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MAINE COOPERATIVE WILDLIFE RESEARCH UNIT

University of Maine

Orono, Maine

QUARTERLY REPORT

January-March, 1959

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
Graduate Assistants - Philip U. Alkon
 Fred E. Hartman
 William L. Robinson
Graduate Student - Arne Krafft
Clerk - 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NOT FOR PUBLICATION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

January-March, 1959

RESEARCH PROJECTS

FUR ANIMAL RESEARCH

Ecology of the Fisher

Objectives: To obtain data on the distribution, habitat preferences and winter food habits of the fisher.

Assignment: Malcolm W. Coulter, Assistant Leader

A few specimens were examined including two females that were carrying large embryos. Additional work was accomplished in studying food habits material and in tabulating these data. Anticipated manuscript work on this project could not be accomplished because of a heavy load of administrative duties and special assignments during the winter.

Three days were spent in the field with a trapper employed by the Department of Inland Fisheries and Game who was live-trapping fisher for shipment to Vermont.

Plans for next quarter: Inactive.

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 spring population and nesting studies will be initiated in April. Principal emphasis this season will be placed on breeding ecology of the black duck.

(b) Renesting and Homing Study

Objectives: To study renesting behavior and the degree of migrational homing exhibited by the black duck and the ring-necked duck, and, to a limited extent, by the mallard.

Assignment: Malcolm W. Coulter, Assistant Leader and William Miller, Waterfowl Project Leader, Vermont Fish and Game Service

Plans were made for intensive field work that will begin during late April. Nest traps and other materials were ordered or repaired. Data gathered last year were summarized and tabulated.

Plans for next quarter: To conduct intensive field study along lines of previous seasons. Work in eastern Maine will be expanded through cooperation of the Moosehorn National Wildlife Refuge.

(c) Waterfowl Banding

Objectives: To study the movements and migration routes of waterfowl in Maine.

Assignment: Malcolm W. Coulter, Assistant Leader

Inactive during quarter.

Plans for next quarter: Inactive.

(d) 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

Work was begun on the 10-year analysis of accumulated data. This is being compiled jointly with Howard E. Spencer, Jr., of the State Game Division. It had been hoped to get preliminary drafts of several phases of the report completed during the winter. However, an unusually heavy load of administrative duties and conferences prevented much progress from being made.

Plans for next quarter: Inactive.

(e) 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

Hartman devoted as much time as could be spared from classes to intensive work on the study area. Population checks were made at regular intervals and detailed records kept as to particular mud flats used by the birds. Feeding behavior was recorded. Special efforts were made to determine the effects of weather on activity of the birds, as well as to record any evidence of mortality or hardship. This was deemed of importance in view of the severity of the winter.

The population peak was reached during the first half of January with more than 4,300 birds present. Of these, roughly 50% were black ducks, 35% greater scaups and 15% goldeneyes. The numbers of ducks dropped steadily during late January and throughout February as progressively more of the mud flats and coves became ice-bound. It was believed that the birds moved further out in the Bay at this time, presumably feeding around the off-shore ledges and islands.

Warmer weather set in near the last of the month, ice conditions were alleviated somewhat and the ducks again started building up in numbers. This was most noticeable with scaup and goldeneyes. First migratory withdrawals from the study area were noted toward the end of March.

No evidence was obtained of actual mortality due to the unusually prolonged cold spell of February. It is likely that some losses would have occurred, however, had warmer weather not set in when it did. Several specimens collected at that time showed some emaciation and loss of weight.

Fifteen specimens were collected during the period for stomach analysis and for post-mortem examinations. Food determinations were begun of the specimens obtained during the fall hunting season. Systematic sampling of the mud flats was likewise begun.

Plans for next quarter: To carry out population checks throughout the spring migration period, and to continue work on mud flat sampling. Laboratory work on specimens already obtained will be conducted as time permits.

WOODCOCK RESEARCH

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: To conduct the regular spring censuses. In addition, a series of specimens will be obtained in cooperation with the woodcock-pesticide study of the Bureau of Sport Fisheries and Wildlife.

UPLAND GAME BIRD RESEARCH

Ruffed Grouse Cover Requirements and Populations

Objectives: To obtain data on preferred winter cover types and population densities.

Assignment: Howard L. Mendall, Leader

Because the pressure of administrative duties and special assignments

was greater than in any previous winter, most work on this project was cancelled.

Plans for next quarter: Inactive.

BIG GAME RESEARCH

(a) 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, Graduate Student

Krafft was able to resume work, after a long delay, on his thesis write-up.

Plans for next quarter: To continue preparation of the thesis.

(b) Winter Cover Studies of the White-tailed Deer

Objectives: To measure the effects of a deficiency of winter cover on penned fawn deer.

Assignment: William L. Robinson, Graduate Assistant

Robinson had concluded the field work on this project by the close of the quarter. A complete summary will be presented in the next quarterly report.

Plans for next quarter: Preparation of the thesis.

(c) A Study of Hardwood Browse for Deer

Objectives: To determine the time at which supplemental hardwood cuttings for deer should be made in order to provide the most nutritious and palatable winter food.

Assignment: Philip U. Alkon, Graduate Assistant

Alkon's study progressed throughout the quarter according to schedule. Since a complete project summary will be given in the next quarterly report, no details of accomplishment will be presented at this time.

Plans for next quarter: Preparation of the thesis.

COOPERATION, EDUCATIONAL WORK AND MISCELLANEOUS ACTIVITIES

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

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

An arrangement for the integration of certain wildlife activities within the State culminated several months of conferences and negotiations with Unit, University and State Fish and Game Department personnel. Under the new arrangement the Assistant Unit Leader will serve as coordinator of wildlife programs that are carried out at the University of Maine or in cooperation with the University. This involves basic research of the Unit and of the Game Division of the Maine Department of Inland Fisheries and Game, and also the University wildlife training program. It does not include fisheries programs, however.

Coulter, Mendall and Quick participated in the State Game Warden Training School held in Augusta.

Coulter served as Chairman of the Wildlife program at the University of Maine's annual Farm and Home Week. Mendall also participated in the Farm and Home program, giving a paper at the Forestry Forum.

Several speaking engagements were given during the quarter by Coulter, Quick, Alkon and Mendall.

Mendall attended the Regional Conference of Fish and Wildlife Service personnel held in Boston during February. He delivered a paper on the work of the Unit.

Coulter attended the Atlantic Flyway technicians meeting in Dover, Delaware in February.

Mendall attended the annual Unit Leaders meeting and North American Wildlife Conference, in New York in March. Coulter and Quick also attended the latter meetings. Mendall served as Vice-chairman of the Wetlands session.

Mendall's publication "The Ring-necked Duck in the Northeast" was given the 1959 terrestrial publication award of the Wildlife Society as "the outstanding publication in wildlife ecology and management".

An all-day meeting of the Unit Coordinating Committee was held in January at the offices of the Maine Department of Inland Fisheries and Game. The group consisted of Mr. Nutting, Commissioner Cobb, Deputy Commissioner Bucknam, Game Division Chief DeGarmo, and Mendall.

Respectfully submitted,

Howard L. Mendall

Howard L. Mendall, Leader
Maine Cooperative Wildlife
Research Unit

University of Maine
Orono, Maine
June 15, 1959

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April-June, 1959

RESEARCH PROJECTS

FUR ANIMAL RESEARCH

Ecology of the Fisher

Objectives: To obtain data on the distribution, habitat preferences and winter food habits of the fisher.

Assignment: Malcolm W. Coulter, Assistant Leader

Inactive during quarter.

Plans for next quarter: To begin work on the manuscript on winter ecology and food habits.

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 studies on breeding ecology and productivity were conducted by Mendall throughout the period. Assistant Leader Coulter and Graduate Assistants Alkon and Robinson furnished aid on several of the study areas. Other assistance was given at various times by State Game Biologists, particularly Henry Carson, and by Game Warden Lawrence Caron; also by Refuge Biologist Eldon Clark of the Moosehorn National Wildlife Refuge, and by Judge John Dudley of Calais.

Studies in breeding ecology were confined primarily to the black duck. Production studies, as usual, covered all breeding species. Techniques were the same as in previous years and study areas throughout northern, eastern and central Maine were sampled. Overall coverage, however, was reduced slightly from that of 1958.

Mendall's annual mid-July production report has already been submitted. Essential features of that report (exclusive of tabulated data) are given at this time. The period covered extends slightly beyond the quarter herein reported upon, but in the interest of continuity, it appears desirable to present the entire summary in one report. This is as follows:

Breeding Populations

Initial breeding stock of most species showed very little change this year on the study areas as a whole in comparison with 1958. Since this follows a rather substantial increase of two years ago, Maine's breeding waterfowl remain in fairly good condition.

The only apparent change in status that is considered noteworthy is a marked increase in the blue-winged teal. This bird is always a minor nesting species in Maine and so its favorable numbers this year will not add a great deal to the State's production. Nevertheless, breeding blue-wings are more numerous at present than at any time since these studies were initiated. They arrived on the breeding grounds at unusually early dates and nested correspondingly early.

Other species did not show enough variation from the counts of a year ago to have any statistical significance. A slight increase in the ring-necked duck was balanced by a very slight decrease in the black duck - the reverse of 1958. In both cases, however, the changes were well within the bounds of normal sampling errors on the study areas.

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

<u>Species</u>	<u>Status in 1959</u>
(Measured on census areas)	
Ring-necked Duck	9% increase
Black Duck	3% decrease
Wood Duck	5% decrease
(Estimated)	
Blue-winged Teal	Substantial increase
Green-winged Teal	No change
Common Goldeneye	No change

General Breeding Conditions

Climatic conditions and phenology in 1959 have been closer to the long-term average than was the case a year ago. It has been, however, a season of extremes. The spring break-up was much later than in 1958, but this was followed by a long period of warm, sunny weather; the early phase of nesting was near average dates for the black duck and was actually ahead of average for the late nesting ring-necks and teals.

May was hot and dry throughout the State with precipitation below normal and temperatures above normal. This is conducive to very favorable breeding under northeastern conditions. By contrast June was cool and very wet. Near record precipitation fell in central and eastern Maine (from 6" to over 9" at some stations), as well as in parts of southern Maine. Although the entire month was wet, rainfall was heaviest during the period from the 14th to the 20th. Flood conditions prevailed locally in central and eastern Maine on the 19th and 20th. Even in the northern part of the State, where total rainfall for the month was close to normal, some waterways were at near flood level on the 19th and 20th. July, up to the present, has been close to the average. A gradual drop in water has taken place, although levels are still higher than is ordinarily the case.

Fortunately, the black duck hatching peak occurred slightly earlier than in 1958 and was at approximately the 21-year average date. Thus the majority of black duck nests hatched in advance of the flood. Later nesting species, especially ring-necks and blue-winged teal were not as fortunate and considerable nest loss occurred on streams and small marshes, especially in central and eastern Maine. On the larger marshes and lakes, and in the northern Maine marshes, the flood damage was not as extensive.

Although some renesting following the high water is occurring at present, the late date of the flood undoubtedly prevented as much of this as would have been the case earlier. The potential loss was alleviated in part by the fact that both ring-necks and teals nested earlier than usual and an appreciable number had already hatched.

Nesting Success

A total of 31 nests was available to supplement other data in determining natural success. This is a smaller sample than in recent years. Of this number 18 were ring-necks, 9 were black ducks and 4 were blue-winged teal. As of mid-July, 4 ring-neck nests were still being incubated. Hatching success for the remainder was 56 per cent. This is below the long-term average but is above the figure of a year ago. Half of all recorded nest losses were from floods. Predation was much lower than is usually the case.

The Brood Season

Up to mid-July, 61 complete and aged broods had been recorded, this being substantially more than at the corresponding period of a year ago. Brood sizes, especially of the older age classes are higher than average for both black ducks and ring-necks. With the relatively high water now present, and with emergent vegetation at its height, excellent rearing conditions exist.

Conclusions

1. No significant change in breeding populations was noted in 1959 except in the blue-winged teal which showed a marked increase.
2. Nesting success is higher than in 1958 but is still below the long-term average. Flood losses have been higher than usual but predation has been relatively light.
3. Rearing success is as good as, or slightly improved, as that of a year ago and is above the long-term average as well.
4. Considering all phases of the breeding season, it is expected that ultimate production in Maine in 1959 will show a slight increase over that of 1958.

Plans for next quarter: To conclude the season's 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)

Intensive field study began with the start of nesting activities by black ducks in April. Field work was concentrated in 4 major locations, 3 in Maine and 1 in Vermont. The work in Vermont, conducted jointly by Coulter and Miller, is now in its third year.

In eastern Maine the project was expanded through the cooperation of the Refuge Branch, U. S. Bureau of Sport Fisheries and Wildlife to include 4 marshes on or near the Moosehorn National Wildlife Refuge. In addition, refuge personnel hatched and reared more than 100 ducklings in connection with the study. Because of the interest of Refuge Manager David Hickok, Biologist Eldon Clark and Forester Paul Ryan, hatching and rearing success at the refuge was very good. This cooperation will provide an opportunity to add many useful data, particularly for the ring-necked duck. Howard Mendall and Graduate Assistants Alkon and Robinson assisted with field work in eastern Maine. Graduate Assistants Alkon, Robinson and Hartman helped with the field work at the Goose River study area and also tended the incubator in Orono. Dorothy Coulter reared the ducklings hatched at Orono.

Techniques employed in field study were quite similar to those used in previous seasons, i.e., breeding hens were trapped at their nests, banded, color-marked and released at the nest site. Eggs from these nests were collected to simulate loss of the clutch to predators, floods, etc. Eggs so obtained were hatched in incubators and the ducklings reared for later release on the study areas. All ducklings were reared in wire pens placed off the ground and were fed a high protein (28-30%) turkey feed. In addition the ducklings fed extensively upon insects attracted by lights left in the pens at night. It is believed that this supplemental natural food is very desirable. Hatching and rearing success at all locations, viz., Milton, Vermont, University of Maine, and Moosehorn Refuge has been good.

The activities of marked females were followed and much effort was devoted to study of the re-nesting activities of these birds. Since this work is still in progress only a brief summary of the incomplete results will be given in this report.

1. The nests of 79 ducks (black ducks, mallards or ring-necked ducks) have been located and studied. Some of these were likely re-nests, resulting from natural loss of the first nest. Clutches in this category were not disturbed although many of the hens were trapped to determine if they carried bands from previous seasons.

2. Forty-five hens were marked to study re-nesting after their first clutch had been taken.

3. At least 11 of the 45 were known to be re-nesting at the end of the quarter. One black duck hen has re-nested for the second time this season.

4. Approximately 375 ducklings are being reared from eggs collected during the study. Some of these birds have already been released on the study areas; the remainder will be released when they are 4-5 weeks old.

5. The return of adult hens, banded at nests on the study areas in previous years has been higher than for 1958. In some instances data relative to the nesting and re-nesting activities of individual hens during a 3-year period have been accumulated.

Plans for next quarter: Continue intensive field study. Compile all data from the study as an aid to planning future work on the project.

(c) Waterfowl Banding

Objectives: To study the movements and migration routes of waterfowl in Maine.

Assignment: Malcolm W. Coulter, Assistant Leader

Inactive during the quarter.

Plans for next quarter: Inactive.

(d) 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: Inactive.

(e) 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

During much of the quarter, thesis time was devoted to the examination of digestive tracts previously collected. Field work consisted of spring population counts, some preliminary mud flat sampling, and readings of salinity and water temperature.

Two phases of the sampling program were worked on during April and early May. One consisted of perfecting techniques and methods. Also, the preliminary classification of the flats was begun. Initial classification was on the basis of the firmness of the mud, color of the mud, amount of organic matter present, and amount of rock present.

Salinity and temperature measurements were taken in the shallow water over the various mud flats which were determined previously as being used most by feeding blacks. Table 1 gives the salinity and temperature of the water for the various sections of the study area exclusive of the Bucksport region. These readings were taken during the high tide period and from 3 to 100 feet from the high tide line.

Table 1

Average Salinity and Temperature Measurements from the Penobscot Estuary

Section	Date	Salinity (Corrected to 15°C.)	Water Temperature (°C.)
Orland River	April 8, 1959	.8	4.8
Fort Knox	April 11, 1959	3.6	1.7
Winterport	April 12, 1959	3.7	10.2
Porcupine Island	April 15, 1959	4.1	6.5
Marsh Stream	April 18, 1959	.5	7.0

At the present time, 67 black duck gizzards and gullet-gizzard combinations have been examined. The major food items are the clams, Mya arenaria and Macoma balticus. Other important foods are the amphipods, Gammarus oceanicus and Orchestia grillus, and the mollusks, Littorina littorea and Mytilus edulis.

Twenty goldeneye stomachs were examined. The main food items were Mya arenaria, Mytilus edulis, Macoma balticus, and various crustaceans including Gammarus oceanicus. Mya arenaria, Mytilus edulis, and miscellaneous crustaceans were the important foods found in six bufflehead gizzards.

Plans for next quarter:

1. To complete food habits study on present collection of digestive tracts.
2. To continue work on mud flat sampling.
3. To commence population checks in late summer and early fall.

WOODCOCK RESEARCH

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

The usual spring censuses were conducted on the Unit's eastern Maine study areas. An increase of approximately 10 per cent was recorded over breeding populations of a year ago. This is somewhat higher than the data compiled for the entire state.

In cooperation with the woodcock-pesticide project of the Bureau of Sport Fisheries and Wildlife, a series of specimens were collected on the Washington County breeding grounds. These were sent to the Patuxent laboratories.

A combined field inspection and planning conference relative to this study was held at Calais during May; present were John George of the Patuxent Refuge, who is organizing the study, Bruce Wright, Director of the Northeastern Wildlife Station at Fredericton, New Brunswick, and Mendall.

Plans for next quarter: Inactive.

UPLAND GAME BIRD RESEARCH

Ruffed Grouse Cover Requirements and Populations

Objectives: To obtain data on preferred winter cover types and population densities.

Assignment: Howard L. Mendall, Leader

Inactive during the quarter.

Plans for next quarter: Inactive.

BIG GAME RESEARCH

(a) 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, Graduate Student

During the quarter, Krafft submitted several chapters of the revised thesis draft relating to this study.

Plans for next quarter: To continue the thesis revision.

(b) Winter Cover Studies of the White-tailed Deer

Objectives: To measure the effects of a deficiency of winter cover on penned fawn deer.

Assignment: William L. Robinson, Graduate Assistant

Robinson completed all Unit duties in June and was given his Master's degree at the Spring commencement. He is working during the summer for the Maine Department of Inland Fisheries and Game. In September he will enter the University of Toronto to begin work on a Doctorate. His thesis was entitled, "A Study of Winter Shelter Requirements of Penned White-Tailed Deer". The thesis summary and conclusions are as follows:

This study was conducted to test the effects of sparse cover on penned white-tailed deer. Three groups of fawns, in three pens, were kept at a low level of nutrition. Coniferous cover density was deliberately varied as follows: Pen O, open or sparse shelter; Pen M, moderate shelter; and Pen D, dense shelter. Two deer per pen were studied during the winter of 1957-1958 and five per pen during the winter of 1958-1959. Climatic influences were measured in each enclosure, condition of the deer was evaluated, and their behavior was observed.

The results of the climatic measurements indicated that minimum temperatures in selected locations were significantly lower in the open area than in the other two pens. The following average minima were recorded:

	Pen O (Sparse Cover)	Pen M (Moderate Cover)	Pen D (Dense Cover)
1957-1958	16.5°F.	18.0°F.	18.7°F.
1958-1959	8.4°F.	--	10.0°F.

By contrast, temperatures in the bedding areas of the deer showed no significant differences between pens. During a two-week period the following average minimum temperatures were recorded:

Pen O	Pen M	Pen D
6.5°F.	5.9°F.	6.8°F.

Wind movement in selected locations was about three times greater in the open area than in the moderate cover and about nine times greater than in the dense shelter. In the bedding areas, however, less wind movement was recorded: about one and one-half times as much wind in Pen O as in Pen M and about three times as much as in Pen D.

Snow was deepest in Pen O during most of each winter. Only for a few days each year, however, was the depth great enough (over twenty inches) to hinder movement. On these days the deer soon made packed trails on which they could walk about the area with ease.

Consideration of all measured climatic factors indicated that the deer in the open area were subjected to slightly more severe conditions than those in the other two enclosures. This was brought about primarily by increased wind movement, and secondarily by slightly reduced minimum temperatures. Snow depth could not be considered an important factor in this study.

Many measurements and observations were made in an attempt to determine the condition of the deer. Three criteria selected as indicators of condition were (1) a "condition index", consisting of the numerical ratio of body weight

in pounds to hind foot length in inches, (2) visual estimates of condition, and (3) fat content of the femur marrow. The lack of quantitative information as a guide in determining condition of the deer pointed out the need for fundamental research in deer physiology to describe basic "normal" values.

The results of the condition index presented values ranging from 5.44 (a prime, fat animal) to 2.22 (a starved animal). A comparison of condition indices measured in fall and spring showed that, during each winter, all deer except one experienced a decline in condition. The two that showed improvement were in the moderate and sparse cover situations. No significant differences in change of condition indices were found to exist between groups of deer held in different cover densities.

Visual estimation of condition of the deer in the first winter's study did not reveal differences in condition attributable to cover deficiency. In the second winter a scale based upon visible evidence of physical condition was used periodically to evaluate each deer. Ratings ranging from "10" (a deer in excellent condition) to "0" (a dead animal) were assigned each deer. The following average values for each group were recorded at the beginning and end of the study:

	January 3	March 3
Pen O	6.2	4.2
Pen M	7.4	5.6
Pen D	7.0	5.0

These figures failed to indicate that more rapid declines in condition took place in the deer kept in the open area than in those in the moderate and dense cover situations.

Analysis of femur marrow fat content provided a basis for evaluating condition of the deer at the conclusion of the study. In the first winter, differences between groups of deer were negligible. In the second winter the average marrow fat content of the deer in the sparse cover was 10.22 per cent compared with 29.25 per cent (moderate cover) and 31.01 per cent (dense cover). The difference probably resulted from the fact that the deer in the open area were in poorest condition at the start of the experiment.

Three cases of mortality occurred in March, 1959, as a result of the experimental conditions. Two fawns in the open area and one in the dense area died. Autopsy revealed cause of death in each case to be starvation with no trace of pneumonia. Had lack of adequate shelter been a cause of death, either: (1) pneumonia, or (2) a notably higher fat content of femur marrow should have been found in the fawns in the open cover. Neither was found. The conclusion based upon this finding is that lack of shelter did not play a major part in causing death of any of the animals.

Observations of behavior were centered upon three main phases of activity: (1) total movement about the pens, (2) dominance, and (3) bedding. Measurement of total amount of movement by a track count system showed that during the first winter more restlessness occurred in the deer kept in the open and moderate cover situations than in the dense cover. It is probable

that the preferences of the deer in these pens would have been for more dense cover, had it been available to them.

Dominant behavior was closely related to condition of the individual deer. Those deer that consistently drove the others from the feeding shelter were invariably in best condition at the end of the study, regardless of their condition at the beginning.

Bedding sites were apparently chosen for their protection from wind and for their warmer temperatures, especially during periods of cold weather. The fact that bedding sites chosen by the deer during the second year's study were identical with those selected by the animals of the previous year indicated definite preferences for specific sites. A typical bedding site was characterized by having overhead shelter in the form of dense conifers, protection on the north afforded by trunks of trees or by slash, and a southern exposure allowing sunshine to reach the ground.

In summary, no differences in condition of the deer could be ascribed to cover deficiencies present on the study area. Three deer that died of malnutrition showed no effects of exposure. Observations of behavior indicated that a preference for more dense cover may have existed among the deer kept in the open area. Dominance was important in determining the final condition of individual deer. Bedding sites were apparently chosen for their less severe micro-climate.

Plans for next quarter: None. This project is now completed.

(c) A Study of Hardwood Browse for Deer

Objectives: To determine the time at which supplemental hardwood cuttings for deer should be made in order to provide the most nutritious and palatable winter food.

Assignment: Philip U. Alkon, Graduate Assistant

Alkon completed his duties at the Unit at the close of the period and received the Master's degree at the June Commencement. He is now at his home in New York and is negotiating for a wildlife position in the northeastern region. His thesis title was, "A Study of Nutritional and Palatability Values of Hardwood Slash as Winter Deer Food". His summary and conclusions are as follows:

This study was designed to determine the relation between time of cutting and the nutritional and acceptability values of hardwood slash as winter food for deer. Red maple, sugar maple, and paper birch were selected for study. The following techniques were used: (1) Browse samples were collected from the tops of trees felled monthly from September through March during two years. These were analyzed for moisture, crude protein, crude fat, crude fiber, ash, and nitrogen free extract; (2) Browse samples collected in the first season were fed to albino rats; (3) Various kinds of browse were offered to four penned deer in both seasons; and (4) Monthly cuttings were made in the vicinity of a known deer yard.

The following conclusions were made:

1. Defoliated twigs were consistently higher in moisture than twigs collected from trees felled prior to leaf-fall. The presence of leaves appeared to facilitate a loss of moisture from the twigs.
2. The separation of the tops from the trunks did not influence nutritive changes within the twigs. The pattern of seasonal changes of moisture, protein, fiber, and nitrogen-free extract was similar in October- and fresh-cut samples.
3. A movement of moisture and protein from the leaves to the twigs prior to leaf-fall was indicated. A translocation of other nutrients was not apparent.
4. Some differences between the species existed. However, all species conformed to the overall patterns described above.
5. Differences in nutrient content between the sample groups did not appear to be of significance. Although fresh- and October-cut twigs were higher in most nutrients, the differences were small. Paper birch was noticeably higher than sugar maple in all components except ash and fiber.
6. No statistically significant differences in weight losses were demonstrated by albino rats fed browse diets, on the basis of time of cutting. However, considerable individual variation was exhibited by the animals in their response to browse. It is believed that albino rats are not ideal subjects for the type of experiment conducted.
7. The penned deer preferred twigs from freshly cut trees, or trees cut in October, to September-cut browse. Paper birch and red maple were more acceptable than sugar maple. Direct observations revealed that the deer were selective in their use of the samples.
8. On a fresh-weight basis, those samples preferred by the deer were consistently higher in moisture and lower in fiber than less acceptable browse.
9. On the basis of the findings, time of cutting affected the acceptability of the twigs but not their nutrient content. Browse from trees felled after the leaves had fallen was more succulent; that is, it contained more moisture and less fiber. Such browse was preferred by the penned deer. Since the acceptability of a food is a major determinant of its value, it is believed that trees cut after leaf-fall provided the most valuable winter food for deer.

Plans for next quarter: None. This project is now complete.

COOPERATION, EDUCATIONAL WORK AND MISCELLANEOUS ACTIVITIES

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

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

PUBLICATIONS

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Coulter, Malcolm W. and Clarence E. Faulkner

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Mendall, Howard L.

1959. The Wildlife Research Program at the University of Maine. Maine Field Naturalist, 15(3):72-83.

Respectfully submitted,

Howard L. Mendall

Howard L. Mendall, Leader
Maine Cooperative Wildlife
Research Unit

University of Maine
Orono, Maine
July 30, 1959

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MAINE COOPERATIVE WILDLIFE RESEARCH UNIT

University of Maine

Orono, Maine

QUARTERLY REPORT

July-September, 1959

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
Clerk - 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

July-September, 1959

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 season's studies were concluded during August. Successful hatching occurred for all but one of the four nests that were still under observation when the last quarterly report was prepared. Brood rearing conditions, considered excellent during the early part of the summer, continued to remain very satisfactory. Although water levels dropped somewhat throughout August they were nevertheless higher than average throughout the rearing period.

No observations were made to indicate any appreciable change from the prediction of mid-July that overall production in Maine in 1959 would be slightly increased over that of a year ago. Since the last quarterly report carried a rather complete summary of both the spring and early summer accomplishments on this project, further details appear unnecessary at this time.

Plans for next quarter: Largely inactive, although some population and migration data will be obtained 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 work continued until after mid-August. Study techniques were similar to those described in previous reports.

Fourteen instances of renesting were observed and studied. The number of renests located was less than last year. This was due primarily to adverse weather during the period when ring-necked ducks were attempting to reneest. An unusual amount of precipitation during mid-June caused flood conditions on all study areas. Even at marshes where structures are present for water level control, it was impossible to prevent flooding. Only one of 10 marked

ring-neck hens was definitely known to successfully re-nest. However, observations of the behavior of several females that were marked prior to the floods suggested that some of them had started re-nests.

The first instance of a marked black duck hen laying three clutches during the same year was recorded this season. This bird has been trapped each year on the same island since 1957. During the past season her initial nest of 11 eggs, in the second week of incubation, was collected on May 3. Her second nest of 7 eggs, incubated 2 to 3 days, was collected on May 25. The third nest of 9 fresh eggs was discovered on June 13.

Homing by hand reared hens released on the study areas continued to be very low. However, in contrast to past seasons, the return to nesting islands on Lake Champlain of adult black ducks, banded on their nests in 1957 or 1958, was very high (more than 50 per cent). This is the first year that a high return of banded adult hens has occurred on any of the study areas. Reasons for the great variation in return rate and for the high rate of return this season are not clear.

Plans for next quarter: To prepare a summary analysis of all data gathered to date.

(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: Limited bag check studies will be conducted throughout the hunting season. In addition, Mendall and Coulter will participate in the cooperative wing sample study as requested by the Patuxent laboratory of the Bureau of Sport Fisheries and Wildlife. This year's bag checks will be on a restricted basis, as was the case in 1958, pending a decision as to how much field investigation is necessary to satisfactorily supplement the data from the Postal kill questionnaire.

(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

During this quarter laboratory work consisted of completing the analysis of the digestive tracts previously collected. Mud flat sampling constituted most of the field work. Population checks, salinity and temperature measurements, and plant collecting were also carried out.

Food habits study: A total of 167 digestive tracts collected from the

study area during the past year and from previous years was analyzed. Of this total, 102 were blacks, 49 were common goldeneyes, 7 were Barrow's goldeneyes, 6 were buffleheads, and there was one each from a mallard, greater scaup, and an unidentified merganser.

The foods occurring most frequently in the black duck were the clams, Macoma baltica (especially) and Mya arenaria. Other important foods were the amphipods, Gammarus oceanicus and Orchestia grillus, various vegetation, and seeds of bulrush, Scirpus spp.

Combining the common goldeneye and the Barrow's goldeneye digestive tracts, the most important foods were the clams, Macoma baltica and Mya arenaria, and the mussel, Mytilus edulis. Gammarus oceanicus and unidentified amphipod remains usually constituted the rest of the gizzard contents.

In addition to these digestive tracts from the study areas, 26 stomachs from other coastal and estuarine habitats were examined. Fifteen of these were from the Bagaduce River and consisted of 11 blacks, 2 common goldeneyes, one canvasback, and one common merganser. Excluding the merganser which had fed on fish exclusively, the major food items for the other species were eelgrass, Zostera marina, mussel, Mytilus edulis, and the snails, Littorina littorea and Odostomia bisuturalis.

The gizzards of three black ducks from Penobscot Bay contained Macoma baltica, Mya arenaria, Orchestia grillus, and vegetation. The gizzard of one black from Frenchman's Bay contained Littorina littorea and Gammarus oceanicus. Unidentified snail material was the main item found in seven blacks from the Skillings River.

Mud flat sampling: A series of preliminary samples were taken and boundaries were established for the different types of flats based on the criteria mentioned in the last quarterly report. A sampling scheme was then devised under the direction of Dr. Harold Young of the School of Forestry. Valuable suggestions in sampling were also made by Dr. Harold Gausman of the Agronomy Department. With this sampling procedure it will be possible to test for significant difference (at the 5% probability level) between the various types of flats sampled by use of the standard error of mean difference.

The shoreline distance for each flat to be sampled is obtained from a coastal marine chart of the area. Ten numbers are then randomly selected from a table of Tibbett's random numbers. These numbers may range from zero up to the number that corresponds to the total distance measured for the shoreline. These numbers correspond to the appropriate distances as they are laid off on the various flats along the shore. The location of these distances is then marked along the shore. At these spots the lines are laid out so as to run as perpendicular as possible to the shoreline.

On each line four sample plots are taken. Those mud flats having a width of less than 150 feet have a sample plot about 10 feet from both the mean high tide line and the mean low tide line. The remaining two plots are placed as to be evenly spaced from each other and the outer two. Mud flats with a width of more than 150 feet have the end sample plots about 20 feet from both mean water extremes. As before, the two middle plots are

evenly spaced from each other and the outer two. Thus each flat sampled has 10 lines and 4 samples per line making a total of 40 samples per flat regardless of size. Exceptions may be made on a few of the very small flats.

The samples are taken by means of an Ekman dredge which takes a surface area sample of a nine inch square. The sampling is done from a boat usually when there is shallow water (several inches) over the flats. Thus the depth to which the dredge bites into the mud can be fairly well regulated so as to produce rather uniform-sized samples. This depth is around 4 inches.

Miscellaneous activities: Salinity and temperature measurements were taken in the shallow water over the various mud flats which were determined last winter as being most extensively used by feeding black ducks.

Records were kept as to the late summer and early fall build-up of birds. First evidence of flocking was noted July 16 in the Winterport section, but it was not until the second half of August that appreciable numbers occurred. Numbers ranging from 100 to 175 were recorded at various times from mid-August to September 23. In late September, 225 blacks were present, together with 75 green-winged teals. Other portions of the study area contained relatively few birds. Practically no divers had appeared up to the end of the quarter.

Plans for next quarter:

1. Continue mud flat sampling.
2. Collect waterfowl digestive tracts for food habits study.
3. Make population counts and observations.
4. Obtain salinity and temperature measurements.

(e) Breeding Ecology of the Common Goldeneye

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

Assignment: Richard M. Gibbs, Graduate Assistant

This is a new project initiated during the summer.

Statement of problem: Among the various waterfowl species harvested annually in Maine, the black duck and goldeneye are of major importance. The black duck has been investigated by many workers but few data relative to goldeneyes are available. Both species breed locally and are subjected to considerable hunting. Both are present throughout the length of the hunting season. As hunter activity continues to increase, however, the goldeneye bears more and more pressure. It is not known whether the species can withstand this harvest and continue to prosper under present or foreseeable conditions.

An investigation which will ultimately yield management recommendations is needed. Maintenance of local breeding populations and sustained annual harvests would be major considerations.

Scope: This investigation is to be one phase of a more inclusive goldeneye study of the State Game Division. It will be a two-year graduate study by M.S. candidate Gibbs. The assistantship and expenses of the project are being financed by the Game Division of the State Department of Inland Fisheries and Game through Federal Aid funds.

Study areas:

1. Pierce Pond and adjacent small ponds in Somerset County.
 2. Kennebago River and adjacent areas in Franklin County.
- Supplementary data will be obtained when feasible on other areas, but intensive study will be limited to the areas named.

Progress during Quarter

Field work was started in mid-July. Although most of the work was done at Pierce Pond, general surveys were made of the Kennebago study area in order to become familiar with the terrain and to obtain comparative population counts. Emphasis, however, was placed on the development of field techniques to be used during the next nesting season.

Brood drives were conducted on Pierce Pond during the last week of July. A total of 16 goldeneyes, 15 non-flying young and one adult female, were trapped and banded. Eight birds were marked with red nasal disc markers. Subsequent observations have indicated that red is a poor color under field conditions, and therefore, yellow markers will be used in future markings. The sex ratio of the banded young was 9 males:2 females. The sex of 4 young was not determined conclusively, but they were probably males. Their ages ranged from about 6 to 8 weeks.

It was found that the best trap, from the standpoint of mobility and ease in handling, was one made of chicken wire. The trap was set up in a V-shaped design, with a funnel opening into a semi-circle, also constructed of chicken wire, and with a wire bottom. The leads, or sides of the V, were 15-20 feet long. Although the young could pass through a net with 2 1/2 inch bar mesh with ease, the chicken wire proved impassible. The trap was erected so that one lead started on the shoreline, making the trap parallel to the shore. This had two advantages. First, the water was shallower, making it easier to erect and work the trap, and secondly, it eliminated the need of an extra canoe and crew in the drive.

The broods could be driven long distances along the shore, if not pressed, but were reluctant to go directly across large expanses of open water. It was decided that it would be more advantageous to conduct future brood drives somewhat earlier, or when the majority of young are five weeks old. Most broods at six weeks of age had already been deserted by the hens and as a result, the young were scattered.

Little specific data on brood movements, mortality, dispersal, and departure from the study area were obtained due to the lack of definite means to distinguish the different broods. It is fairly certain, however, that 9 broods were present on the Pierce Pond area during the second week of July, with a total of about 45 young. The number of young per brood varied from 1-10. There was much mixing of broods, especially as the summer progressed and the females began to desert their young; several broods were seen having

young of two or more age classes. One brood, with the female present longer than most, and which was observed with some regularity, gained six young in one week, three of which were added in one day between 9 A.M. and 4 P.M. This brood then had young of three different age classes. By the end of July, when most of the broods were six weeks of age, the majority of the females had left the area, or gone into hiding to molt.

A total of 25 nest boxes were put up along the shore of the Pierce Pond area. Three were placed on Kilgore Pond, eight on the Upper pond, six on the Middle pond, four in the Narrows, and four in the Lower pond. The nest boxes were constructed of rough lumber, with inside dimensions of 10 x 10 x 24 inches, with an opening of 3 1/2 inches in diameter. The boxes were attached to trees, as close to the water as possible and facing open water. The areas in front of the boxes were cleared of obstacles. The purpose of these nesting boxes is twofold: first, to try to increase the number of birds breeding on the area, and secondly, to facilitate the nesting study.

Plans for next quarter:

1. To continue population counts on both study areas until freeze-up.
2. To perfect methods of color-marking flightless young.
3. To compile existing file data concerning past summer populations, bag checks, brood counts, and breeding pair inventories.

WOODCOCK RESEARCH

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: In cooperation with the woodcock-pesticide project of the Bureau of Sport Fisheries and Wildlife, Unit personnel will participate in the fall collections of wings and specimens.

NOTE:

Several Unit studies, described in previous quarterly reports, are no longer considered to be active projects and are not reported upon at this time. These are the following:

1. Ecology of the Fisher - assigned to Malcolm W. Coulter.
2. Ruffed Grouse Cover Requirements and Populations - assigned to Howard L. Mendall.
3. Waterfowl Banding - assigned to Malcolm W. Coulter.
4. Moose Studies in Norway - assigned to Arne Krafft.

Some work in tabulating and analysing data remains to be done, as well as the preparation of reports or manuscripts. Several publications have

already resulted from the fisher studies. A very limited amount of field or laboratory work may possibly be carried out on both the fisher and grouse projects prior to completion of final reports. Such efforts, however, will not be on a scheduled basis.

For the foregoing reasons, it would appear misleading to continue to record these studies in a list of active Unit projects. Therefore, they will not be reported upon in future quarterly reports until such time as the completed thesis (in Krafft's case), final reports, or manuscripts are available for summarizing.

COOPERATION, EDUCATIONAL WORK AND MISCELLANEOUS ACTIVITIES

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

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

Mendall participated in a number of meetings and conferences during the quarter. Included were conferences in Augusta with State officials pertaining to the 1959 waterfowl regulations; also meetings of the Maine Waterfowl Council. Program-planning conferences were held in Calais with personnel of the Moosehorn National Wildlife Refuge, and in Fredericton, New Brunswick with personnel of the Northeastern Wildlife Station and the Fish and Wildlife Branch of the New Brunswick Department of Lands and Mines.

Coulter took part in numerous conferences with Game Division and University personnel in connection with his duties as wildlife coordinator.

Plans were completed for providing office and laboratory space, as well as equipment, at the Unit for special studies to be conducted this fall by Dr. Harrison F. Lewis, former Chief of the Canadian Wildlife Service. Dr. Lewis, now retired, is under contract with the Nova Scotia Department of Lands and Forests to carry out a study of the food habits of the bobcat, the red fox and the raccoon. Dr. Lewis feels that the Unit laboratory is better adapted for his analysis needs than those available in the Maritime Provinces. The work is expected to require about 5 weeks time.

A periodic meeting of the Unit Coordinating Committee was held in Orono on September 24.

PERSONNEL CHANGES

A number of important personnel changes occurred during the quarter. Dr. Horace F. Quick received a Fulbright fellowship for a year of study in Africa and is on leave of absence. Quick taught the undergraduate wildlife courses at the University and served as Unit collaborator. This vacancy is being filled by Dr. Sanford Schemnitz who obtained a PhD in wildlife management at Oklahoma State University. Recently Dr. Schemnitz has been conducting research in Michigan.

Three new graduate students have begun work at the Unit. This brings

the graduate roster to four which is considered a full quota for existing facilities. The new men are:

Richard Gibbs, a wildlife graduate last June from the University of Massachusetts. Gibbs reported July 1 and was able to initiate preliminary work on his thesis during the summer. He has been assigned to the new goldeneye project through a P-R assistantship.

D. James Coutu, was graduated in June in wildlife management from West Virginia University. He, also, holds a P-R assistantship and reported to the Unit in September. He will be assigned to a new project, now being formulated, on beaver productivity.

Frederick Payne was graduated in forestry from the University of Maine in 1957. Recently he has been employed as a forest consultant in Vermont. He reported to the Unit in September. His thesis subject is unassigned at present but will deal with woodcock or upland game.

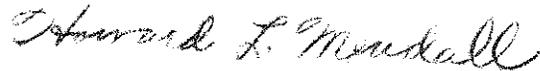
PUBLICATIONS

Coulter, Malcolm W.

1959. The Fisher: Wanderer of the Woodland. Maine Fish and Game, Vol. 1, No. 2, Fall, 1959. pp. 9-11.

Coulter's publication entitled Big Game and Fur-Bearing Animals of Maine (Extension Bulletin 425) was revised during the quarter and the manuscript sent to the Editor.

Respectfully submitted,



Howard L. Mendall, Leader
Maine Cooperative Wildlife
Research Unit

University of Maine
Orono, Maine
November 18, 1959

MAINE COOPERATIVE WILDLIFE RESEARCH UNIT

University of Maine

Orono, Maine

QUARTERLY REPORT

October-December, 1959

Cooperating Agencies

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

Unit Personnel

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Assistant Leader - Malcolm W. Coulter
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*On leave of absence until September, 1960.

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MAINE COOPERATIVE WILDLIFE RESEARCH UNIT

Quarterly Report

October-December, 1959

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) - Waterfowl hunter bag check studies.

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)

Some progress was made during the quarter in analysing data previously accumulated on this study. The work was not completed, however, because of the pressure of other duties.

Plans for next quarter: Inactive, except for analysis of data and making plans 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 12th 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 on a curtailed basis this season, as was the case in 1958, although most of the important hunting areas were sampled to some extent. Major emphasis was placed on Merrymeeting Bay, the

Sebasticook River drainage and the Penobscot Estuary. Because of both the degree of coverage and the noticeable decline in hunting pressure the last of the season, the results are much more representative of early season shooting than of the late coastal gunning.

A total of 1,096 hunters was contacted and 1,360 birds were examined.

Fall Populations

In line with the favorable breeding season, early fall populations appeared equal to, or slightly higher than those of a year ago. This was especially noticeable among the black duck, wood duck and the two teal. Ring-necked ducks, on the contrary, were generally decreased in numbers, again correlating with the fact that this species was the only major breeding duck showing a lowered production.

The foregoing statements apply to the State as a whole. Locally, many variations occurred as is generally the case. In northern and eastern Maine, and in much of the Sebasticook drainage, early October populations were noticeably higher than a year ago. By contrast, throughout the upper Penobscot and Kennebec valleys unusually high water levels prevailed and birds were very scarce. Excellent numbers of ducks were present in Merrymeeting Bay when the season opened although a heavy departure of teal occurred shortly after opening day.

Populations from late October to early December were not as satisfactory and appeared to be lower than those of 1958, at least during the hunting season. A substantial flight of black ducks through the interior took place about mid-November but this was during the closed season between the two split periods. Diving ducks, especially the goldeneye, appeared to be decreased more noticeably than the black duck, although it was considered that the latter species, too, was not as abundant as last year throughout all but the first of the hunting season.

A decided improvement in coastal populations was evident during the last two weeks in December, but this did not occur until after the season had closed. Although beyond the scope of the present report, it is of interest to note that the subsequent wintering population, as determined by the January inventory, showed a marked improvement over that of a year ago.

Hunting Success

A split season was selected in Maine in 1959, the periods being October 9-November 7 and November 21-December 5. The bag limit was reduced to 3 birds. An additional special season on sea ducks (scoters, eiders and old squaws) extended to January 8.

Average hunter success, as determined by the bag checks, was 2.2 in the early season, 1.5 in the late season, and 2.1 for both periods combined. This is a decline from the 2.3 average of 1958. The lower average bag may be attributed not only to fewer birds that prevailed on many areas after the opening, but also to less favorable hunting weather. Numerous periods of rain as well as mild, calm weather prevailed during much of the season. Another factor that, in many localities adversely affected hunting success,

was the decline in the number of gunners. Heavy hunting ordinarily is associated with decreased success but there are many large waterways in Maine where the reverse is true. This becomes particularly noticeable during warm, calm weather - which often prevailed in 1959. Then it was a case of too few hunters to keep the birds moving.

The decrease in the amount of hunting effort was strikingly apparent to the biologists afield during the entire season, even on opening day. It was particularly noticeable during the late, coastal hunting. This year there were several days during the second part of the split season when the biologists found it virtually impossible to locate any duck hunters. Informal interviews were held with a number of potential duck hunters, checked in recent years but not encountered at their usual areas. Their reasons for not hunting this year generally fell into one or more of the following categories:

1. Decrease in number of shooting days and reduction in the bag limit.
2. Frequent news releases during late summer and early fall pointing out drastic reductions in continental waterfowl populations.
3. Increase in cost of duck stamp.

Goose hunting at Merrymeeting Bay showed a continuation of the improvement noted a year ago. In the opinion of some observers it was nearly equal to the 1954 season which was the last outstanding year.

As pointed out in reports of previous years, this study is not designed to measure sea duck hunting. From reports received, however, it appears to have been a rather poor season. Substantial declines in the numbers of white-winged scoters have been indicated the past two years. This is the species of "sea coot" that is most important to the sea duck gunners. Good eider duck shooting at off-shore ledges was reported, but this is a highly specialized sport, and is of importance to only a very limited number of Maine duck hunters.

Crippling Loss

Figures compiled on crippling loss showed this mortality to be 29.7 per cent. This is the highest figure recorded in 12 years of bag checks. It should be pointed out, however, that this year's sample from the coast was lower than usual; coastal gunners generally retrieve a larger proportion of their ducks than do inland hunters. As is always the case, crippling loss was highest during the early part of the season on the inland marshes. On two of the check areas, this loss for the first two days reached the staggering figure of 57 and 67 per cent respectively.

Bag Composition

The kill by species of the birds examined is given in Table 1.

Table 1

1959 Waterfowl Bag Checks

Species Composition (Exclusive of Sea Ducks)

Species	No. Birds Checked	Per cent	Per cent Change from 1958
Black Duck	699	51.4	-9.8
Green-winged Teal	279	20.5	+9.9
Blue-winged Teal	80	5.9	+2.7
Common Goldeneye*	71	5.2	-1.8
Wood Duck	59	4.3	+0.7
Ring-necked Duck	39	2.9	-0.2
Mallard	38	2.8	+1.1
Canada Goose	23	1.7	+1.3
Mergansers (3 species)	20	1.5	-1.3
Bufflehead	19	1.4	-1.5
Pintail	15	1.1	-0.2
Lesser Scaup	3	0.2	No change
Greater Scaup	3	0.2	No change
Ruddy Duck	1	0.1	-0.3
American Widgeon	1	0.1	No change
Mallard x Black Hybrid	1	0.1	No change
Unidentified	9	0.7	
Total	1360	100.1	

*Includes 3 Barrow's Goldeneyes.

Principal increases were in the two teal, the mallard and the Canada goose. The green-winged teal occupied its usual standing as the number two species but reached its highest proportion in any year studied. This may not be a true representation because data from Merrymeeting Bay in this year's sample was greater than is generally the case. It is at the Bay where the teal kill is of most importance.

Major decline in 1959 was with the black duck and probably reflects the lowered number of blacks available to the gunners during the middle and latter part of the open season. Decreases in the diving ducks is believed to be associated with generally lowered populations of those species.

Sex and Age Ratios

More than three-fourths of all ducks examined were sexed and aged. These data are shown in Table 2.

Age ratios for the black duck, as well as for all species combined, showed the identical proportions as in 1958. The majority of the blacks were taken in October and may be assumed to represent, to a substantial degree, Maine breeders or birds from nearby areas of Canada. The ratio would indicate somewhat better local production than was apparently the case in more westerly breeding regions.

Summary and Conclusions

1. The 1959 waterfowl hunting season was not as satisfactory, except for goose shooting, as that of a year ago.

2. Overall populations were better than in 1958 at the start of the season. Thereafter fewer birds were available to the gunners. Good flights through the State occurred between the split seasons. Major build-up of the wintering population on the coast apparently did not occur until late December.

3. Hunting pressure, especially during the late season on the coast, was the lowest observed in twelve years.

4. The black duck and green-winged teal made up over 70 per cent of all birds examined in the hunters' bag.

5. Sea duck hunting, especially on the white-winged scoter, showed a continuation of last year's unsatisfactory trend.

6. Sex and age ratios indicated a reasonably good condition from a biological standpoint.

Plans for next quarter: To complete a 10-year analysis of accumulated bag check data, an interrupted study that was initiated last year.

Table 2

Waterfowl Sex and Age Ratios - 1959
(Breakdown for major species only)

Species	Ad. Male		Ad. Female		Im. Male		Im. Female		Total	Age Ratio		Sex Ratio	
	Ad. Male	Ad. Female	Im. Male	Im. Female	Ad.:Im.	Male:Female							
Black Duck	106	94	196	142	538	1:1.7	55:45						
Green-winged Teal	43	33	73	71	220	1:1.9	53:47						
Blue-winged Teal	11	16	24	20	71	1:1.6	49:51						
Wood Duck	18	10	10	7	45	1:0.6	62:38						
Common Goldeneye	9	8	13	12	42	1:1.5	52:48						
Ring-necked Duck	3	7	13	15	38	1:2.8	42:58						
Grand Totals (Including minor species not listed above)	223	179	366	288	1056	1:1.6	56:44						

(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

Mud flat sampling constituted most of the field work during the first half of the quarter. Waterfowl population checks and observations were carried on throughout the entire period. Waterfowl digestive tracts were collected during the hunting season. Salinity and water temperature measurements were made.

Mud flat sampling: The mud flat sampling, primarily involving the clams, *Macoma balthica* and *Mya arenaria*, was carried out according to the sampling plan discussed in last quarter's report. Although the final statistical analysis of the results has not been made, some real differences between clam populations of various flats has been noted. The Porcupine Island section produced the greatest abundance of these mollusks. Various flats in the Winterport and Orland River sections, and the Fort Knox region, also had good clam populations, but their abundance was about half that of the Porcupine Island area.

Waterfowl populations: The waterfowl population increased gradually throughout the fall. A noticeable influx occurred in mid-November but the peak numbers were not reached until the last half of December, especially for the diving ducks. At this time, there were approximately 2,643 birds on the study area. Of these, about 55 per cent were greater scaups, 32 per cent were black ducks, and 13 per cent were goldeneyes. Although more black ducks were present during October than a year ago, their numbers after that were below the 1958 level.

Collection of digestive tracts: A total of 79 digestive tracts was collected during this hunting season by Unit personnel, state game and fisheries biologists, and cooperating hunters. This total was broken down as follows: 40 black ducks, 21 common goldeneyes, 6 green-winged teal, 4 buffleheads, 2 pintails, and 2 greater scaup; there was one each of mallard, Barrow's goldeneye, hooded merganser and common merganser.

Salinity and water temperature measurements: Measurements of salinity and water temperatures were taken in the shallow water over the various mud flats which were determined previously as being most extensively used by feeding blacks. These readings were taken during the high tide period and from 3 to 100 feet from the high tide line.

Plans for next quarter:

1. To commence thesis write-up.
2. To analyze digestive tracts obtained this fall.
3. To continue population counts and observations.
4. To collect a few winter specimens for gizzard analysis and post-mortem examination.

5. To make further determinations of clam populations.
6. To take soil samples for mechanical analysis and content of organic matter.

(e) Breeding Ecology of the Common Goldeneye

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

Assignment: Richard M. Gibbs, Graduate Assistant

Progress During Quarter

During this quarter, field work consisted of continuing the fall population counts on the Pierce Pond and Kennebago River study areas. Three population counts were made at Pierce Pond and two on the Kennebago River area. Aerial surveys were made on both study areas on October 19 and 30. A count by canoe was made at Pierce Pond on November 7. For the aerial counts a single-engine float plane operated by the Warden Division of the Department of Inland Fisheries and Game was used.

From the standpoint of time and completeness of coverage, the aerial method is best in making population counts on the study areas. With the use of a plane two men, including the pilot, can completely cover both study areas in three hours, whereas by car and canoe, the same coverage would take in excess of five days. The Kennebago area, in particular, requires much time to survey except by air.

Low populations at Kennebago, noted in September, continued to prevail through October as well. Since freeze-up occurred prior to mid-November, it was apparent that the area was of minor importance during the fall migration period.

At Pierce Pond, better populations of birds were recorded throughout the fall. The November 7 count, made shortly before freeze-up, showed 150 goldeneyes to be present.

Compilation of all existing goldeneye file data of the Unit and the Game Division was initiated in an effort to delineate the breeding range of the species in Maine. To date, the original county survey sheets and the file data on brood counts and breeding pair inventories have been compiled.

Plans for next quarter: To continue compilation of file data, and to study various methods of color-marking flightless young.

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

This is a new Unit project. The investigation is being conducted at the request of the Game Division, Department of Inland Fisheries and Game, and is financed by Federal Aid to Wildlife Restoration Project, W-37-R-9.

The current annual beaver census in Maine and forecasts of trends in the beaver population are based upon data resulting from an intensive study conducted in 1947-1950 (Hodgdon and Hunt, 1953 - Beaver Management in Maine, Game Div. Bull. #3, Me. Dept. Inland Fisheries & Game, 102 pp.). Predictions of the populations appeared to be reasonably accurate until 1956. Since that year it has become increasingly apparent that changes in colony composition, number of beaver per colony, rate of reproduction, or possibly other factors were resulting in inaccuracies in the annual forecast of populations. Since the 1947-1950 study, the intensity of trapping has varied and there have been obvious changes in habitat. These factors, perhaps in combination with others, may be partially responsible for recent inconsistencies in predictions.

This study represents an effort to recheck one of the possible sources of error in calculating beaver population trends.

Methods of study:

The reproductive rate of beaver will be determined from counts of placental scars in the uteri. From the data collected with each uterus it will be possible to further group the data by climatic zones and by size classes. Techniques described by Hodgdon and Hunt (1953) for counting placental scars will be used.

Design of study:

Several specialists in statistics and sampling design were consulted in an attempt to insure that the sample gathered would be reliable. Dr. Harold E. Young, Dr. Harold W. Gausman, and Miss Mildred R. Covell, of the University of Maine faculty, and Chester F. Banasiak, State Game Biologist, were very helpful in the determination of the necessary sample size. Kenneth W. Hodgdon, Assistant Chief, Game Division, provided data from the 1947-1950 study. These data furnished some clue as to the factors of variability that might be encountered.

It was determined that approximately 600 reproductive tracts would be needed to detect significant differences. This sample will be collected over a two-year period, allowing 300 per year.

The total sample required was broken down and yearly quotas established for each climatic zone. Based on area, and assuming an equal distribution of beaver throughout the State, these quotas are as follows: Northern, 147; Intermediate, 93; Central, 60.

Reproductive tracts from adult female beaver are to be collected by regional biologists. Collection will begin with the opening of the 1960 trapping season. Based upon data presented by Hodgdon and Hunt (1953) the following criteria were selected to separate yearlings from adults:

1. Incisor tooth width - 6.4 mm.
2. Hind foot length - 6 1/4 inches
3. Fur length - 26 1/2 inches

These measurements may include 6.5 per cent yearling females and may exclude 2.6 per cent of the smaller adult females. Accurate field criteria for separating adults from yearlings are not known, but it appears that the above will suffice to yield a collection of predominately adult beaver.

Plans for next quarter:

1. To examine the uteri that are received.
2. To make a preliminary statistical analysis of the first season's data.
3. To initiate a study of suitable media for permanent preservation of the tracts.
4. To accompany as many trappers as possible in order to obtain information on the trapping of beaver.

WOODCOCK RESEARCH

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

During the fall Unit personnel cooperated in the woodcock-pesticide project of the Bureau of Sport Fisheries and Wildlife through the fall collection of wings. In addition, complete data on sex, age, measurements and weights were obtained for 61 specimens, collected at periodic intervals covering all of the hunting season. This work was carried out by Graduate Student Payne.

Plans for next quarter: Inactive.

COOPERATION, EDUCATIONAL WORK AND MISCELLANEOUS ACTIVITIES

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

Coulter and Mendall continued to furnish technical aid when requested to the State Department of Inland Fisheries and Game. Coulter participated in several conferences with Game Division and University personnel in connection with his assignment as wildlife coordinator.

Dr. Harrison F. Lewis, former Chief of the Canadian Wildlife Service, spent 5 weeks in the Unit Laboratory on a special assignment for the Nova Scotia Department of Lands and Forests. This work, dealing with food habits of the bobcat, red fox and raccoon, consisted of analysis of stomach contents and scats collected last year. While here, Dr. Lewis participated in several seminars and other campus group meetings.

A new wildlife seminar, involving undergraduate as well as graduate students, was initiated this fall. Coulter and Mendall assisted Schemnitz and Dr. Harry Everhart of the Zoology Department in organizing this group.

Meetings of the staff seminar, begun a year ago, were resumed this fall under Coulter's guidance. This seminar is restricted to staff members, graduate students, and fish and game biologists stationed near the Orono area.

PUBLICATIONS

Coulter, Malcolm W.

1959. Big Game and Fur-Bearing Animals of Maine. Maine Ext. Serv. Bull. 425 (Revised), Univ. of Maine, Orono. 29 pp. (This is the 4th printing and the second revision of this publication.)

Respectfully submitted,

Howard L. Mendall
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Maine Cooperative Wildlife
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University of Maine
Orono, Maine
February 4, 1960