reports of this infection in sparrows in Ontario have been made by Wobeser (1967) and Wobeser and Finlayson (1969) and in House Sparrows and Greenfinches in England by Cornelius (1969). Other reports of salmonellosis in sparrows in Great Britain and in the United States are cited in the paper by Wobeser and Finlayson.

The source of S. typhimurium in these cases is unknown. Since one specific phage type is most commonly involved, it seems probable that the sparrows themselves are the source of infection, that there are carriers of this organism in the population, and that mortality occurs under the combined influences of cold weather and concentration of birds at feeding stations.

Tuberculosis: Three cases of tuberculosis were diagnosed in Sparrow Hawks, one found dead, and two alive but in an emaciated and weakened condition.* One of these hawks had entered a house and had eaten a pet Budgerigar when it was found! This seems to be an example of a predator driven to an unusual act by disease and hunger.

Pasteurellosis: Pasteurella multocida was cultured from a young Screech Owl. This is the

---

* One of these cases was referred for examination by Dr. Howard Savage.

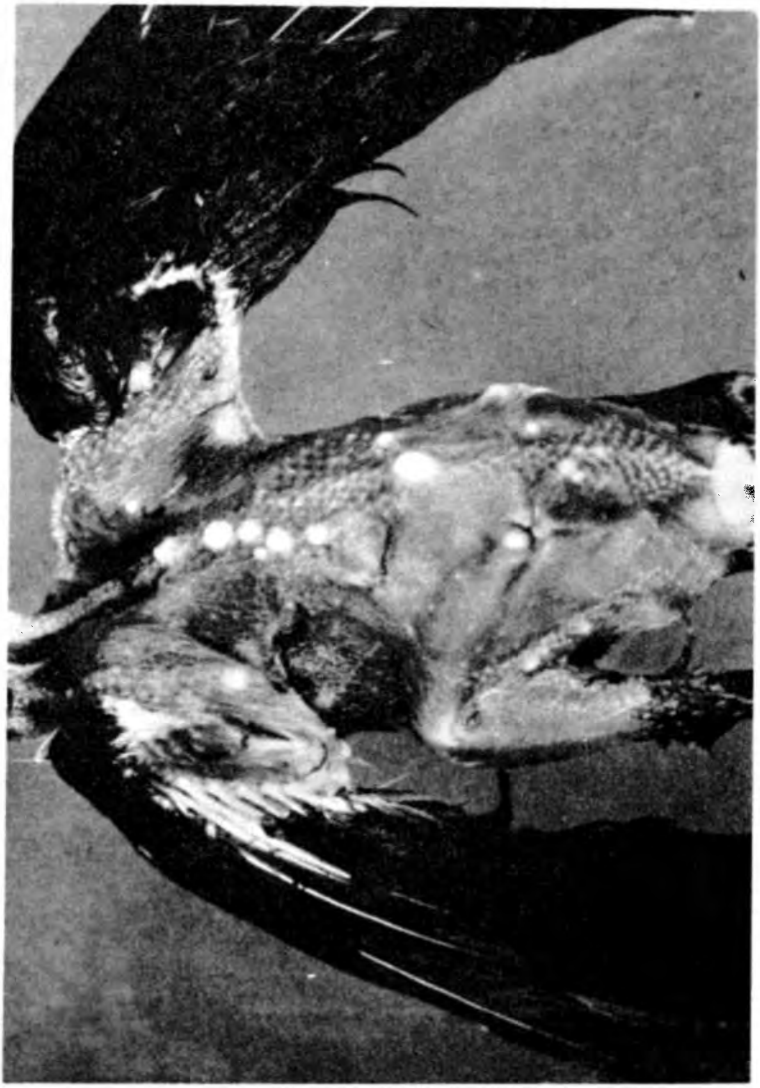


Figure I

House Sparrow infected with Salmonella. Note skin pustules, seen in a small proportion of cases.

bacterial organism which is of great importance as a cause of cholera in poultry and wild waterfowl. Extensive losses have occurred in free-living waterfowl in many parts of North America.

DISEASES OF THE CARDIOVASCULAR SYSTEM

Conditions in this category were rarely diagnosed. This is in marked contrast to studies of captive wild birds in which amyloidosis, arteriosclerosis, and myocardial infarction are among the most prevalent diseases.

DISEASES OF THE SKIN

Two conditions, mite infestations and pox virus infection were common causes of skin lesions. Most cases of mite infestation involved the legs and feet and were caused by mites of the genus Cnemidocoptes (Kirmse, 1966a,b). Birds most commonly affected were gregarious perching species, such as Red-winged Blackbirds and Common Grackles. One case of infestation with Harphyrhynchus mites was found in a Cowbird. This bird had pea-sized yellowish, tumour-like masses scattered over the whole body.

Pox virus infections were diagnosed in 18 species of wild birds. Most cases appeared as one or more nodular tumorous skin growths on the unfeathered parts of the body—the feet and legs, eyelids and base of the bill (Kirmse,1966c). Sometimes lesions occurred inside the mouth (Figure 2). Most of the birds with mite or pox infections were otherwise healthy.*

Experience with some birds held captive indicates that mite infections persist and the skin lesions

---

*Many of these birds were brought for examination by interested bird banders whose assistance is gratefully acknowledged.

Figure 2

Yellow Shafted Flicker with a pox lesion in the mouth become larger during the life of the bird, while pox lesions may persist for several weeks or months and then eventually the nodules slough and the skin heals (Kirmse, 1967). Neither disease is considered to be an important mortality factor. In some cases, deaths may occur as a result of secondary bacterial infections.

One case of Collyriclum faba infection was diagnosed in a Brown Thrasher, found dead at Long Point. This parasite is a fluke which is carried in cysts in the subcutaneous tissues near the anus. Five cysts, the size of small peas, each containing a pair of flukes, were present in this bird. Since the bird apparently was dead a considerable length of time before it was examined, and postmortem changes were far advanced, it was not possible to determine the cause of its death. Recently Byrd (1970) described a case of C. faba infection in a Brown Thrasher in Virginia. He referred to one other report of the fluke in this species and commented "the fluke is known as a parasite of birds belonging to three orders, 15 families, 26 genera and approximately 37 species."

DISEASES OF THE DIGESTIVE SYSTEM

A variety of disease conditions were diagnosed affecting the digestive system. Most of the diagnoses of verminous enteritis and hepatitis of unknown cause were made in Ring-billed Gulls. The intestinal parasites were one or more species of flukes. Most of these gulls were diagnosed as cases of DDT poisoning.*

DISEASES OF THE NERVOUS AND MUSCULAR SYSTEMS

Protozoan parasites of the genus Sarcocystis

---

* Analyses for pesticides and other toxic substances were made by the Section of Toxicology, Ontario Veterinary College.

Figure 3

Fibroma in the throat of a Starling

(sarcosporidiosis) were found by P. Kirmse in all of a group of 17 Red-winged Blackbirds from Lake St. Clair. These were presumably healthy birds collected by Dr. M. Dyer of the Department of Zoology, University of Guelph. Sarcosporidiosis was diagnosed also in one mallard shot by a hunter. The pathogenic significance of this infection is unknown but it is probably minimal, since the parasite is usually just an incidental finding in otherwise healthy birds.

DISEASES OF THE RESPIRATORY SYSTEM

The most prevalent disease recognized affecting the respiratory system was Aspergillus infection. The 14 birds with aspergillosis were 1 robin, 2 Herring Gulls, 4 Ring-billed Gulls, 1 Mallard and 6 Black Ducks. The ducks were brought for examination by Marshall Field, from a flock which was presumed to have been exposed to a pile of discarded mouldy grain. Usually aspergillosis is seen as isolated or sporadic cases. This epizootic in ducks was, therefore, unusual.

DISEASES OF THE URINARY SYSTEM

Gout, recognized by the deposition of uric acid crystals in tissues, was diagnosed in 4 Ring-billed Gulls, and 1 Barn Owl. This is a disease which is often associated with stressful situations. The gulls had intestinal parasites and had elevated levels of DDT and its metabolites in their tissues. The Barn Owl had necrotic lesions in the pharynx which probably interfered with feeding.

MISCELLANEOUS CONDITIONS

The 23 cases of DDT poisoning were diagnosed in Ring-billed Gulls. Fluoride poisoning was diagnosed in two gulls found dead near the site of an industrial spill of a fluoride compound. Lead poisoning occurred in swans, geese and ducks which accidentally ingested lead pellets while feeding in areas contaminated with the shot of hunting. Lead poisoning is one of the most important causes of death of wild waterfowl.

Tumours (neoplasms) were not commonly diagnosed (Figure 3).

SUMMARY

Disease conditions diagnosed in free-living wild birds were tabulated for the period 1961 to May, 1970. Most of these specimens originated in Southern Ontario. Diseases of highest prevalence are discussed as to the circumstances of their occurrence and their potential as factors of mortality.

REFERENCES

Byrd, Elon E. 1970. The Brown Thraser, Toxostoma rufum (L), as a host for Collyriclum faba (Bremser). J. Parasit. 56: 195 - 196.

Cornelius, L.W. 1969. Field notes on salmonella infection in Greenfinches and House Sparrows. Bull. Wildlife Disease Assoc. 5: 142-143.

Kirmse, P. 1966a. A note on the value of museum specimens in the study of diseases in wild birds. Ontario Bird Banding 2: 29-30.

Kirmse, P. 1966b. Cnemidocoptic mite infestations in wild birds. Bull. Wildlife Disease Assoc. 2: 86-99.

Kirmse, P. 1966c. New wild bird hosts for pox viruses, Bull. Wildlife Disease Assoc. 2:30-33

Kirmse, P. 1967. Host specificity and long persistence of pox infection in the Flicker (Colaptes auratus). Bull. Wildlife Disease Assoc. 3: 14-20.

Wobeser, G. 1967. Salmonella typhimurium infection in House Sparrows. Ontario Bird Banding 3: 114-115.

Wobeser, G. and Margaret C. Finlayson. 1969. Salmonella typhimurium infection in House Sparrows Arch. Environ. Health. 19: 882-884.

SUMMARY OF DISEASES DIAGNOSED IN FREE-LIVING BIRDS 1961 - MAY,1970

	Number of Cases
BACTERIAL INFECTIONS, SYSTEMIC	
Mycobacterium tuberculosis	3
Salmonellosis	68
Septicaemia, Bordetella bronchisepticum	1
" , Escherichia coli	1
" , Pasteurella multocida	1
DISEASES OF THE CARDIOVASCULAR SYSTEM	
Amyloidosis	1
Haemorrhage, intracranial	1
Infarction, myocardial	2
DISEASES OF THE SKIN	
Fluke infestation	1

DISEASES OF THE SKIN (continued)

Granuloma	1
Mite infestation	14
Pox	46

DISEASES OF THE DIGESTIVE SYSTEM

Enteritis, general	3
Enteritis, verminous	11
Oesophagitis	1
Gastritis, verminous	7
Hepatitis, parasitic	1
Hepatitis, unknown aetiology	22
Histomoniasis	1
Impaction	1
Necrosis, liver	8
Parasitism, intestinal	25
Pharyngitis, necrotic	1
Tapeworms	1
Ulcer, gizzard	1

DISEASES OF THE NERVOUS AND MUSCULAR SYSTEMS

Necrosis, muscular	1
Neuronal degeneration	1
Sarcosporidiosis	18

DISEASES OF THE RESPIRATORY SYSTEM

Air saculitis	4
Pneumonia, Aspergillus infection	14
Pneumonia, other	3
Sinusitis	1
Syngamus trachea (gapeworm) infestation	6

DISEASES OF THE URINARY SYSTEM

Gout	6

MISCELLANEOUS

Abscess	1
Cyst (coccygeal)	1
Drowning	1
Gunshot	1
Leucocytozoonosis	1
Malnutrition	5
Neoplasms	2
Oil contamination	4
Peritonitis	2
Poisonings, D.D.T.	23
Poisonings, Fluoride	2
" , Lead	16
Trauma, accidental	18

THE EFFECT OF WEATHER FACTORS ON CARDINAL SINGING BEHAVIOUR

G. L. Holroyd

DEPARTMENT OF ZOOLOGY
UNIVERSITY OF TORONTO
25 HARBORD ST.,
TORONTO 5.

INTRODUCTION

This study is concerned with the effect of weather on the singing behaviour of the Cardinal (Richmondena cardinalis). External stimuli, especially light intensity, appear to cause daily fluctuations in singing activity (Scheer,1964; Craig, 1943; Dow, 1968). Other external stimuli affecting singing are temperature, humidity, vegetation, wind, preciptation and the presence of conspecifics (Armstrong, 1963). In this study, temperature, light intensity, precipitation and wind effects on Cardinal song behaviour were studied.

METHOD

The study area, locally known as Winnett's Swamp, is located in northern London, Ontario (43° 01'N 81° 15' W). This is close to the northern limit of the Cardinal's breeding range. The study area is roughly rectangular bordered by residential land on three sides and an "old field" on the other. The area is a dense tangle of shrubs, trees and vines, ideal for nesting Cardinals (D. M. Scott pers comm).

Daily censuses of the Cardinals were made from 19 to 25 March and on 1 April 1969, between 0810 and 0850 EST for period averaging 30 minutes each. An additional count was made on 19 March from 0915 to 0935 EST because of a rapid change in the weather. The censuses excluded the centre of the woods, but any birds singing there would have been heard. The song of the Cardinal often carried 100 yards.

The time, temperature, light intensity, cloud cover wind speed, wind direction, general weather conditions and number and location of singing Cardinals were recorded each day during the census. Temperature, to the closest degree centigrade, was taken using a 5" Fisher thermometer. Light intensity was measured by aiming a Sekonic Auto Leader light meter (Model 38) toward the sun. Readings of shutter speed were taken with ASA 400 and f8 held constant. These readings were then converted to lux using a Model 200 Photo volt Corp. light meter. Cloud cover was estimated in tenths. Wind speed was estimated using the Beaufort scale. The Cardinals' location when singing was mapped and the perch height estimated using 5' intervals.

OBSERVATIONS

Cardinals are resident locally throughout the year, moving up and down the adjacent Thames River in winter. By March, they are back "on territory", often maintaining the same territory in successive years (Peter Smith pers comm). Casual observations in January indicated bird song more frequently on sunny warm days than on inclement days. Singing was, however, less frequent in the winter than in the spring. By March, Cardinals appeared to be singing frequently.

All singing referred to here was done by males. Females were observed singing but not consistently enough to be included in this study.

There was a total of 11 territorial males in the census area as determined by singing location maps. All eleven were never heard on one census.

CENSUS METHOD

There appeared to be two possible methods for measuring quantitatively the singing behaviour. The choices were either to follow an individual and record the number of times it sang in a given period, or to census an area quickly to get a count of the number of birds singing. The first method proved too difficult. In the thick tangle of scrub bushes of Winnett's Swamp it was not possible to follow a single bird long enough to get sufficient data. A quick census each day, however, provided quantitative data which could be analysed. While the check was not instantaneous, each bird had only 4 - 5 minutes to sing before the observer had passed its territory.

RESULTS

Figures 1 - 4 show the various weather components plotted against the number of Cardinals singing. Regression coefficients were calculated for each method and their significance tested with the standard "F" test. Results are expressed as probability of degree of significance of the regression coefficient. Probability values equal to or less than .05 were accepted as statistically significant. A significant regression therefore indicates that the relation between the number of Cardinals singing and the various weather factors is due to chance in five times out of one hundred or less.

In Figure 1 is plotted the number of Cardinals singing and the temperature on each day. No significant regression coefficient could be determined. However, when the two widely divergent points (shown as triangles) were not used, a linear equation was derived. When tested, the coefficient showed a high degree of significance (Probability "P" is less than .01)

Figure 2, depicting light intensity and number of Cardinals singing, yielded a linear equation. In the test the coefficient was again highly significant ("P" less than .01).

Figures 3 and 4, which show the cloud cover and wind speed data, did not have significant regression coefficients (P is greater than .10 and P greater than .25 respectively), and therefore linear regression equations did not exist in either case.

DISCUSSION

Two of the four weather variables tested resulted in significant regression coefficients. Linear equation for both temperature and light intensity with number of Cardinals singing are plotted on figures 1 and 2 respectively.

As the temperature increased the number of birds singing also increased. From the equation $Y=1.49 + 0.87X$ (where Y is the number of birds singing and X the temperature in degrees centigrade) there would not be any birds singing at a temperature of -1.7° C or colder. This would be interpreted as the minimum temperature threshold for singing at this location in late March.

Nice (1943 cited in Armstrong,1963) found that Song Sparrows had a temperature threshold for singing which varied with the seasons. Cold temperatures inhibited song while warm temperatures were more stimulating. From the equation of figure 1, the temperature threshold for Cardinal song in late March at London would run from -1.7° C to 10.9° C. Over 10.9° C all eleven Cardinals may be expected to be heard singing during a single census.

In figure 1 there are two points which were not used in the regression analysis. These points occurred on days of extreme light intensity. On one very bright day with a temperature of -1° C there were ten Cardinals singing. On a foggy day with a temperature of 5° C only one bird was heard. These two points give some indication of the possible effect of light intensity on singing activity.

The linear regression of light intensity and the number of Cardinals singing (figure 2) is $Y = 3.04 + .0067X$ with Y as defined above and X the light intensity in lux. As light intensity increases so did the number of Cardinals singing.

The effect of light intensity on the amount of singing has been shown for several species (cited in Armstrong,1963). However, these studies have shown that light intensity determines the start of singing in the morning and the termination in the evening, and not the amount of singing during the day. The effect appears to be the same; that is low light intensities inhibit singing and vice versa.

The combined effect of light intensity and temperature on the number of Cardinals singing can be seen in Graph 2. On five censuses there was low light intensities yet there were from one to six Cardinals singing on these days. The temperature on these days varied from 1° C to 6° C. The warmer days had more Cardinals singing and the cooler days had a smaller number of Cardinals singing. Both light intensity and temperature appear closely related to the number of Cardinals singing.

Cloud cover which is a determining factor of light intensity also affects Cardinal singing. Figure 3 plots cloud cover with the number of Cardinals singing. No linear regression existed. However, it is obvious from the figure that cloud cover inhibits singing while more birds were singing on sunny days.

The data on wind speed is plotted in figure 4. The largest number of singing Cardinals occurred at lower wind speeds, but the regression coefficient was not significantly different from zero. If more data were collected, then a relationship between wind and speed and number of Cardinals singing may become apparent.

The role of internal factors must not be overlooked in discussing stimuli to singing. Thorpe (1961) showed the importance of a testicular hormone in determining song condition. Manning (1967) concluded that song was spontaneous rather than stimulated by external factors. This study has shown, however, that external factors, in this case, light intensity and temperature, can modify the amount of singing. No relationship was found between Cardinal singing and wind and rain. The temperature threshold of Cardinals singing was determined to span the range from - 1.7° C to 10.9° C.

LITERATURE CITED

Armstrong, E.A. 1963. A study of bird song. London, Oxford University Press

Craig, W. 1943. The song of the Wood Pewee, *Myiorchanes virens*: A study of bird music. Albany, New York State Museum Bull. #334

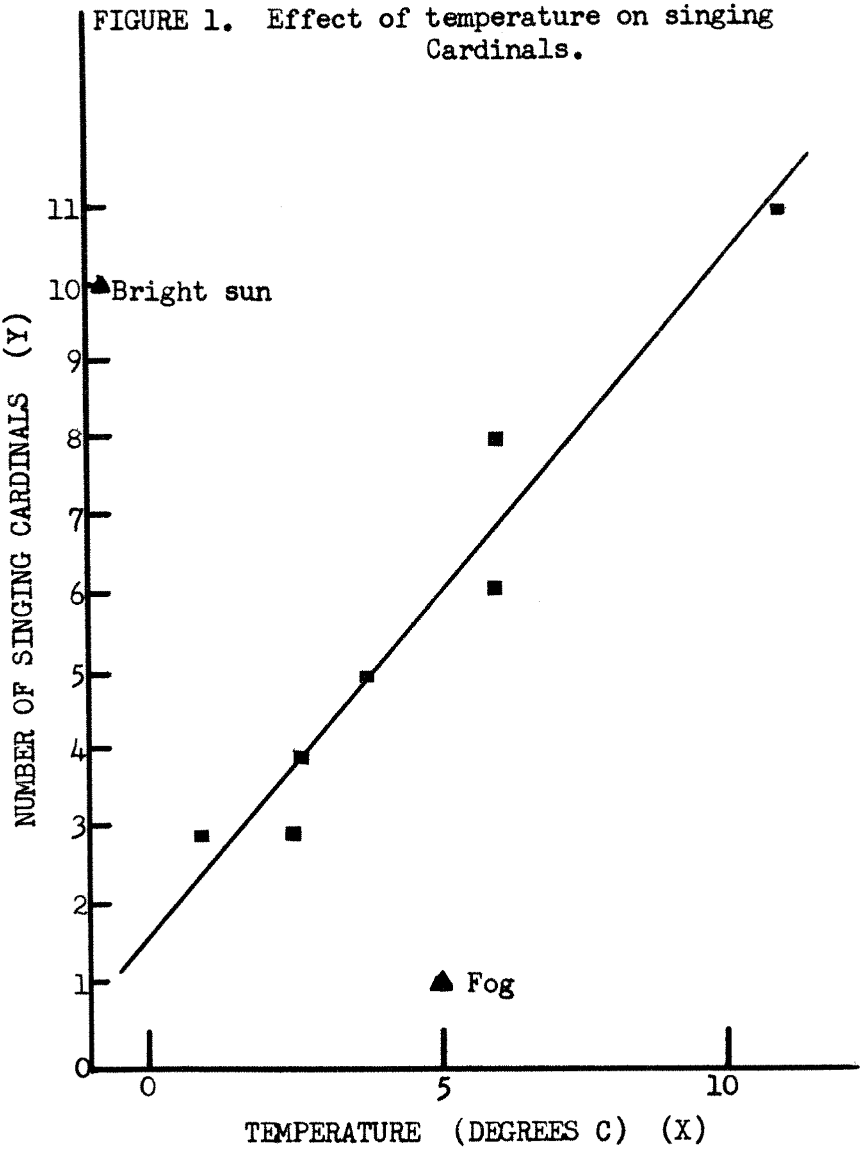
Dow, D. D. 1968. A comparative study of habitat utilization by the Cardinal in peripheral and central breeding populations. London, Canada, unpublished Ph.d. thesis, University of Western Ontario.

Manning, A. 1967. An introduction to animal behaviour London, Arnold

Scheer, G. 1964. Der fruhgesang der vogel (The morning song of birds) Ornithol.Mitt. 16(8) 162 - 170

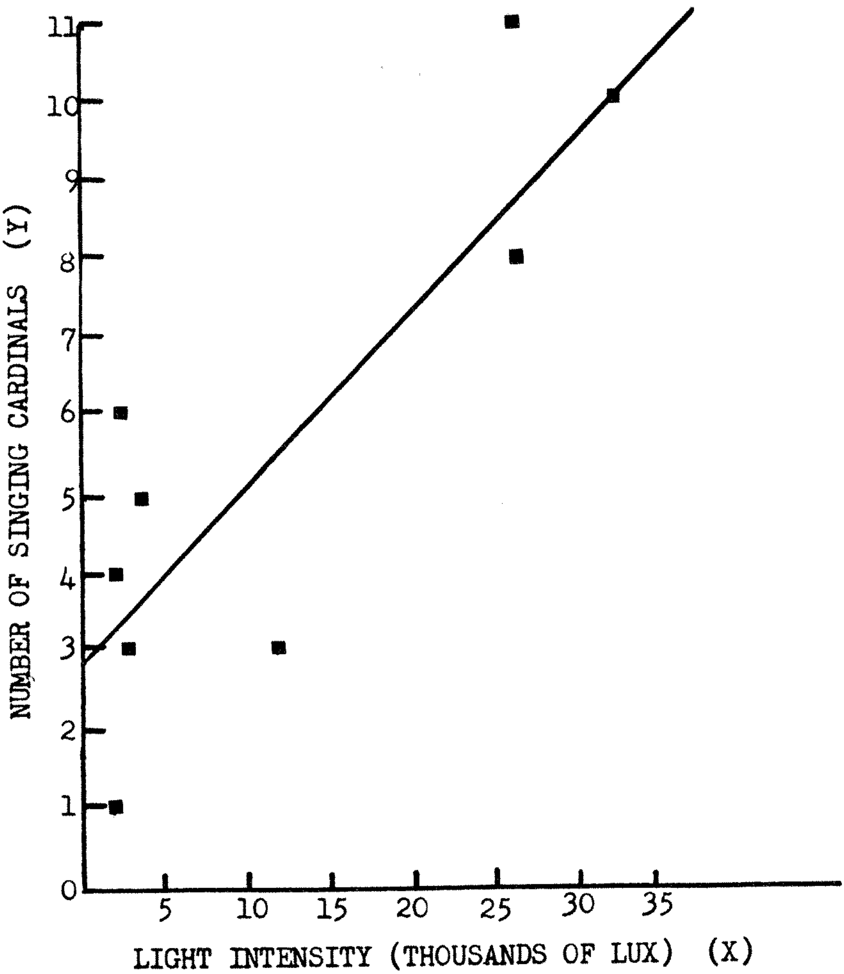
Thorpe, W.H. 1961. Bird Song. England, Cambridge University Press

FIGURE 1. Effect of temperature on singing Cardinals.



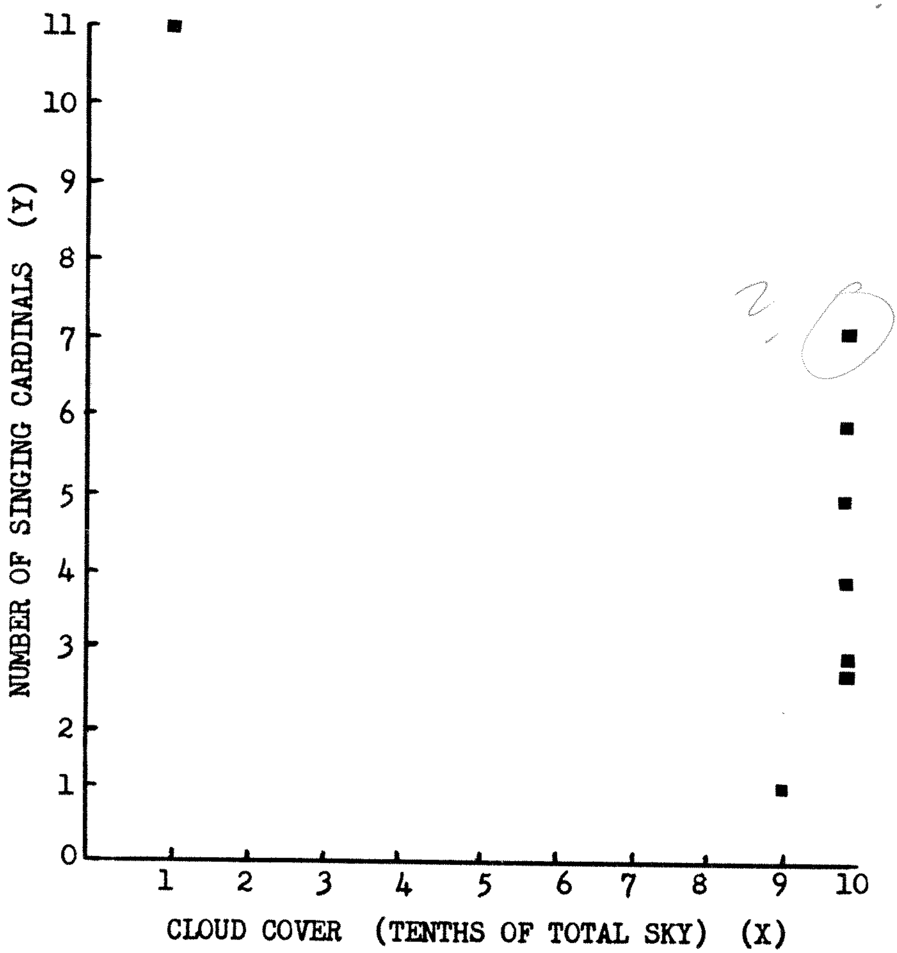
Excluding the points marked thus (▲) the equation of the line is $Y = 1.49 + 0.87\ X$. The test of significance of the regression coefficient gave a probability $P < .01$. Hence the coefficient is highly significant.

FIGURE 2. Effect of light intensity on singing Cardinals.



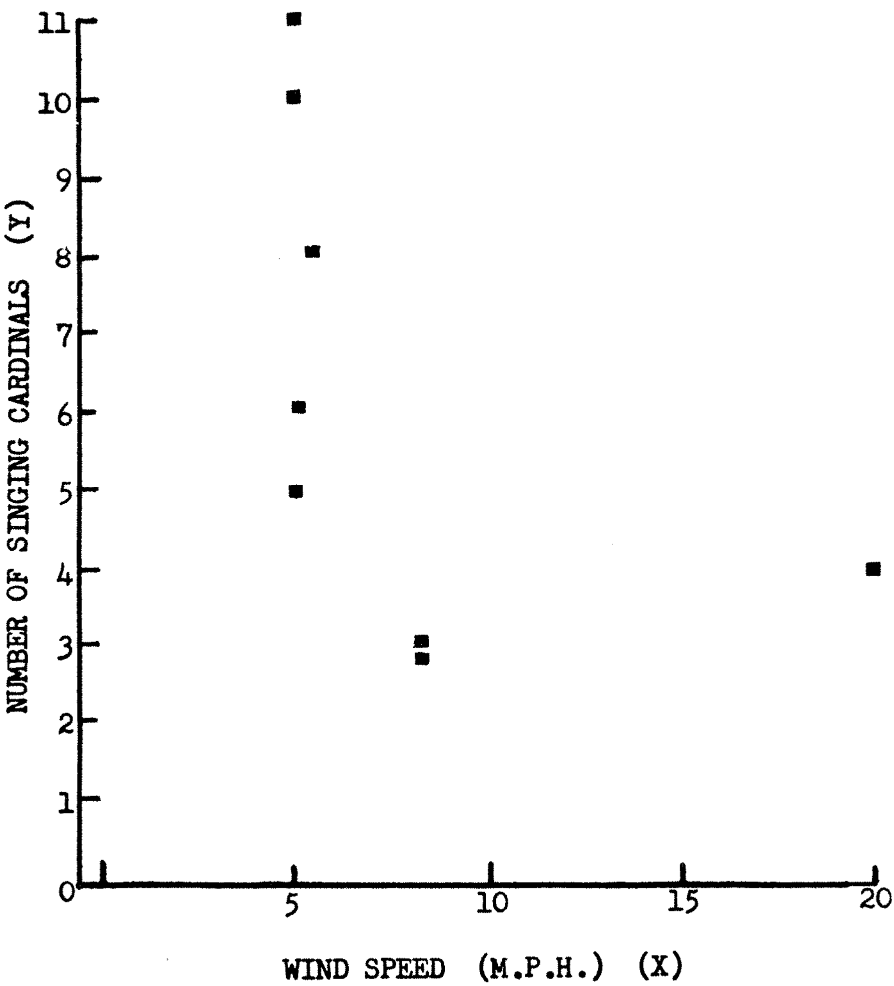
The line is represented by the equation $Y = 3.04 + 0.0067\ X$. The test of significance of the regression coefficient gave $P < .01$

FIGURE 3. Effect of cloud cover on singing Cardinals.



A linear equation could not be fitted to the points: P $>$.10. However there is apparent a difference in number of birds singing between zero cloud cover and total cloud cover.

FIGURE 4. Effect of wind speed on singing Cardinals.



It was thought unwise to fit a linear equation to the points. $P > .25$

ONTARIO BIRD BANDING

EDITOR Dr. A. D. Brewer
277 Arthur St. N.,
Guelph, Ontario. 824-4342

ONTARIO BIRD BANDING is published quarterly by the Ontario Bird Banding Association. The annual membership dues of $4.00 include a subscription to ONTARIO BIRD BANDING. Single copies are available at $1.00 each. Orders for single copies or back numbers and requests for information on membership should be sent to the secretary.

Although emphasis is placed on material of interest to banders, manuscripts of articles or short notes dealing with any aspect of ornithology are welcomed. Manuscripts should be typewritten and double spaced. Tables and figures should be prepared on separate sheets. Photographs should have good contrast for successful reproduction.

Contributors receive 25 reprints of their article gratis. Additional reprints are to be paid for by the author, and these must be ordered at the time the manuscript is returned for proof-reading. Information on the cost of reprints is available from the editor.

Authorized as Second Class Mail by
the Post Office Department, Ottawa,
and for payment of postage in cash.