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MAINE COOPERATIVE WILDLIFE RESEARCH UNIT

University of Maine

Orono, Maine

QUARTERLY REPORT

January-March, 1960

Cooperating Agencies

Maine Department of Inland Fisheries and Game
Wildlife Management Institute
University of Maine
United States Fish and Wildlife Service

Unit Personnel

Leader - Howard L. Mendall
Assistant Leader - Malcolm W. Coulter
University Representative - Albert D. Nutting
Faculty Collaborators - Horace F. Quick*
 Sanford D. Schemnitz
 David C. O'Meara
Graduate Assistants - D. James Coutu
 Richard M. Gibbs
 Fred E. Hartman
Graduate Student - Frederick J. Payne
Secretary - Maxine L. Horne

*On leave of absence until September, 1960.

NOT FOR PUBLICATION

The quarterly reports are usually statements of progress. The data presented often are incomplete and the conclusions reached may not be final. Consequently, permission to publish any of the information contained herein is withheld pending authorization from the Research Unit.

MAINE COOPERATIVE WILDLIFE RESEARCH UNIT

Quarterly Report

January-March, 1960

RESEARCH PROJECTS

WATERFOWL RESEARCH

(a) Waterfowl Distribution and Management

Objectives: To obtain data on the abundance, distribution, and migration of waterfowl species in Maine; and to conduct research that will assist in the management of the important breeding species, especially the black duck and the ring-necked duck.

Assignment: Howard L. Mendall, Leader

Inactive during the quarter.

Plans for next quarter: The regular seasonal studies will be resumed in April.

(b) Renesting and Homing Study

Objectives: To study renesting behavior and the degree of migrational homing exhibited by waterfowl, primarily the black duck and the ring-necked duck.

Assignment: Malcolm W. Coulter, Assistant Leader
(Vermont phase conducted jointly with William Miller,
Waterfowl Project Leader, Vermont Fish and Game Service)

Plans were formulated for the spring work including experiments in the construction of an automatic trap.

Plans for next quarter: To initiate the spring field studies.

(c) Waterfowl Hunter Bag Checks

Objectives: To determine hunter success, crippling loss, and species, sex and age composition of the kill.

Assignment: Howard L. Mendall, Leader

Considerable time was devoted to tabulation and interpretation of the data for the 10-year bag check analysis.

Plans for next quarter: To continue the 10-year analysis.

(d) Ecology of Waterfowl Wintering in the Penobscot Estuary

Objectives: To determine the food habits of waterfowl, especially the black duck, utilizing the Penobscot Estuary during late fall and winter; to determine the location and abundance of the important foods within the area, and to classify, accordingly, the mud flats and salt marshes.

Assignment: Fred E. Hartman, Graduate Assistant

All field work was concluded on this project during the quarter, and the thesis write-up was begun.

Plans for next quarter: To complete the thesis.

(e) Breeding Ecology of the Common Goldeneye

Objectives: To determine the density of breeding populations on selected study areas, nesting and brood rearing preferences, and to measure productivity and annual production.

Assignment: Richard M. Gibbs, Graduate Assistant

During the quarter, considerable progress was made in tabulating the accumulated file data of the Unit and Game Division. One important aspect of this work was the delineation of the breeding range of the species within the state. In cooperation with personnel of the Poultry Husbandry Department, experiments were begun in dyeing embryos; hens' eggs are being used for this purpose.

Plans for next quarter: To initiate intensive field work on the two study areas.

FUR ANIMAL RESEARCH

Productivity of Maine Beaver

- Objectives:
1. To investigate possible changes in the overall rate of reproduction since the period 1947-1950 when a productivity study was conducted.
 2. To investigate possible differences in the rate of reproduction between beaver from the different climatic zones.
 3. To compare the rate of reproduction between major size classes of beaver.

Assignment: D. James Coutu, Graduate Assistant

Reproductive tracts collected during the 1960 trapping season have been studied for placental scars. Analysis of the data is still in progress.

A total of 451 uteri was received. This was a very gratifying figure in view of the fact that the first year's minimum quota had been set at 300. The number of tracts received from the different climatic zones is as follows: Northern, 233, Intermediate, 129, Central, 83, and with six unclassified.

Analysis of the data thus far reveals that the beaver available for this present study produced fewer young than those of the 1947-1950 survey. This holds true for all females examined as well as those that were known positively to be productive. The differences in some categories are statistically significant, especially for specimens from the Intermediate Zone.

Plans for next quarter: To complete the analysis of the first winter's data.

WOODCOCK RESEARCH

(a) Woodcock Population Studies

Objectives: To conduct an annual census and to obtain related ecological data on the Unit's permanent census routes in Maine.

Assignment: Howard L. Mendall, Leader

Inactive during the quarter.

Plans for next quarter: Regular spring censuses will be made on the permanent census areas. In addition, a special banding program and collecting of specimens will be carried out in cooperation with the woodcock-pesticide project of the Bureau of Sport Fisheries and Wildlife. The banding activities, which will be on the Greenbush study area, will be conducted by Graduate Student Payne.

(b) Inter-relationships of Woodcock and Beaver

Objectives: To study the effects of beaver flowages in the maintenance of desirable woodcock habitat, especially as related to the management program on the Moosehorn National Wildlife Refuge in eastern Maine.

Assignment: Frederick J. Payne, Graduate Student

This is a new project, to be initiated in April. Several planning conferences with University and Refuge personnel were held during the winter; also preliminary examination of file and literature material was begun. Since details as to procedure have not as yet been completely worked out, these will be presented in the next report.

COOPERATION, EDUCATIONAL WORK AND MISCELLANEOUS ACTIVITIES

Coulter and Mendall continued to furnish technical aid when requested to the State Department of Inland Fisheries and Game.

Assistance was given the general public in arranging for autopsies, identifying specimens, and in furnishing technical information.

Coulter, Mendall and Schemnitz gave instruction at the annual State Warden Training School held in Augusta.

The Unit staff participated in the wildlife seminar as well as the staff seminar, the latter being under Coulter's guidance.

Coulter gave several week's instruction in a new freshman course dealing with elements of wildlife management for forestry and wildlife students.

Coulter and Mendall attended the Northeastern Wildlife Conference held at Providence, Rhode Island in January. Mendall served as summarizer of the waterfowl panel.

Mendall attended the annual Unit Leaders' Meeting and North American Wildlife Conference in Dallas, Texas. Following the meetings he made a two-day inspection of the Rockefeller State Waterfowl Refuge in Louisiana.

The Unit staff made the arrangements for the fish and wildlife session held as part of the 4-day program of the Annual Farm and Home Week of the University of Maine. This session consisted of a half-day panel discussion of pesticide-wildlife problems. Three main speakers presented information on different aspects of the subject - a forest entomologist, a fisheries biologist, and a chemist. The latter was Dr. James DeWitt, Chief Chemist of the Patuxent Research Center of the Bureau of Sport Fisheries and Wildlife. Coulter served as panel chairman.

PUBLICATIONS

Coulter, Malcolm W.

1960. The Status and Distribution of Fisher in Maine. Jour. Mammal., 41(1):1-9.

Mendall prepared the manuscript for 22 bird summaries to be included in a publication by the Maine Audubon Society entitled "Enjoying Maine Birds".

The Unit staff edited two manuscripts by former graduate assistants Alkon and Robinson which summarize their respective thesis findings. Both manuscripts have been accepted for publication in the Journal of Wildlife Management.

Respectfully submitted,


Howard L. Mendall, Leader
Maine Cooperative Wildlife
Research Unit

University of Maine
Orono, Maine
May 31, 1960

MAINE COOPERATIVE WILDLIFE RESEARCH UNIT

University of Maine

Orono, Maine

QUARTERLY REPORT

April-June, 1960

Cooperating Agencies

Maine Department of Inland Fisheries and Game
Wildlife Management Institute
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MAINE COOPERATIVE WILDLIFE RESEARCH UNIT

Quarterly Report

April-June, 1960

RESEARCH PROJECTS

WATERFOWL RESEARCH

(a) Waterfowl Distribution and Management

Objectives: To obtain data on the abundance, distribution, and migration of waterfowl species in Maine; and to conduct research that will assist in the management of the important breeding species, especially the black duck and the ring-necked duck.

Assignment: Howard L. Mendall, Leader

The regular seasonal studies were begun in April. A special report was prepared by Mendall under date of July 15 giving all 1960 results up to that time. This report, exclusive of tabulated brood data, is reproduced in full as follows:

This report summarizes the results, to date, of the 1960 waterfowl breeding ground studies in northern, eastern and central Maine. Investigations were conducted primarily by the writer assisted by members of the Unit staff. Assistance was also provided on some phases of the study by warden Lawrence Caron and biologists J. William Peppard, Henry Carson and Howard Spencer, Jr., of the Maine Department of Inland Fisheries and Game, by biologist Eldon Clark of the Moosehorn National Wildlife Refuge, and by John Dudley of Calais, Maine.

This is the 22nd consecutive year of these studies. Techniques were the same as in recent years. Coverage was essentially the same as in 1959 except that more intensive surveys were made this year in habitat frequented by the common goldeneye in western Maine. Estimates of populations and breeding success, however, are based only on comparable data.

Breeding Populations

Initial breeding populations are determined from 13 study areas that, over a period of years, have proven quite reliable indicators for northern, eastern and central Maine, especially for the State's two most numerous species - the black duck and the ring-necked duck. Data for the wood duck, being fewer, have less value. The two teals and the common goldeneye do not occur on the study areas in sufficient numbers to permit more than general estimates as to their comparative status.

Initial breeding stock of most species showed little significant change from the population level of 1959, an exception being a substantial increase in the wood duck. Thus, during three consecutive years, a nearly static population, at a fairly high level, has been indicated within the region covered, for the important black duck and the ring-necked duck. As would be expected, there were numerous local fluctuations. Most increases occurred in eastern Maine.

Although a slight decrease was apparent this year in the blue-winged teal, this is of little importance since the numbers of this bird (always a secondary species in Maine) were exceptionally high in 1959. Likewise, no significance is attached to the increase in the goldeneye; only in western Maine, which is not included in the census, is this species common as a breeder.

Results of breeding pair counts or estimates are summarized as follows:

<u>Species</u>	<u>Status in 1960</u>
(Measured on census areas)	
Wood Duck	26% increase
Black Duck	No change
Ring-necked Duck	4% decrease
(Estimated)	
Common Goldeneye	Slight increase
Green-winged Teal	No change
Blue-winged Teal	Slight decrease

General Breeding Conditions

Climatic conditions in Maine have been more favorable for waterfowl production in 1960 than for the past several years. The spring break-up and migration was later than in 1959. Likewise, both phenology and breeding chronology were retarded during April. However, May and June produced above average temperatures and the growing season was actually advanced by early summer. Precipitation throughout the period has been near normal for the State as a whole, varying from slightly above average in northern Maine to a little below average in the southern counties and the coastal belt. Because water levels were relatively low during early spring, they have remained a little below average on most marshes. Indications in mid-June were that subsequently they might become too low for optimum brood rearing, but abundant rainfall since then has improved conditions considerably.

Floods during the nesting period, often a threat to Maine waterfowl, were much less serious than a year ago. Excessive precipitation did occur during the second week of May and resulted in some nest losses, especially on streams and small marshes. Fortunately, this took place at a time to cause a minimum of adverse effects. Since the chronology of the early nesting species was already retarded, the majority of black ducks losing nests are believed to have renested. Many of the normally later breeding birds, such as the ring-necked duck and blue-winged teal, either had not started to nest or were only in the laying stage. It was the latter two species that had suffered heavy production losses in 1959. Thus the net result of this year's high water was, to a large extent, merely a prolongation of the nesting season and later hatching peaks.

Nesting Success

A total of 31 nests, the same number as in 1959, was available to supplement other data in determining natural success. Aside from 2 mallards

and one each of blue-winged teal and common goldeneye, all nests were of the ring-necked duck and the black duck. As of mid-July, nests of 2 ring-necks were still being incubated while that of the goldeneye had not been re-checked. Of the 28 remaining, 22 or 79 per cent had hatched successfully. This is much higher than both the long-term average and the figure of a year ago.

No claim is made that this small sample is adequate to determine seasonal nesting success. These data merely constitute specific case histories to supplement the more extensive indirect evidence. They are thus utilized to increase the value of the information available from breeding pair counts and subsequent brood counts on specific study areas. Nevertheless, all the season's evidence points to the fact that nesting success in Maine for important species has been unusually high. This is true both for original nests and for renestings.

The Brood Season

Because of retarded breeding chronology, as well as a prolonged nesting season occasioned by renesting, hatching peaks are noticeably later than in 1959. With the black duck, two distinct peaks occurred - one the last week of May and another about mid-June. This constitutes further evidence that not only did many black ducks renest after the May flood but that these renestings were generally successful.

A total of 117 aged broods where complete counts had been made were available as of mid-July. This is in comparison with 61 a year ago, but does not, in itself, indicate a proportional production increase. Although that is to some extent true, it is essentially the result of special studies on the goldeneye in western Maine (beyond the coverage of usual Unit studies).

Brood sizes for all species combined in the important Class II and III age categories are similar to those of a year ago and are higher than the long-term average. This has added significance in view of the larger number of goldeneye broods included this year. This species is characteristically a relatively low producer. Both black ducks and ring-necks averaged a fraction of a bird per brood higher this year in Classes II and III.

By contrast, rearing conditions on the marshes at this writing, although satisfactory, are not quite as good as in 1959 due to somewhat lower water. Thus, little or no increase in relative production per brood is anticipated in comparison with 1959.

Conclusions

1. No significant change in breeding populations was noted in 1960 from the favorable level of a year ago except for a substantial increase in the wood duck.
2. Nesting success in 1960 is much higher than that of 1959. It is also considerably higher than the long-term average.
3. Rearing success is similar, in the overall pattern, to that of a year ago.
4. Considering similar initial populations, unusually high nesting

success, and similar rearing success, it is expected that waterfowl production in Maine in 1960 will be moderately increased over that of 1959.

Plans for next quarter: To conclude the season's studies.

(b) Renesting and Homing Study

Objectives: To study renesting behavior and the degree of migrational homing exhibited by waterfowl, primarily the black duck and the ring-necked duck.

Assignment: Malcolm W. Coulter, Assistant Leader
(Vermont phase conducted jointly with William Miller,
Waterfowl Project Leader, Vermont Fish and Game Service)

Intensive field work began during the last half of April. Efforts were concentrated at 3 major locations including 2 in Maine and 1 in Vermont. The joint work in Vermont is now in its fourth year.

Several people and organizations again assisted with various phases of this project. Personnel of the Moosehorn National Wildlife Refuge, Calais, Maine, including Gordon Nightingale, Eldon Clark and Paul Ryan, reared ducklings and helped with plans for an automatic trap. Howard Mendall and Graduate Assistants Hartman, Gibbs and Coutu, and also graduate student Payne, assisted during nesting checks in the field.

Techniques for study were similar to those employed during past years viz., nesting hens were trapped, banded, marked and released at their nests. Eggs from these nests were removed to simulate destruction by predators or other natural causes. Eggs so removed were hatched in incubators and reared for release on the study areas.

Two improvements in techniques were developed. William Miller perfected a comparatively simple device for springing the nest trap automatically. The trigger mechanism is activated when the temperature of eggs in the nest reaches a pre-determined point (usually 90-94°F.). This trap proved to be extremely useful in catching very wary hens or those nesting in sites where it was difficult to approach them to manually spring a trap.

Another improvement was the design by Eldon Clark of a simple water tank that could be attached to the duckling pens. In the past, ducklings have sometimes been transferred to larger "hardening pens" for conditioning prior to release. An important part of this "hardening" is the opportunity for the ducklings to get into water to condition their plumage. With the tank and pen as designed, swimming water can be made available with little extra labor or cost. Furthermore, the time when the ducklings have access to water can be controlled.

A summary of progress during the quarter follows:

1. A total of 34 nests of black ducks or mallards have been located and studied. Most of these were considered to be first nests.

2. Twenty-three hens have been trapped, banded and color-marked at their nests.

3. Approximately 200 ducklings are being reared for later release on study areas. Hatching and rearing success to date has been exceptionally good.

4. The return of adult hens to the study areas has been high. In Vermont 12 of 17 black ducks and mallards trapped at nests were birds banded at nests during previous years of the study. Three of 6 black duck hens at one area in Maine had been previously banded.

5. Return of hand-reared birds released last year has been low. The numbers of hand-reared birds returning to the release area appears to be very small.

6. Individual case histories for some hens were expanded by data gathered during the past quarter. These records appear to be of considerable value in attempting to understand some aspects of nesting, re-nesting, and homing.

Fewer birds have been marked this season than during the past two seasons. Not as many nesting birds were located on some of the islands in Vermont. Furthermore, no ring-necked ducks were marked in Maine. Although it appeared that fair populations of the latter returned to the study areas, local floods during May (at the time nest sites were being selected) apparently caused many of them to nest elsewhere. Despite intensive efforts to locate nests, too few were found to be of use in the re-nesting study.

Plans for next quarter: To conclude the season's studies.

(c) Waterfowl Hunter Bag Checks

Objectives: To determine hunter success, crippling loss, and species, sex and age composition of the kill.

Assignment: Howard L. Mendall, Leader

Inactive during the quarter.

Plans for next quarter: To continue the 10-year analysis of accumulated data.

(d) Ecology of Black Ducks Wintering in the Penobscot Estuary

Objectives: To determine the food habits of waterfowl, especially the black duck, utilizing the Penobscot Estuary during late fall and winter; to determine the location and abundance of the important foods within the area, and to classify, accordingly, the mud flats and salt marshes.

Assignment: Fred E. Hartman, Graduate Assistant

The thesis write-up was completed during the quarter and the thesis was accepted by the Graduate School. Hartman will be awarded the Master's degree at the August Commencement. The summary and conclusions as given in the thesis are as follows:

The ecology of the black duck in the Penobscot Estuary was studied during late fall and winter of two years. The objectives were to determine the food habits of the black duck and to study its movements and behavior with respect to the major feeding areas. Another important objective was to determine the relationship between the abundance of food organisms and environmental factors in the intertidal zone. Results of this study should be of assistance in making sound recommendations to engineers when dredging operations may result in a loss of valuable waterfowl feeding habitat.

Specific food habits data were tabulated for both seasons. Major food items were recorded for areas where tidal marsh was prominent and for areas where it was negligible. A census was conducted weekly throughout autumn and winter to determine the number of black ducks utilizing each section, as well as the Estuary as a whole. Observations were made of the ducks' feeding habits, the amount of usage different flats received by ducks when feeding, and the movements between feeding and resting areas. The effects of cold weather and predation on the black ducks was also noted. Some ducks were collected, under permit, in winter for the food habits study. These birds, and also the ones obtained during the autumn hunting season, were examined for physical condition.

Supplemental data were collected on the ecology of the greater scaup and the goldeneye.

Systematic sampling of ten mud flats was performed to determine the abundance of invertebrate food organisms and the soil types. These flats were selected by the writer on the basis of the amount of usage they received by ducks. Amphipods were sampled at various stages of the tide at four mud flats to obtain an estimate of their abundance. Measurements of salinity and water temperature were taken during all seasons of the year. Weather conditions, especially in relation to ice formation in the Estuary, were noted.

The following conclusions from the study are drawn:

1. Animal organisms, especially clams, comprised the bulk of the food material taken by black ducks during fall and winter. Other prominent animal foods were snails and amphipods. Cordgrass and acorns, in that order, were the important vegetable foods consumed in fall. Cordgrass was the principal vegetable food in winter.
2. Edible mussels and clams are the chief foods of goldeneyes, and also of scaup, based on a very limited study of the latter.
3. A definite relationship exists between food availability and the kinds of food eaten by black ducks. The mud flats containing the largest numbers of clams are usually utilized the heaviest by ducks for feeding.
4. Waterfowl populations fluctuate periodically not only in the Estuary but within each section as well. These fluctuations are greatest during periods of heavy ice formation and migration.
5. Periods of severe ice formation affect black ducks in two ways:
 - a. When the flats freeze, only a limited supply of food is available to the ducks. Because of this limitation a few

of the ducks examined displayed symptoms of malnutrition; however, no mortality due to starvation was observed.

b. Because of the lack of food some birds move out of the study area.

6. The effect of predation on waterfowl was negligible. Only ten black ducks were found dead; all probably resulted from predation.

7. Many black ducks have regular movements between feeding and resting areas. During the low tide period the ducks feed on the exposed mud flats. At high tide, when the flats are covered, the birds move into marsh habitat for feeding.

8. Black ducks travel from one-half to about four miles in moving from one location to another. They move as a group of 20 to 40 birds during the fall but as pairs or groups of 4 to 12 during winter. There are some birds that feed and rest in the same general location. As the weather becomes extremely cold the movements become shorter or nonexistent.

9. Goldeneyes move as individuals or as very small groups. By contrast, scaup travel within the study area in larger groups, from forty to several hundred birds. The movements of these diving fowl do not seem to be correlated with feeding and resting areas.

10. The soil composition of most flats sampled was silty-sand.

11. The salinity and water temperature varied for each season of the year. Both were highest in summer. Salinity was lowest in spring and temperature was lowest in winter.

12. Significant differences in the clam populations occurred between some flats. These differences were not influenced by the amounts of sand, silt, clay, or organic matter, or by water temperature. Salinity probably had an effect on the abundance of clams between sections. Another reason for the variations in clam populations may be due to the settling of spat and their relation to currents.

13. Although the clam population of several flats were significantly lower in winter in relation to the fall samples, no apparent reason can be given for this decrease. In spite of the fact that these lower densities coincided with the lowest seasonal water temperature, the evidence seems insufficient to establish a cause and effect relationship.

14. In order to preserve the more valuable mud flats, they were classified according to their importance. The criteria used in the classification were the amount of usage by black ducks, the average numbers of clams per square meter, and the amount of icing of the low tide zone during periods of extremely cold weather.

15. The present investigation disclosed other aspects of waterfowl ecology in the Penobscot Estuary that are in need of study. These involve (1) the biology of the clams; and (2) environmental factors in relation to the abundance of clams.

NOTE: This is a completed project.

(e) Breeding Ecology of the Common Goldeneye

Objectives: To determine the density of breeding populations on selected study areas, nesting and brood rearing preferences, and to measure productivity and annual production.

Assignment: Richard M. Gibbs, Graduate Assistant

Field work at both the Pierce Pond and Kennebago study areas was begun as soon as the break-up of ice occurred. This has been conducted on a full-time basis by Gibbs since the first of June. Emphasis is being placed on studies at Pierce Pond, with the Kennebago region being considered as a supplementary study area.

A complete seasonal review of progress will be given in the next quarterly report.

Plans for next quarter: To continue intensive field work for the remainder of the summer.

FUR ANIMAL RESEARCH

Productivity of Maine Beaver

- Objectives:
1. To investigate possible changes in the overall rate of reproduction since the period 1947-1950 when a productivity study was conducted.
 2. To investigate possible differences in the rate of reproduction between beaver from the different climatic zones.
 3. To compare the rate of reproduction between major size classes of beaver.

Assignment: D. James Coutu, Graduate Assistant

Analysis of the last winter's data has now been completed. A comparison of averages of placental scar counts for the size classes within each climatic zone shows varied results (Tables 1 and 2). For the larger beaver significant differences occurred in the Intermediate zone and in total, whereas for the smaller beaver, a measurable difference occurred only in the Northern zone. These differences held true for total females as well as for those known to be productive.

Table 1

Average Number of Placental Scars of all Females of the Study
Compared to the Survey (Totals, zones, and size classes)

	Average Scars		Difference Significant
	Previous Survey	Present Study	
All Females			
<u>Zones</u>			
Northern	2.9	1.9	Yes
Intermediate	3.3	1.7	Yes
Central	3.1	2.2	Yes
Total	3.1	1.9	Yes
<u>Large Beaver</u>			
Northern	2.6	2.3	No
Intermediate	2.8	1.9	Yes
Central	3.4	2.7	No
Total	2.9	2.3	Yes
<u>Small Beaver</u>			
Northern	.4	1.3	Yes
Intermediate	.8	.7	No
Central	.9	.9	No
Total	.7	1.1	No

Table 2

Average Number of Scars of Productive Females of the Study
Compared to the Survey (Totals, zones, and size classes)

Productive Females	Average Scars		Difference Significant
	Previous Survey	Present Study	
<u>Zones</u>			
Northern	3.3	3.1	No
Intermediate	3.6	3.1	Yes
Central	3.8	3.4	No
Total	3.6	3.2	Yes
<u>Large Beaver</u>			
Northern	3.4	3.2	No
Intermediate	3.8	3.2	Yes
Central	4.1	3.4	No
Total	3.8	3.2	Yes
<u>Small Beaver</u>			
Northern	1.7	2.8	Yes
Intermediate	2.8	2.7	No
Central	2.7	3.4	No
Total	2.6	2.9	No

Plans for next quarter: Largely inactive.

WOODCOCK RESEARCH

(a) Woodcock Population Studies

Objectives: To conduct an annual census and to obtain related ecological data on the Unit's permanent census routes in Maine.

Assignment: Howard L. Mendall, Leader

Woodcock census studies on the Unit check areas were completed. A slight, but statistically insignificant, decrease was noted in comparison with the high population level of 1959.

A series of adult woodcock were collected in central and eastern Maine for examination in connection with the woodcock-pesticide studies of the Patuxent Research Center. Also, as a phase of this study, it was deemed

advisable to band, as nearly as possible, the complete resident male population of a given area. The Greenbush study area seemed best adapted to such a program. It is quite well isolated from other breeding habitat and yet has a high population density. The banding was under the direction of Graduate Student Payne and was very successful. Virtually the entire male population had been tagged by mid-May, although the total of 25 birds included a few early migrants.

Plans for next quarter: Inactive.

(b) Inter-relationships of Woodcock and Beaver

Objectives: To study the effects of beaver flowages in the maintenance of desirable woodcock habitat, especially as related to the management program on the Moosehorn National Wildlife Refuge in eastern Maine.

Assignment: Frederick J. Payne, Graduate Student

Work on this new project was conducted on an intensive basis throughout the last of the quarter. As soon as spring classes ended, Payne moved to the Moosehorn Refuge where he will remain throughout the summer.

Following conferences with University and Refuge personnel, a thorough examination of all existing file data has been made. It is apparent that this study will involve, to a large extent, a determination of the conditions under which desirable woodcock cover will become established on abandoned beaver flowages. Under most conditions of such flowages in eastern Maine, alder is the most important type.

Plans for next quarter: To continue detailed field studies on the Moosehorn Refuge.

COOPERATION, EDUCATIONAL WORK AND MISCELLANEOUS ACTIVITIES

Coulter and Mendall continued to furnish technical aid when requested to the State Department of Inland Fisheries and Game.

Assistance was given the general public in arranging for autopsies, identifying specimens, and in furnishing technical information.

PUBLICATIONS

Mendall, Howard L.

1960. In, Enjoying Maine Birds, pp. 6-16, 20. Maine Audubon Society (Edited by O. S. Pettingill, Jr.), 85 pp.

Coulter devoted considerable time to editing and to preparing the tabular and illustrative material for the final draft of former graduate student Krafft's thesis.

PERSONNEL CHANGES

Dr. Sanford Schemnitz, who temporarily replaced Dr. Horace Quick on the teaching staff, left the University as of June 30. He has taken a position at Pennsylvania State University.

During his year in Orono, Dr. Schemnitz won the respect and affection of a host of students and staff members who wish him well in his new assignment. Dr. Quick will return to the University in September.

Graduate Assistant Hartman completed his duties at the Unit June 30. He has obtained employment, effective this fall, as a biologist with the Pennsylvania Game Commission.

Respectfully submitted,

Howard L. Mendall

Howard L. Mendall, Leader
Maine Cooperative Wildlife
Research Unit

University of Maine
Orono, Maine
August 9, 1960

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Graduate Student - Hugh Haswell
Secretary - Maxine L. Horne

NOT FOR PUBLICATION

The quarterly reports are usually statements of progress. The data presented often are incomplete and the conclusions reached may not be final. Consequently, permission to publish any of the information contained herein is withheld pending authorization from the Research Unit.

MAINE COOPERATIVE WILDLIFE RESEARCH UNIT

Quarterly Report

July-September, 1960

RESEARCH PROJECTS

WATERFOWL RESEARCH

(a) Waterfowl Distribution and Management

Objectives: To obtain data on the abundance, distribution, and migration of waterfowl species in Maine; and to conduct research that will assist in the management of the important breeding species, especially the black duck and the ring-necked duck.

Assignment: Howard L. Mendall, Leader

The seasonal production studies were concluded during August. These were described in detail, as of mid-July, in the last quarterly report. Tabulation of field data acquired after that date did not materially alter the conclusions previously presented. Decreasing water levels throughout late July and August appeared to have few adverse effects on rearing success. The lowered water table, resulting from the severe summer drought, did not reach a critical stage until after most ducklings were approaching maturity.

Although the drought had a minimum effect on the season's production, it was responsible for an unusual distribution of post-breeding populations throughout the state. During late August and the first half of September, extensive withdrawals of local birds occurred over a very wide area of northwestern, northern and eastern Maine. Conversely, a large increase in waterfowl numbers occurred in the coastal marshes and in Merrymeeting Bay. At the latter area the September concentration of birds was reported as the heaviest in many years.

Plans for next quarter: Population data will be obtained throughout the fall in conjunction with work on the hunter bag check study.

(b) Renesting and Homing Study

Objectives: To study renesting behavior and the degree of migrational homing exhibited by waterfowl, primarily the black duck and the ring-necked duck.

Assignment: Malcolm W. Coulter, Assistant Leader
(Vermont phase conducted jointly with William Miller,
Waterfowl Project Leader, Vermont Fish and Game Service)

Field studies were continued in an effort to locate as many nests as possible. Techniques were similar to those described in past reports. One addition which was developed by Miller is an automatic trigger mechanism for the nest trap. The mechanism is designed to spring the trap when the hen returns to the nest and begins to incubate her eggs. The trap is triggered when egg temperatures are raised to 90-95°F. This method is very useful in instances when birds become very wary and leave the nest at the slightest

hint that an observer is approaching. In the past, some hens were known to leave their nests when the observers were as much as 1/4 mile distant.

Fifty nests were studied. Twenty-four hens were trapped, marked and banded at their nests. However, only 6 renests were located, a much smaller proportion than in previous years of the study. This may be due to the fact that many of the marked hens were permitted to incubate their clutches until the last week of incubation. Earlier data suggest that noticeably fewer females that lose nests late in incubation lay a second nest in contrast to those that lose nests early in incubation.

The return of hand reared birds to the nesting areas continues to be very low. However, as mentioned in earlier reports, return of older hens banded at nests has been high. Repeated return of some of these females is providing an opportunity to explore several aspects of nesting biology such as clutch size in older hens vs. young hens, nesting dates, and other points that are of value in attempting counts of breeding birds or in predicting annual production.

Plans for next quarter: Inactive.

(c) Waterfowl Hunter Bag Checks

Objectives: To determine hunter success, crippling loss, and species, sex and age composition of the kill.

Assignment: Howard L. Mendall, Leader

Inactive during the quarter.

Plans for next quarter: The usual fall bag check studies will be conducted.

(d) Breeding Ecology of the Common Goldeneye

Objectives: To determine the density of breeding populations on selected study areas, nesting and brood rearing preferences, and to measure productivity and annual production.

Assignment: Richard M. Gibbs, Graduate Assistant

This project was not discussed in detail in the last quarterly report. Thus, the present write-up is a seasonal summary. Field work consisted of population counts prior to nesting, brood checks, banding, observations of brood behavior, movements, and habitat preferences, and habitat mapping. All work, unless otherwise noted, was carried out on the Pierce Pond study area which lends itself much better to intensive study than does the Kennebag area.

The 29 nest boxes erected during the fall and winter were checked several times during the spring. Only one, however, was used by goldeneyes. A complete clutch of 7 eggs was being incubated on June 4. Eleven days later

the nest was still intact but on June 30 it was found to have been destroyed. All signs pointed to a raccoon as being the predator involved.

The first brood was seen on May 26, at an estimated age of 1 or 2 days. The latest hatching was approximately June 24. The hatching peak at Pierce Pond was during the 5 day period June 9-13.

Banding

Banding operations were conducted July 6-7 and July 19-20 at Pierce Pond, and at the Kennebago study area July 12-14. The method of trapping was essentially the same as outlined in the quarterly report for July-September, 1959. One innovation was the use of a large, one piece, folding duck trap with a wire bottom and a net top. At good trapping sites, i.e., shallow water and a relatively soft bottom, three men could set the trap in 20 minutes, and take it down in 10 minutes.

At Pierce Pond 30 goldeneyes (3 adult females and 27 young) were banded. At Kennebago 44 birds (6 adult females and 38 young) were tagged. In addition to banding, adult females on both study areas were marked with yellow nasal discs, and young females with white nasal discs. These markers are to aid in future homing studies, as well as to assist in following local movements during the summer.

With experience gained a year ago, driving success was excellent. Although the technique is routine, one unique experience, appears to warrant further investigation as to its practicability. On one drive, 12 young and the adult female were trapped. To facilitate handling, the trap was to be placed on the shore, but upon lifting it out of the water, ten of the young were lost. After banding and releasing the two young, the hen was tethered in the trap which had been placed in its original position. The young were herded successfully once more. Once within the leads, they were reluctant to enter the trap, and began to "peep". The female, which had been quiet up until this time, gave one call, whereupon the young rushed through the opening and into the trap.

Brood Activity

In general, broods in the early Class I stage stayed in sheltered, out-of-the-way coves that contained varying amounts of emergent vegetation. The kind of vegetation appeared to be of little consequence, only its presence being important. As the ducklings became older, they ranged farther afield and into more open water, until at about four weeks of age, they remained in open water throughout the day.

Since relatively shallow water (less than 10 feet) was preferred, movement was usually restricted to following the shoreline. Only rarely did a brood venture across very deep water. Distances covered daily varied considerably from brood to brood, ranging from 100 yards to $3/4$ of a mile or more. Over long periods of time, and in fact throughout the entire period that they remained together as a brood, the young tended to remain in rather definite areas, although these areas varied greatly in size.

Daily activities of downy ducklings consisted mostly of short periods of alternate feeding and resting, with scattered periods of play. As the young

became older, the feeding sessions became longer and the rest periods fewer but longer. These older broods were sometimes left by the hen for varying lengths of time, up to 40 minutes or more. The young invariably rested on some convenient rock until the female returned.

Desertion of the broods by the adult females began the last week of June, and by the first week of August, all females had abandoned their broods. The progress of the hen's molt and the flightless period is probably the most important factor in determining the time of desertion. However, one of the marked females observed after deserting her brood appeared to be in excellent plumage and still capable of strong flight. Therefore, there may be other factors involved.

Combining of broods coincided with the earlier desertions, in that young broods abandoned by their hens tended to combine with broods with the hen still in attendance. Broods deserted after the young were about 6 1/2-7 weeks of age did not exhibit this tendency. On the other hand, by the time the majority of the broods reached this age, there were very few adult females still in the area.

Production

The population data on production at the Pierce Pond Study Area are summarized as follows:

<u>Age Class</u>	<u>Number of Young</u>
Ia	71
Ib	53
Ic	35
IIa	30
IIb	27
IIc	27
III	25
Flying	25

Thus, from an original population of 14 broods of some 71 young, only 25 flying birds were produced. This amounts to about a 65 per cent juvenile mortality. Specific mortality factors could not be determined, but predation does not appear to be excessive.

Population counts at the Kennebago study area have not been included, as sufficient data are not available. The same high rate of mortality, however, appears to prevail there also.

Plans for next quarter: To make aerial censuses of both study areas until freeze-up, and to begin the thesis write-up.

FUR ANIMAL RESEARCH

Productivity of Maine Beaver

Objectives: 1. To investigate possible changes in the overall rate of reproduction since the period 1947-1950 when a productivity study was conducted.

2. To investigate possible differences in the rate of reproduction between beaver from the different climatic zones.
3. To compare the rate of reproduction between major size classes of beaver.

Assignment: D. James Coutu, Graduate Assistant

Largely inactive during the quarter except for review of the literature and planning for the fall program. During several weeks spent at the Moosehorn National Wildlife Refuge, an opportunity was afforded to make observations on a number of active beaver flowages.

Plans for next quarter: To make all necessary arrangements for the laboratory and field studies to be conducted during the trapping season; also to investigate the feasibility of bleaching reproductive tracts with hydrogen-peroxide to more clearly define placental scars.

WOODCOCK RESEARCH

(a) Woodcock Population Studies

Objectives: To conduct an annual census and to obtain related ecological data on the Unit's permanent census routes in Maine.

Assignment: Howard L. Mendall, Leader

Inactive during the quarter.

Plans for next quarter: Inactive.

(b) Inter-relationships of Woodcock and Beaver

Objectives: To study the effects of beaver flowages in the maintenance of desirable woodcock habitat, especially as related to the management program on the Moosehorn National Wildlife Refuge in eastern Maine.

Assignment: Frederick J. Payne, Graduate Assistant

Payne devoted nearly full-time during the quarter to intensive field work on this project. As pointed out in the last quarterly report, the study involves, to a large extent, a determination of the effect of beaver flowages on alder habitat used by breeding and migrating woodcock; also to determine the situations under which alder will establish itself within abandoned beaver flowages. Under most conditions of beaver flowages in eastern Maine, alder (or types in which alder is the chief component) is the most important vegetative species. It does not appear feasible, in a one-year study, to attempt to include other forest types which may be affected by beaver activity.

Field work during the quarter included the collection of data on the past and present type composition, by acreage, of active and abandoned beaver flowages; the period of maximum water level of these flowages; and the regeneration of alder within abandoned flowages. Observations of woodcock habitat inundated and woodcock use of abandoned flowages were made. Aerial photograph interpretation of total alder habitat on the Moosehorn Refuge was supplemented by field checks of specific areas.

The collection of data on acreage and per cent type composition of 104 beaver flowages has now been completed. These data do not include flowages which have been affected by man-made impoundments after beaver activity, nor do they include beaver activity within man-made impoundments. The period of maximum water level of flowages was determined primarily from increment borings taken from living, affected trees on the periphery of the individual flowages; also from the records maintained at the Moosehorn National Wildlife Refuge.

The average per cent survival of alder rosettes after successive years of flooding was calculated from 28 beaver flowages. Data showed a highly significant difference between the per cents of survival the first and fourth years and the second and fourth years; also a significant difference between the third and fourth years. The differences between the first and second, first and third, and second and third years were not significant. The average per cent of survival of alder rosettes after one year of flooding was 99 per cent, after 2 years 96 per cent, after 3 years 89 per cent and after 4 years 34 per cent. After 5 years of flooding only a negligible number of rosettes survived.

Very few beaver flowages on the Moosehorn Refuge have been abandoned for more than 6 years. Since the regeneration of alder by seeding does not become a factor in re-establishment until at least the fourth year; it is evident that the establishment thus far of this species on abandoned flowages at Moosehorn has been primarily by vegetative regeneration.

Plans for next quarter: (1) To continue tabulation and analysis of data collected; (2) to sample alder stands on the Moosehorn Refuge to determine the proportion of the total acreage that is currently woodcock habitat.

COOPERATION, EDUCATIONAL WORK AND MISCELLANEOUS ACTIVITIES

Coulter and Mendall continued to furnish technical aid when requested to the State Department of Inland Fisheries and Game.

Assistance was given the general public in arranging for autopsies, identifying specimens, and in furnishing technical information.

Mendall participated in several program planning conferences and waterfowl meetings in Augusta and Calais; also in Woodstock and Fredericton in New Brunswick.

The fall meeting of the Unit Coordinating Committee was held in September at Commissioner Cobb's office in Augusta.

PUBLICATIONS

Coulter devoted considerable time to editorial work on manuscripts for publication prepared by former graduate assistants Philip Alkon and Fred Hartman.

PERSONNEL CHANGES

A new graduate student, Hugh Haswell, reported to the Unit in September. Haswell is a graduate in forestry from the University of New Brunswick. Currently he is on educational leave from the New Brunswick Department of Lands and Mines where he is employed as Provincial biologist. Haswell's thesis will be on the white-tailed deer.

Dr. Horace F. Quick returned to the University in September following a year's leave of absence for Fulbright fellowship studies in Africa.

Effective July 1, Chester Banasiak, Deer Research Project Leader for the Department of Inland Fisheries and Game since 1952, joined the staff of the School of Forestry as an Assistant Professor in Game Management. In his new capacity Professor Banasiak will continue his work with deer on a contract basis through the Federal Aid program of the State Game Division.

Professor Banasiak received his B.S. in 1948 from Michigan State College and his M.S. from the University of Massachusetts. He served as a game biologist in West Virginia and in Wisconsin before coming to Maine.

Respectfully submitted,

Howard L. Mendall
Howard L. Mendall, Leader
Maine Cooperative Wildlife
Research Unit

University of Maine
Orono, Maine
November 12, 1960

MAINE COOPERATIVE WILDLIFE RESEARCH UNIT

University of Maine

Orono, Maine

QUARTERLY REPORT

October-December, 1960

Cooperating Agencies

Maine Department of Inland Fisheries and Game
Wildlife Management Institute
University of Maine
United States Fish and Wildlife Service

Unit Personnel

Leader - Howard L. Mendall
Assistant Leader - Malcolm W. Coulter
University Representative - Albert D. Nutting
Faculty Collaborators - Horace F. Quick
David C. O'Meara
Chester F. Banasiak
Graduate Assistants - D. James Coutu
Richard M. Gibbs
Frederick J. Payne
Graduate Student - Hugh Haswell
Secretary - Maxine L. Horne

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MAINE COOPERATIVE WILDLIFE RESEARCH UNIT

Quarterly Report

October-December, 1960

RESEARCH PROJECTS

WATERFOWL RESEARCH

(a) Waterfowl Distribution and Management

Objectives: To obtain data on the abundance, distribution, and migration of waterfowl species in Maine; and to conduct research that will assist in the management of the important breeding species, especially the black duck and the ring-necked duck.

Assignment: Howard L. Mendall, Leader

Population and migration data gathered during the fall are summarized under sub-project (c).

Plans for next quarter: Inactive.

(b) Renesting and Homing Study

Objectives: To study renesting behavior and the degree of migrational homing exhibited by waterfowl, primarily the black duck and the ring-necked duck.

Assignment: Malcolm W. Coulter, Assistant Leader
(Vermont phase conducted jointly with William Miller,
Waterfowl Project Leader, Vermont Fish and Game Service)

Inactive during the quarter.

Plans for next quarter: Inactive except for making preparations for the spring work.

(c) Waterfowl Hunter Bag Checks

Objectives: To determine hunter success, crippling loss, and species, sex and age composition of the kill.

Assignment: Howard L. Mendall, Leader

For the 13th consecutive year personnel of the Maine Cooperative Wildlife Research Unit and the State Game Division cooperated in a joint bag check study of waterfowl hunting. Coverage was similar to that of 1959. This year, however, Merrymeeting Bay was sampled less intensively, with increased data from the Penobscot River and the eastern Maine coast. Thus, the 1960 sample is a better representation of the entire state than was the case a year ago.

A split season was in effect in 1960 with open dates being October 7-29 and November 19-December 10. The bag limit remained unchanged. The special sea duck season on scoters, eiders and old squaws extended to January 7, but the bag check study does not include that phase of hunting.

During the field work a total of 905 hunter contacts was made and 1329 birds examined. There appeared to be an increase in the number of hunters afield this year, following last year's "low". This was definitely true in the Penobscot Valley, both in the fresh water portion of the river and in the tidal estuary; also along the eastern Maine coast during the late season.

Fall Populations

Following a favorable breeding season, early fall populations of most species appeared to be increased over those of 1959, with the exception of the ring-necked duck. Green-winged teal were particularly abundant this year. Geographically, good populations were prevalent throughout most of central and southern Maine, and also in the coastal belt. This was not true in the northern third of the state, however. In northeastern Maine in particular (Aroostook, Washington and northern Penobscot counties), departure of local birds from the breeding marshes was in evidence as early as mid-August and continued throughout September. Exceptionally low water prevailed on many marshes in this area.

Between split seasons, substantial migrations of black ducks and goldeneyes from Canada occurred throughout all parts of inland Maine. This movement began shortly before the first part of the season closed October 29 so gunners had but a few days to take advantage of the extensive flights. Because of the very mild weather of November a considerable number of goldeneyes were still available inland at the opening of the second half of the season. The majority of the blacks, however, had passed on to tidal areas by that time.

Concentrations of the coastal population built up gradually. More than average numbers of black ducks were present throughout the fall. Diving ducks, chiefly goldeneyes and scaups, increased rapidly after a general inland freeze the last of November. Peak populations for all species were reached shortly after December 1.

Hunting Success

Average hunter success, as determined by the bag checks, was 2.5 birds per man-day of effort, as compared with 2.1 in 1959. Likewise, the 1960 figure is substantially higher than the 13-year average. There is no question that the past season provided good duck shooting for most Maine gunners. Moreover, in contrast to the situation that generally prevails, hunting in 1960 was consistently good over a wide portion of the state. The sole exception, on an area basis, was the northeastern inland area, primarily

Washington and Aroostook counties. There, hunter success was decidedly below "par".

As usual, Merrymeeting Bay lead all areas in average hunter success although many waterways in central and in north-central Maine provided excellent gunning. Coastal hunting was the best in several years, particularly in eastern Maine. The December portion of the split season found near ideal hunting conditions.

Crippling Loss

The most unfortunate aspect of the 1960 season was the excessive crippling loss. Based on 1134 ducks shot and retrieved, 354 others were not retrieved. This represents a loss of 31 per cent, the highest such figure in 13 years. Much of this waste is needless and could be avoided with more conscientious effort by the hunters. Results this year follow a pattern noted previously - the better the hunting the less the effort expended in retrieving cripples. An additional point is seen in the fact that crippling loss in Merrymeeting Bay (almost 40 per cent) was much above the state average which is not usually the case. It supports the belief expressed by some of the gunners that in the Bay, with a 3-bird bag limit, many individuals shoot teal, then, if more desirable species start to fly, deliberately let the teal drift away on the current.

Regardless of the reasons for this year's high crippling loss it represents, to a large extent, a waste of game that could be avoided. The fact that on the eastern Maine coast and in the northeastern interior the percentage was less than 20 per cent shows that the loss did not have to be as high as state averages showed.

Bag Composition

The kill by species of the birds examined is given in Table 1. Although a proportional decline in the black duck of nearly 5 per cent occurred from 1959, this species still made up nearly half of all birds examined. By contrast, increases occurred in the green-winged teal, goldeneye and wood duck. The relative number of green-winged teal (21.5 per cent of the total) is the highest obtained since hunter bag check studies were begun. Green-wings were very common throughout Maine this past fall. They remained later than usual and several were checked during the late portion of the season.

The goldeneye made up a higher than average proportion of the bag. Excellent "whistler" gunning was afforded this year, especially on the Penobscot River and throughout the Kennebec Valley.

Figures given in the table for the Canada goose are misleading. It has been pointed out in reports of previous years that this study is not designed to accurately measure goose hunting. More geese were believed present throughout the interior of the state in 1960 than for several years, but very few were killed. Goose hunting is of virtually no importance in Maine except in Merrymeeting Bay.

Table 1

1960 Waterfowl Bag Checks

Species Composition (Exclusive of Sea Ducks)

Species	No. Birds Checked	Per cent	Per cent Change from 1959
Black Duck	600	46.5	-4.9
Green-winged Teal	278	21.5	+1.0
Goldeneye	130	10.1	+4.9
Wood Duck	83	6.4	+2.1
Blue-winged Teal	49	3.8	-2.1
Ring-necked Duck	36	2.8	-0.1
Pintail	33	2.6	+1.5
Mallard	21	1.6	-1.2
Mergansers (3 species)	19	1.5	No change
Bufflehead	18	1.4	No change
Lesser Scaup	9	0.7	+0.5
Greater Scaup	6	0.5	+0.3
Canada Goose	3	0.2	-1.4
Am. Widgeon	2	0.1	No change
Shoveler	2	0.1	
Black x Mallard Hybrid	1	0.1	
Unidentified	1	0.1	
Total	1291	100.0	

Sex and Age Ratios

About two-thirds of all ducks examined were sexed and aged. Such information, especially the age ratios, is directly related to breeding ground production. Figures from Maine, however, have little meaning except when considered with such data throughout all parts of the Atlantic Flyway. Nevertheless, it is of interest to note that overall age ratios this year showed, from a biological standpoint, a much more desirable figure - 1 adult to 2.4 young being shot in comparison to the 1959 ratio of 1 adult to only 1.6 young. Sex composition of all birds checked showed 52 per cent males and 48 per cent females. Last year the male to female ratio was 56:44.

Summary and Conclusions

1. The 1960 waterfowl hunting season was substantially improved over that of 1959. All sections of Maine enjoyed better gunning except in northeastern inland areas.

2. Crippling loss was the highest recorded during 13 years of bag check studies.

3. The black duck, green-winged teal and goldeneye, in that order, lead all species in the hunters' bag. Together they comprised almost 80 per cent of all ducks examined.

4. Sex and age ratios of birds killed were very satisfactory from a biological standpoint.

Plans for next quarter: To complete the analysis of bag check data accumulated during a 10-year period, and to prepare a report on the various aspects of waterfowl hunting in Maine. Work on this study, interrupted a year ago, was resumed in December. It is being written jointly by Howard Spencer, Jr., waterfowl biologist of the State Game Division and by Mendall.

(d) Breeding Ecology of the Common Goldeneye

Objectives: To determine the density of breeding populations on selected study areas, nesting and brood rearing preferences, and to measure productivity and annual production.

Assignment: Richard M. Gibbs, Graduate Assistant

During the fall, aerial population counts were made periodically at both study areas. Fall populations at Pierce Pond were increased over those of 1959 while at the Kennebago area the reverse was true.

All field work on this project has now been completed. Much of the quarter was devoted to analysis of accumulated data.

Plans for next quarter: To prepare a preliminary draft of the thesis.

FUR ANIMAL RESEARCH

Productivity of Maine Beaver

- Objectives: 1. To investigate possible changes in the overall rate of reproduction since the period 1947-1950 when a productivity study was conducted.
2. To investigate possible differences in the rate of reproduction between beaver from the different climatic zones.
3. To compare the rate of reproduction between major size classes of beaver.

Assignment: D. James Coutu, Graduate Assistant

Preparations were made for the final winter's laboratory studies. The sample size of specimens needed has been re-calculated. A two-year total of 200 reproductive tracts appears desirable from each climatic zone of the state. The minimum for this second year has been set at 296 uteri, and quotas have been assigned to each state biologist. The uteri are to be collected according to the same procedure outlined for the first year of the study.

To assist in laboratory examination of the uteri, experiments were conducted with reproductive tracts of muskrats. Tracts containing placental scars were placed in 3 per cent hydrogen peroxide to bleach the uteri and more clearly define the placental scars. Subsequent examination showed that this assisted in better differentiation of the scars.

Plans for next quarter: To examine the specimens obtained during the winter trapping season, to analyze the data, and to begin the thesis write-up.

WOODCOCK RESEARCH

(a) Woodcock Population Studies

Objectives: To conduct an annual census and to obtain related ecological data on the Unit's permanent census routes in Maine.

Assignment: Howard L. Mendall, Leader

Inactive during the quarter.

Plans for next quarter: Inactive.

(b) Inter-relationships of Woodcock and Beaver

Objectives: To study the effects of beaver flowages in the maintenance of desirable woodcock habitat, especially as related to the management program on the Moosehorn National Wildlife Refuge in eastern Maine.

Assignment: Frederick J. Payne, Graduate Assistant

Progress during the quarter included further compilation of data and revision of the outline to be used as a guide for writing the thesis.

Summary of some of the tabulated data disclosed that an estimated total of about 790 acres have been flooded by beaver on the Moosehorn Refuge since about 1940. Included in this total is an estimated 254 acres of woodcock habitat (215 acres alder, 39 acres other vegetation). Alder has re-invaded about 40 per cent of the area it formerly occupied prior to flooding. However, it is likely that alder will invade additional land in abandoned beaver flowages. Most of the flowages studied have not been abandoned by beaver (and thereby eventually drained) long enough to permit re-establishment of alder covers.

Red maple and tamarack survived flooding for up to 4 years. Gray and white birch and aspen died within 2 years after flooding.

Plans for next quarter: To begin the thesis write-up.

BIG GAME RESEARCH

Moose Studies in Norway

Objectives: To study the productivity and management of moose on a private forest of 80,000 acres in Romerike, Norway.

Assignment: Arne Krafft, Former Graduate Student (Krafft was in residence at the University of Maine in the academic year 1955-56)

During the quarter, the final revision of Krafft's thesis was completed, and it has now been approved by the Graduate Faculty. The thesis summary is as follows:

The ecology and management of moose on a 360 sq. km. private forest in Hurdal, Norway was studied from 1953 to 1957. Results of this study may be summarized as follows:

1. Information about the migration habits of moose reveals that some of the animals inhabiting the study area in summer and fall winter outside the area for varying periods between December and January to April.

2. Population trends are discussed and it is concluded that presently the herd is larger than ever recorded. An estimate of the fall population in 1955 and 1956 indicates an average density of about 8 moose per 10 sq. km. (2 moose per sq. mi.).

3. In 1954-1956 the fall population composition remained relatively constant, averaging 30 per cent adult and yearling males, 44 per cent adult and yearling females and 26 per cent calves.

4. In 1954-1956 the number of calves, 5 months of age, for each successful cow averaged 1.06. Presumably, about one-fourth of the adult females were without offspring during the fall. This low rate of reproduction is assumed to be a result of poor winter range conditions.

5. The annual harvest of moose has been increasing steadily from 1923 to the present. In recent years (1953-1956) the legal kill averaged 1.2 moose per 10 sq. km. per year (1 moose per 3 sq. mi.). In terms of dressed weight this kill represents 217 kilos per 10 sq. km. per year (124 lb. per sq. mi.).

6. Legal hunting is currently the most important mortality factor, representing about one-half of the calf crop as measured in the fall population.

7. Apart from the legal kill most of the mortality to moose during the last 12 years (1945-1956) was found to be caused by illegal hunting and accidents, and in severe winters it seems that appreciable deaths occurred, probably attributable to malnutrition.

8. The current harvest could be considerably increased, probably by about 50 per cent without overtaxing the breeding population. To achieve a better utilization of moose it is recommended that this increased harvest should be taken by hunting until it is known whether a reduction of the breeding stock is needed.

9. To insure an increased kill the hunting regulations should be set so that calves make up about 25 per cent of the number harvested and the remaining part should be about equally divided between males and females of all age classes 1.5 year of age and older.

10. The method of determining the harvestable crop and the type of regulation of the sex and age composition of the kill are suggested, as well as the desirable length and dates of the hunting season.

11. It is believed that an all-age and all-sex harvest of the full crop produced each year will result in better winter food conditions. It is likely that better winter food conditions will result in an increased rate of reproduction. A larger annual harvest would also mean more recreation for the hunters. To the owner of land it would mean increased income, and a greater opportunity for practicing more intensive moose management.

(NOTE: This is now a completed project.)

COOPERATION, EDUCATIONAL WORK AND MISCELLANEOUS ACTIVITIES

Coulter and Mendall continued to furnish technical aid when requested to the State Department of Inland Fisheries and Game.

Assistance was given the general public in arranging for autopsies, identifying specimens, and in furnishing technical information.

The winter meetings of the wildlife staff seminar were resumed during the quarter under Coulter's guidance.

The Unit again cooperated, as was the case a year ago, with the Nova Scotia Department of Lands and Forests in the mammalian food habits study being conducted by Dr. Harrison F. Lewis, retired former chief of the Canadian Wildlife Service. The Unit provided laboratory, office and library facilities, as well as some technical assistance, for Dr. Lewis for approximately 7 weeks during November and December. Over 1,000 digestive tracts of bobcat, red fox and raccoon were examined.

PUBLICATIONS

Coulter completed the editorial work necessary on the final draft of Krafft's thesis, summarized elsewhere in this report. He also began the manuscript of the food and feeding habits of the fisher.

Mendall commenced work on the manuscript of the 10-year waterfowl harvest studies, conducted jointly with the State Game Division.

Respectfully submitted,



Howard L. Mendall, Leader
Maine Cooperative Wildlife
Research Unit

February 24, 1961