JOB COMPLETION REPORT

SURVEYS AND INVESTIGATIONS PROJECTS

Project No. 3-R-3 Work Plan No. 8 Job No. 8

TITLE OF JOB: Banding of waterfowl and study of nesting conditions.

OBJECTIVES: As originally stated: To determine nesting conditions and abundance of waterfowl; establish flyway information. (This work to be done in four different locations in Alaska.)

As revised: To make an intensive survey of the Innoko River region to collect pertinent data, primarily regarding the use of the area by waterfowl, but also regarding other forms of wildlife in general. Also, to band as many waterfowl as possible in the area, preferably ducks. Information resulting from this survey to be compiled in as comprehensive a manner as possible.

TECHNIQUES USED: As originally planned, a field party of two men, one a biologist and the other a local native assistant, was established and provided with equipment for conducting the work.

For clarity of presentation, the more detailed descriptions of various individual techniques used have been embodied in the main report, in the section, "Findings," below, and may be found there under the appropriate sub-headings.

FINDINGS: The information resulting from this job is presented below, organized as a formal report.

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SUMMARY

1. The Innoko River waterfowl banding and survey project was carried on during June and July, 1948. Holy Cross, on the lower Yukon River was the starting point for the field work. Quantitative data collected is presented in tabular form in the appendix, together with various explanatory maps.

2. The topography and climate of the region are described, and an unusual flood condition believed to have been detrimental to nesting success is discussed.

3. Basic field equipment consisted of two boats and two outboard motors, combined to effectively meet varying conditions. The field work was divided into a preliminary reconnaisance of the area during the first month, followed by intensive banding work in selected locations during the second month. Some observations were made from the air, and the success and limitations of this method are discussed.

4. The wildlife resources of the area are described. Information regarding numbers, distribution, and life history of various species was obtained from local residents, sight records, and field observations. This is discussed in general for the various groups of birds, game, and fur animals, and in detail as regards waterfowl.

5. A total of 695 birds were banded in the Innoko area. The methods and techniques used are discussed, together with the habits of the various species as influencing their capture.

INTRODUCTION

This report contains a general description of the work accomplished in the Innoko region, together with various remarks concerning other pertinent topics. A series of tables in the appendix present the numerical data in a convenient reference form, and three explanatory maps are also included.

An excellent selection of basic field equipment for use in this job had been assembled by Mr. Gillham, much of it having seen previous use by him in pre-war investigations of the Hooper Bay area. This was added to where necessary and the writer departed from official station at Anchorage by air on June 5th. At Holy Cross on the lower Yukon near the mouth of the Innoko, Philip Edwards, a local Indian familiar with the Innoko region, was engaged as assistant, and after final preparations were completed the journey by boat up the Innoko River was begun on June 9th.

Except for a brief visit by Mr. Gillham on July 13th while enroute north by air, there were no contacts made with headquarters until after return to Holy Cross on August first. During this time in the field, the general directions, and many pertinent suggestions previously offered by Mr. Gillham were closely followed, but it was found that many of the problems arising in the field, especially concerning the banding operations, would be solved only through improvisation. In these instances, the native ingenuity of Edwards was frequently of great value.

TOPOGRAPHY AND CLIMATE

The Innoko River is a tributary of the lower Yukon River, entering from the south-east across from the village of Holy Cross about 300 miles above the Yukon's mouth. It has its source in the Kuskokwim Mts. just west of McGrath on the Kuskokwim River, and on its headwaters are located the well known placer gold fields of which Ophir is the principal camp. A similar placer mining area surrounding the village of Flat about 70 miles to the southwest is drained by the Iditarod River which joins the Innoko about 160 miles above its mouth. Both of these rivers and the several other tributary streams of the Innoko are very devious in their winding courses, and many miles are often covered by river between two points but a short airline distance apart. As an example of this, the headwaters of the Iditarod River may be reached by an overland journey of less than 50 miles from the mouth of the Innoko, while a journey by boat will cover over 400 miles of river in reaching the same spot. Likewise, while the airline distance from the headwaters of the Innoko to its mouth is less than 150 miles, the indirect course and many windings of the river make the actual mileage by water at least four times that distance. Figure 1 shows the location of the Innoko River in Alaska, and Figure 2 presents a more detailed map of the region.

Although the mountains of its source rise to over 4000 feet altitude, most of the area traversed by the Innoko River is extremely flat, and the few low hills and ridges which border the river in some

places are usually under 1000 feet in height. The terrain in general is typical of interior Alaska in its contours and vegetative cover. Being a river valley region, it is well covered with the characteristic spruce-birch forest of the interior in which stands are light and trees comparatively small and scattered, with white spruce on the better sites, black spruce on the wet, swampy flats, and cottonwood, aspen, birch, and willows along the river bottoms and burns as well as in mixture with the spruce. There are extensive unforested areas interspersed throughout wherever wet tundra flats mark ancient lake beds or where drier tundra clothes rocky heights and exposed ridges.

The composition of the tundra itself varies with the site, but in general the wetter types are composed chiefly of cotton sedges, low or bog shrubs, lichens and mosses, while the dryer types consist chiefly of the larger shrubs, grasses, weeds, and black sedges.

The first 110 miles of the river, below Holikachuk, traverse an extensive river bottom area where banks are high with stands of large dominant cottonwoods or spruces, and a thick understory of willows. Many winding sloughs mark abandoned channels of the same type. Above Holikachuk, the forests near the river are in many places replaced by extensive grassy flats that reach their greatest development just above the mouth of the Iditarod River over a stretch of about 30 miles between this and the Innoko River. This area is locally called the "Iditarod Flats." Still further upstream, heavier forests are again encountered and as swifter water marks the beginning of higher ground toward the mountains, the banks become very high and steep with many small willows and some excellent stands of large spruce.

The characteristic climate of the region is one of severe winters and a light rainfall usually between 10 and 20 inches annually. At Holikachuk, a small village in a representative location about 110 miles up the Innoko River, the break-up of the river ice generally occurs during the middle of May, with the freeze-up coming in late October. Table 1 presents a ten-year record of these dates as officially compiled by the U.S. Weather Bureau.

A recurrent feature of the spring break-up throughout the entire Yukon valley is the high water which usually prevails in the river and its tributaries for the first few weeks following the movement of the ice. As this is an annual occurrence, it may rightly be considered a common feature of the environment met by waterfowl and other birds returning to their northern breeding grounds. During the spring of 1948, however, an abnormal condition of high water prevailed over the Yukon valley in general and the Innoko River in particular, and as will be mentioned later this is thought to have been a vital factor affecting goose nesting success in the Innoko region. Not only was the water higher than usual during this period, but the duration of the flood was considered by local residents to have been far in excess of normal.

That this condition was widespread over the Yukon valley is confirmed by the serious floods that occurred in Nenanna and Fairbanks. The explanation of this is contained in the following quotation from the Fairbanks Flood Report for May, 1948, in the files of the U.S. Weather Bureau:

> "The flood was brought about by the unusual weather which prevailed over Interior Alaska during the month of April. At Fairbanks the snowfall for the month measured

> 25.1 inches, which amounted to 2.30 inches of water when melted. Normal precipitation for April is 0.28 inches and the greatest amount ever before measured in April during the 43 years that records have been kept was 0.98 inches.
>
> "April was also much colder than normal. . . . There was practically no thawing weather until the last few days of the month. Ordinarily during the month, although temperatures may remain below freezing, some of the snow will disappear through the process of sublimation. The constant cloudy weather this year made that impossible, so the maximum depth of snow was still on the ground at the close of the month.
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> "When warm weather did come early in May, the temperature jumped to several degrees above normal. . . . Rapid melting of the snow. . . . was the result. Additional precipitation during the first part of May was very light and practically all of the flood water came from melting snow."

The presence of above-normal snow depths late in the spring as described in the above report is also born out by reports of trappers in the Innoko region.

The abnormality of this spring's water conditions becomes very evident in the light of the above facts, and the importance of weather data in wildlife management is also emphasized when the effects of this abnormality are considered as found in the Innoko region, and as may well have occurred in a great many other locations where no survey was made.

METHODS AND EQUIPMENT

The writer believes that the combination of motive power and floating equipment used during this project is very nearly ideal for field work of this sort. The basic equipment used for primary transportation throughout the region was a twenty-two foot open boat especially designed for river and bay work, powered by a sixteen horsepower outboard motor. The boat had a small deck forward, with a high, sheered bow above a "V" bottom which rapidly flatened out toward the stern, making a five-foot beam amidships. The craft was light, drew only eighteen inches of water, and was capable of holding many hundreds of pounds of equipment.

This weight-carrying capacity was very important, inasmuch as it was necessary to carry large quantities of fuel wherever the field work led beyond the vicinity of a trader's warehouse. It was also important in transporting the second piece of equipment which was used entirely for the local field work through lakes, ponds, and side sloughs surrounding a base camp. In this case, it was a twelve-foot Indian skiff of the canoe-type design peculiar to the region but with a flat stern for the use of a second outboard motor of five horsepower. This craft was invaluable for banding and reconnaisance work through shallow and winding channels, for an occasional portage, and also for fuel economy in the day-to-day local operations. In moving from base to base, this second craft was usually carried rather than

towed, for most efficient travel. Although this particular skiff was satisfactory except for an aged condition which required constant reqpairs, the exact design of such a supplementary craft would be unimportant as long as it combined the festures of lightness, portability, of shallow draft, and manueverability.

During the month of June, there were very few opportunities to capture waterfowl for banding purposes. This is comparatively early in the season, and neither moulting adults or maturing broods occur in any numbers. For this reason, the first month in the field was devoted entirely to reconnaisance work, in order to thoroughly cover the entire river and principal tributaries as early as possible so that the later part of the season could then be spent in banding operations. Figure 2 shows the extent of these travels. The limit of upriver travel was the place locally known as Rainey's landing. During this early portion of the work, most of the data on distribution of waterfowl and other species was accumulated, together with a limited number of nesting observations. Because of the distance to be covered, it was necessary to keep moving almost every day, and it was thus impossible to intensively study any one area to accumulate detailed nesting data. to any great extent. During the month of July, opportunities for banding waterfowl increased to a maximum, and although the base camp was frequently moved, most of the time was then spent ina certain few localities of waterfowl conentration.

The mps used were the most complete and detailed of the project area that could be found. These were the U.S. Coast and Geodetic Survey Blight or Aeronautical Charts,with a scale of approximately 16 miles to the inch. They often left much to be desired from the

standpoint of local details, but on the whole were quite accurate and invaluable in the survey work.

Additional information regarding local conditions throughout the entire area was obtained from the various traders and native residents. Especially helpful were George Turner, trader at Holy Cross and long resident in the area, and Paul Keating, trader at Holikachuk, who has had wide experience in market hunting, trapping and prospecting throughout the Innoko and Iditarod region. In general, much information was often contradictory or exaggerated, but certain individuals it was found, could be depended upon for accuracy, and their information was of great help. Although local conceptions of natural history were many times a queer mixture of fact and fantasy, the natives did have a very extensive knowledge of species and distribution of waterfowl and other forms of wildlife in the region. Their ability to describe a certain bird right down to the color of the eye or the minutest characteristic of plumage was very impressive, but after all is not surprising when it is considered that each species is known to them from early childhood and is as familiar to them in their daily life as the various makes of automobiles are to the stateside city dweller. The native names for each species are usually descriptive of its voice, habits, or appearance, and in addition there are many stories and superstitions woven around certain species.

This practical knowledge of the native population should not be underestimated when engaging in scientific natural history work of any kind in an area of this type, and it is believed that with the proper

approach and use of common sense much accurate information of value could be obtained from the more intelligent individuals among a native population. As an example of Philip Edwards' ability, the writer many times questioned him in detail about various birds under discussion and Edwards invariably was able to identify the correct species in either Kortright or Peterson, even in closely related forms difficult to separate. When questioned about the song of the Wilson's Snipe in courtship flight, he was able to state definitely that it was accomplished with the bird's wings, and not its throat, and he also was xconsistently accurate with nesting information and in picking out species uncommon or rare in the region.

The Innoko region was observed twice from the air. The first occasion was during the trip into the area from Anchorage, when the river was followed for some distance as a preview of what would be encountered by boat. The second occasion was a more detailed survey that took place on July 14th. The plane used was a Stinson Flying Station Wagon on floats, and the purpose of the flight was to make an aerial reconnaisance of certain widely separated areas up and down the river in an attempt to discover their importance as duck areas for proposed banding operations. The information gained from the aerial survey was later checked on the ground in some areas, and the results were startling. The prime example was a five-mile stretch of sloughs and ponds to the side of the main river which had been cited by a local resident as a great concentration area of nesting ducks and geese. In inspecting this and other areas at the height of about 500 feet, it was found that the large rafts of moulting geese were very obvious and could be counted quite accurately. The ducks, however,

which at this time were with broods, were not obvious and in the area in question, not more than one or two broods, and no singles or rafts were seen. When the are was entered by boat three days later, however, it was found to actually support a large concentration of ducks with broods and large numbers of moulting males as well.

The writer believes that this inability to locate ducks from the air during the brood season, also remarked by other Fish and Wildlife observers flying over the area, is characteristic of conditions throughout most of the interior region during this period of the year. The areas frequented by the ducks are winding sloughs or pot-holes with bushy or sedge-covered bandks, rather than more open marsh areas as found in the central Canadian provinces. Because both sexes of adult ducks are vulnerable at this season- one because of the responsibilities of the brood, and the other because of the flightless period - they tend to stick very close to thick cover and even when approached on the ground are difficult to locate. As a result, the most careful aerial scrutiny will undoubtedly fail to locate the bulk of the duck population at this time of year. Although this does not hold true of the geese, and probably does not of the ducks at other seasons or in coastal or other habitats, it certainly is important under these circumstances and should be considered when aerial observations are reported.

The material presented in tabular form in the appendix and elsewhere throughout this report is derived from complete day to day sight records, brood counts, and other notes recorded in detail all through the season. No collecting of waterfowl or other species was carried on however and the taxonomical data therefore cannot

be regarded as completely authoritative. A collection of the principal plants found in the area was made and is on hand for future study. A number of color photographs were taken although the constant rain and overcast skies usually made conditions for this activity unfavorable.

The techniques used in the banding operations are discussed in detail under that heading. In general, however, banding was carried on principally in certain areas of brood or moulting adult concentration, working each area from a base camp established in a strategic location. When moving from area to area, the heavily loaded large boat was usually too cumbersome to permit much banding enroute, but on occasion the smaller skiff was launched temporarily to take advantage of any favorable conditions encountered while under way.

WILDLIFE RESOURCES

WATERFOWL

Distribution- A list of all birds observed in the Innoko River region is contained in Table 2 together with an indication of their approximate abundance. Table 3 gives an estimate of the percentage composition of the duck population in general over the entire region. These indications of abundance can of course be only general although they are for the most part based on actual quantitative sight records. With the waterfowl, as with other species, it is obvious that abundance would vary over the area as a whole, and that the composition by species would also vary greatly depending on the local habitat. Some indication of the areas of greatest concentration may be found in Figure 2 which shows the distribution of birds banded. Here the various species are discussed briefly to provide a more detailed picture of these conditions.

By far the most common species over the entire area was the Pintail. From the mouth of the Innoko to the upriver reaches, this species was rarely outnumbered among the ducks, and in certain local areas where the water was shallow and the banks low and grass-covered these birds comprised over four-fifths of the duck population. The next most abundant species was the Baldpate which, although its distribution was not as widespread and general as the Pintail did occur in greater numbers than any other species. It too seemed to favor certain local areas where it outnumbered other species. The lower river, below Holikachuk, where banks are high and timbered with but few shallow, grassy sloughs, was almost deserted by this duck, but

in the area from Holikachuk upriver to the Iditarod and up that river to the region of heavier spruce growth, the Baldpate found many areas to its liking.

The Mallard and Green-winged Teal are considered to have been in approximate equal abundance, although occuring in different fashion over the area. The Mallard seemed to be thinly scattered over the entire region, with no particular concentrations anywhere except where conditions in general encouraged all ducks. The Green-wing on the other hand was more spotty in its distribution. During the first part of the season, in fact, this species was not thought to be too common, but as time went on, numerous local concentrations were found and it finally was considered to equal the Mallard in numbers.

The Crester Scaup was not widely distributed, but was rather plentiful throughout the region of grassy flats above Holikachuk and along the lower Iditarod River. In this type of area, the American Goldeneye was seldom seen, but along the lower Innoko River and to a lesser extent along the upper river, this species occurred regularly. Its distribution followed very closely that of the large, over-mature cottonwood stands on the cutter sites along the river banks. These cottonwoods, being very susceptible to heart rot, furnished ideal nesting sites for the Goldeneye, and the density of its poulation appeared to be largely regulated by their availability.

The Shoveller was scattered infrequently over the region, but was found in greatest numbers in the Iditarod Flats region. Also scattered and found usually on or near large lakes, were all three species of Scoters. Sight records indicated that the ~~White-winged~~

Scoter was the most plentiful, with the American Scoter next in abundance and the Surf Scoter last. None of these birds were present in any numbers, and very few females were observed. [illegible]. The males were usually seen in groups of 6 to 15 in their characteristic low flight over the water, or floating in a line near the center of the river or a lake.

The Red-breasted Merganser was seen but twice along the lower river, although local reports indicated that it was common in that are a and along the Yukon. It was not recorded from the region further up the Innoko.

Judging by reports of local residents, there are on occasion several other species of ducks found in the Innoko region, although their occurrence is rare and erratic. One of these, the Bufflehead, was observed in one instance when a solitary female of this species swam about for some time very close to camp one evening on the upper river. Indication of the presence for some time of another rare species was also found at the remains of an Indian's spring muskrat-hunting camp. In a trash heap that marked the tent site, with two empty bottles of scotch whiskey and miscellaneous waterfowl remnants, was the skin from the head and upper neck of a male Harlequin, that had been apparently saved by the woman of the camp for use in ornamentation.

Amonghthe geese, both the White Fronted and the Lesser Canada were quite plentiful in certain parts of the Innoko area. Over the region as a whole, it is probable that the former species was more numerous than the later, but inasmuch as the local distribution varied greatly, it was difficult to determine what the ratio of abundance actually was. The greatest concentrations of both species occurred in the grassy flats to the sides of the main river, particularly those

a.long and below the Iditarod River. In many of these areas the local concentrations of geese were so heavy and apparently of such long standing that the vegetation on the favorable shores was almost entirely inhibited from growth in a manner resembling a very heavily overgrazed western stock range.

Other species of geese were not observed although residents report that Snow Geese are commonly seen passing through on their northern migration in the spring. In years past, the whistling Swan is said to have nested in the Innoko area, but it was not recorded during this season. During the later part of the summer, when the young birds are flying and the adults have completed their moult, the distribution of waterfowl changes. Then it is that heavy concentrations do build up in certain favored areas, along the rivers, particularly in the "Iditarod Flats."

Mating - It is probable that by June 9th, when the field work begun, almost all mating activities had been completed. It is certain that most individuals of the early nesting species such as the Mallard and the Pintail had ~~all ready~~ already passed through this phase, for by that time the natives were findi g nests of these species containing large clutches.

During the second week of June, however, courtship and/or mating flights of pairs of small groups of Mallards, Teal Shovellers, and Canada Geese were observed. Isolated instances of this behaviour in a pair of Baldpates an d a small group of White-fronted Geese were also observed during the third week in June. In general, however, it appeared that the males of at least the Pintails, Scaup, and Scoters had completed their duties toward the female by the beginning of the third week in June and all ready were

beginning to congregate in flocks. The male Baldpates and even some Mallards were a little later in separating, but even they had started by the end of the third week. Many pairs of the former species were still seen together about the first of July, but shortly thereafter these also were broken up.

Nesting- As mentioned previously, the natives were finding duck nests containing egg clutches of large size during the first part of June. A Mallard nest contining 8 fresh eggs was located near Holy Cross on June 8th. Inasmuch as the native reporting this nest undoutedly ate the eggs, his statement that they were "Fresh" can probably be accepted as true. If so, then this nest must have been started during the last part of May. On June 18th, however, the first broods of very young geese and ducks were sighted, Computations based on size of brood, laying and incubation periods would place the starting date of these nests at about the middle of May. On June 14th 8 nests of Pintail, Scaup and Mallard and Lesser Canada Geese were discovered in the Iditarod Flats region which was at that time largely under water. These nests were of uncertain longevity, but were obviously started before the first of June. Generally speaking, then, it would seem that much of the nesting this year was started during the latter part of May.

The number of nests located was too small to yield much significant information regarding clutches, but the follwoing nest information was recorded:

No. Nests	Species	Size of Clutch
1	Lesser Canada Goose	4
2	Mallard	8
1	Pintail	7
1	Pintail	8
2	Greater Scaup	6
1	Greater Scaup	7
1	Greater Scaup	11

The two Scaup nests containing 6 eggs are believed to have held incomplete clutches.

Judging by observations this season, and reports of natives, the bulk of the nesting in the Innoko region takes place around the small potholes, grassy flats, or small spruce "islands" back some distance from the main rivers. These spruce islands are actually what the name indicates — small knobs of raised ground, covered with spruces, which are islands rising above the grassy or wet tundra flats in the summer, and islands surrounded by water during the flood season. In the Iditarod Flat area where most of the nests were located, these islands were the only ground to be seen for 15 to 20 miles in some directions at the time the area was first visited. Later in the summer, these expanses of water give way to extensive grassy flats which are greatly favored by all waterfowl at this season, and would undoubtedly be selected as a nesting area if not covered with water earlier. This may be the key to what appeared to be abnormal conditions among the geese.

These birds were observed in two different types of areas. The first was the type just described above, and the second was along the upper

main rivers away from the large flats. In these latter areas, the geese were found rather evenly distributed and thinly scattered, and a large proportion of them were pairs with broods. Apparently these pairs had nested on the high tundra flats bordering the rivers and had brought their broods down to the rivers after hatching. In the region of the Iditarod flats, however, and in the adjacent areas, a pair with a brood was seldom seen. Instead, large concentrations of adult geese, often numbering 300 or more in a group were found during their flightless period on the large lakes and tributary streams. It is recognized that this congregating during the flightless period is a common occurrance, and it is realized that many of the geese in the area were perhaps first-year non-breeders. But in spite of this, sight records indicated that not more than one pair of geese in every thirty observed had a brood, and this is thought to be a greater than normal disparity. In addition, many natives and local residents stated that it was uncommon to find such large numbers of adult geese together without broods. The fact that some broods were seen in these groups, and that a larger proportion of broods appeared in the groups in the areas of higher ground, would seem to indicate that it was some factor peculiar to the area and rather than the habits of the geese which caused this condition. It would have been very possible for many geese to have nested in the grassy flats back in from the river where ordinary spring water levels would not reach only to be flooded out when this year's higher water arrived and it is more than likely that the abnormal water levels this spring was that factor.

All duck nests found were located in shrubby growth about two feet tall, either on the spruce islands or on other samll flat

islands of matted tundra and bog shrubs which floated instead of being covered by flood waters. The single goose nest found was on a similar floating island, but was built in a low grassy area rather than brush. Distance from the water varied in all cases, from about two feet, to about 100 feet from the water in the case of one Mallard nest located on the highest ground in the center of a small spruce island. Distance betw en nests was the least on the floating islands where available nesting sites were limited and nests found were as close as 10 feet apart. One fact that should be stressed, however, was that over the areas as a whole, disregarding the isolated occurances on these floating islands in the flooded areas, nesting ducks were thinly scattered and definitely did not occur in what could be called concentrations. It is the immense area available for widely scattered nesting which produces the large annual crop of young ducks in the interior rather than great numbers of breeding pairs in any given locality.

Moulting- The first adult waterfowl to enter the flightless stage were the geese, and the White-fronts did so much earlier than the Lesser Canadas. The first flightless White-fronts were recorded on June 20th, and by June 29th they were congregating in large flocks accompanied by a scattered few that were still able to fly. At this time, most of the Lesser Canada geese could still fly, and by the time that this species was entering the flightless stage in large numbers, some of the White-fronts had almost completely renewed their wings and were ready to fly again. This variation in the stage of the moult was very noticeable within each species as well as between species.

By the 20th of July, 90% of the geese found together in large flocks- most of these being White-fronts - were able to fly, and about half of these had developed to that stage between the 18th and the 20th. By the 28th of July, only an occasional White-front was found still unable to fly, but on that date a flock of well over 300 flightless Lesser Canadas was discovered.

During the third week in June most of the male ducks first began to congregate, and although an isolated pair of flightless male Mallards was recorded on June 17th, the first Pintail and Baldpate "flappers" were observed on the 9th and 10th of July. These early groups were very small, numbering from 3 to 8, and it was not until the third week in July that any large rafts of these moulting males were discovered. Even then these large concentrations were uncommon and difficult to locate. The first male Pintails in eclipse were observed flying on July 15th, and about 50% of this group was flying by the 26th.

The first flightless female Pintail was found with a large flock of males on July 18th, and by the 27th and 28th these were occurring in large numbers. The male Baldpates and Teal were later in the flightless stage than the Pintails, and flocks of 50 to 100 of these were still observed on July 28th.

As an example of the variation in the stage of the moult in a given species, two flightless male Mallards were captured on the same day in the second week of July, and although one of these was still resplendant in breeding plumage, the other had but a few scattered green or vermiculated feathers remaining to indicate its sex.

Broods- Table 4 lists the average brood sizes of the various species of waterfowl in the Innoke region for which accurate brood counts were obtained. In Hooper Bay studies, Gillham (1941) correlated the variations in brood sizes with the density of cover in the area, but because the cover in the Innoke region is generally the same in most areas, this is not believed to be an important factor. On the other hand, it seems obvious that a constant shrinkage in brood size will take place as the season passes and the young are longer exposed to the many hazards of their development. For this reason, the average brood sizes listed in the table were computed on a weekly basis. Even these results, however, do not correctly reflect the actual brood shrinkage because of the varying ages of the broods counted during any given week.

It will be noticed from the table that the Lesser Canada broods averaged 4 young, and the White-fronts averaged 4 and 5. This is slightly smaller than the sizes recorded by Gillham in the Hooper Bay area in 1941, where

White-fronts averaged "about six" per brood, and a series of Lesser Canada broods were recorded as follows: 5,5,7,7,6,5,6,6,7,6.

The first goose and Pintail broods were observed on June 19th. At the end of July, the young geese observed were quite large, but still far from the flying stage. The first flying juvenile Pintails, however, were recorded on July 21st, and by July 28th, many of these broods were flying. At that time, the number of young per brood varied from 3 to 8, but averaged about 6. The Pintail young were the earliest to fly, and at the end of July were still the only species advanced to that stage of development.

Mortality- Waterfowl mortality in the interior breeding grounds may be considered as being largely the result of the following factors: native kill, predation, banding activities if present, accidents and miscellaneous factors. These will be discussed in order.

The native kill may be divided into that which is done legally and that which is in violation of the law, but in its effect must be considered as a constant factor whether legally or illegally done. No quantitative data is available as to the numbers of waterfowl killed each year in the Innoko region by natives, but it is certain that the total per family is large. Not only are they killed for current food needs during the open season, but at this time they are collected in as great quantities as possible to be "jarred," as the natives say, for consumption during the rest of the year. The local white residents at least are familiar with the 90 day possession limit, but inasmuch as there are no waterfowl remaining in the region for any illegal killing by the time the 90 days are expired, they cannot see the necessity for this particular requirement of the law, and in the absence of constant law enforcement are prone to disregard this and many other regulations. The natives, of course, do no better.

In addition, the natives regularly take waterfowl for food at all seasons of the year. There is however, a natural respect for conservation among them, particularly in the older generation and in general they refrain from shooting females during the nesting season. The traditional goose drives that are commonly carried on along the coast are apparently no longer practiced by these interior natives, but they still look forward to the nesting season as providing their only source of fresh eggs during the year. Their ~~con~~conservationist tendencies do not prohibit widespread collecting of waterfowl eggs, ~~and~~ especially as they are convinced that the female will renest and lay another clutch if her first one is taken. Fortunately, the nests are thinly scattered, and the eggs removed probably do not constitute a very large proportion of the total. In addition, nests of other species, particularly the loons, are sought for/this relieves the pressure on the waterfowl.

One of the greatest periods of illegal killing is during the spring muskrat hunting season. At this time the natives are looking forward to the arrival of waterfowl to bring a change of diet, and many of them are away from the villages and in areas where waterfowl are abundant. This combination is conducive to the killing of many ducks and geese. At one such rat hunting camp, 12 pairs of goose wings were found in a refuse heap together with assorted other waterfowl remains. The White-fronted Goose bears the brunt of this killing wherever it is present, because this species is greatly favored for food over all others.

Over the Innoko region as a whole, however, the native kill cannot be considered as a critical factor. The center of population in the region is Holy Cross, and the furthest settlement up the Innoko River is the village of Holikachuk which supported 76 people when a count was made last year. About half way between this village and Holy Cross is the village of Shageluk which is even smaller. This distribution of population leaves the entire upper section of the Innoko area free of natives except for a few scattered trapper s and rat hunters in season. The absence of villages also frees the area of the threat of predation by loose dogs or other factors connected with a native settlement.

Predation from other wildlife is the most constant threat met with on the breeding grounds, but in the Innoko region this was in no instance found alarming. The most outstanding predators were the large gulls, Glaucous or Glaucous-winged, which seemed to subsist almost entirely on a diet of waterfowl wherever these were available. Their preferred victims were the young ducks, but they also commonly killed flightless adult ducks or even geese. Their Their technique of killing varied with the circumstances, but in general they selected a certain individual adult or brood in the water, and persistently chasing it until it was exhausted from diving, would then, either kill it with one quick peck in the head as it immerged from the water, or seizing it by the leg, neck or back, would immediately start tearing at the flesh.

It appeared that the victims of gull predation were usually individual birds that became separated from their flock or brood, or ones that became so frightened when pursued that they were

readily killed. When two or three broods were together, an attacking gull was easily driven off by the females, but unfortunately, many females appeared to be reluctant to attack the large gulls and hence their young were easily captured. Another factor making defense against gull attack difficult, was the practice of hunting in pairs which the gulls usually followed. These predators are very capable, and quickly became very wary when attempts were made to shoot them. It is fortunate that on the upriver breeding grounds, these birds were not actually plentiful.

Apparently the gulls concentrated on the living birds, rather than the eggs. The occasional jaeger in the area, however, probably indulged in its notorious habit of stealing eggs, and this is testified to by the native name "egg-eater" attached to this bird. The number of waterfowl eggs stolen, however was probably not large, and no observations were made of this type of predation.

The habits of the raptors are discussed in another section. The only instances of predation of these birds on waterfowl were found in a few remnants of duck kills and two sight records of Horned Owls pursuing immature goldeneyes and a flightless goose. The extent of this predation is unknown, but it is thought that the horned Owl and some of the blue darter group are the worst offenders in the Innoko region. The Duck Hawk also claims its share undoubtedly. Predation of a unique sort, difficult to measure is constantly carried on by the enormous pike which frequent the Innoko river. A great many reports of waterfowl discovered in pike stomachs were received from the natives, and on one occasion a 12 ounce duckling was struck by a pike while

swimming under water, about 10 feet ahead of the boat. The fish did not hold the duckling, but in striking it, neatly slit open the bird's neck and lower abdomen and the duck died alsmot immediatley.

A factor to be considered in connection with banding activitis is the mortality which is caused indirectly by the interference with broods or adults. Enough instances were discovered of predation traceable to the distvybances caused by banding to indicate that considerable mortality of this sort will occur if the banding party is not careful. The most obvious instances involved the large gulls which were very quick to take advantage of the scattering of broods and other disturbances caused by man. On many occasions, it was necessary to shoot at the gulls in order to save young ducks that were banded and released. Whenever possible the release was made in a group and in a location where good escape cover was at hand and where a quick reunion with the parent was encouraged.

Accidents and various other factors undoubtedly are responsible for a limited amount of mortality. One instance was observed when a young goose was found lying dead from a puncture through the chest. The evidence indicated that the bird had fallen while attempting to climb the bank, and a sharp stick had been driven through the body. The many other birds found with mishapen legs, missing feet, blinded eyes etc. would indicate that even those birds surviving the breeding season without injury are certainly subject to many mishaps elsewhere.

SHORE AND WATER BIRDS

Information regarding species present and abundance of this group is contained in Table 2. A few of the pertinent observations regarding certain species are discussed below.

The entire Innoko region appeared to be extremely well populated with nesting shore birds of many species. The greatest concentrations occured on the many grassy and wet tundra flats, but the yellow legs and several other species were found all through the region along the water courses. The nests of these birds were not easily found, and the few that were discovered were the result of intensive searches on the Iditarod Flats. These were scattered over the flats in company with the nests of gulls and terns.

During the first part of June all the shore birds were well distributed and occupied with their mating and nesting activities. The songs and loud calling of many different species filled the air almost around the clock, and between these and the long hours of daylight, sleep was sometimes made difficult. The yellowlegs and Wilson's snipe were the most abundant of this group and were seen almost everywhere, the former calling from perches in trees, and the latter constantly occupied with its eerie courtship flight and song. On June 18th the first young of the Wilson's snipe were seen. By the 3rd week of July, the shorebirds began congregating and large flocks of willets, peeps, and mixed Greater and Lesser Yellowlegs and Dowitches were frequently seen.

The Little Brown Crane was occasionally observed throughout the area, but nowhere was found abundantly. No nests or young of this species were recorded at any time. During the latter part of

July cranes began to be seen in small numbers on the grassy flats whereas previously only an occasional pair was sighted. Rodents are reported as forming a large part of their diet in the area. Natives regard these cranes as a desireable food, and they are still referred to as "Alaska Turkey", though they are not often being killed at the present time. In years past, the natives would stalk these birds by imitating their dancing gyrations and singing in a loud voice. This would so fascinate the cranes that they could then be approached within shooting range.

It is difficult to explain the apparent absence of young cranes. This was a condition noted also by Gillham (1941) at Hooper Bay, and he suggested that the egg loss of this species must be quite high.

Many other observations pertaining to the shore and water bird group were made, but as none differed appreciably from the published information regarding each species, they will not be considered here.

RAPTORS

The most commonly observed avian predator in the Innoko region was the Marsh hawk. This bird was seen again and again in various types of habitat, but its most common hunting range seemed to be the more open grassy or tundra flats and along the willow-covered margins of streams and sloughs. This type of area, in addition to the small birds present, usually supported a thriving population of rodents. Judging by several pellets found in these area, the rodents form the bulk of the diet of this hawk and probably of most of the other raptors.

The approximate abundance of the other hawks observed is

is listed in Table 2. No observations of especial interest were noted in regard to this group. Undoubtedly there were other species occurring in the area that are not listed, but without frequent use of a collecting gun these additional records could not be obtained.

Among the owls, the Great Horned species was the only one recorded except for one isolated occurrence of what appeared to be a Snowy Owl. The Horned Owl was found to be unbelievably abundant throughout the entire area, and this condition may well have contributed to the decline in numbers of the gallinaceous birds which the local residents report as being a favorite food of this owl. It was interesting to note that even this predator is subject to predation itself. An empty nest of this species was discovered in a tall cottonwood tree, and marks on the tree trunk showed where a black bear had climbed to the nest. The Indian declared that the bear had undoubtedly been after the young owls and hat this was a fairly common occurence in the region.

GALLINACEOUS BIRDS

No gallinaceous birds were observed during the field work this season. According to reports of the natives, all three species that are commonly found in the area have been becoming scarcer during the last several years and many of the trappers in the area last winter reported seeing no birds whatsoever. Apparently this is part of a cyclic fluctation although some of the local residents blame recent extremely cold winters for the great reduction in numbers especially among the Ruffed Grouse.

Normally, the most abundant species in the region is the

Alaska Spruce Grouse, locally called "spruce chicken" which occurs widely throughout the interior forsts. The Alaska Ptarmigan is also found in certain locations in the region. The Yukon Ruffed Grouse locally called "willow chicken" is of more restricted distribution, but in former years occured in goodly numbers in the thick growth along the larger streams. It is still common on the hardwood heights surrounding Holy Cross.

OTHER BIRDS

Table 2 is self explanatory regarding the species of birds not all ready discussed. Those listed are probably only a small proportion of the passerine species that were present, but the character of the work being carried on prevented more detailed attention being given to this group.

It might be mentioned that the Yellow Warbler was a very common nesting species in the willow and alder growth along the rivers. Two nests of this species under observation hatched during the first week in July.

The migratory habits of the swallows were also interesting to note. During the early part of the season, they were quite plentiful throughout the region, but by the middle of July had all departed southward. Apparently they arrive early nest immediately and as soon as the young are able to fly leave the north.

GAME AND FUR ANIMALS

The chief game animal in the Innoko region is the Moose which is found universally distributed in favorable habitat over the entire area. Table 8 list the sight records of this animal by age and sex. The sex ratio as derived from 40 observations in which sex could be distinguished was a little over 2 cows to each bull. Only about one out of every three cows observed was accompanied by a calf, and of these, 40% had twin calves.

In years past, large herds of reindeer were ranged on the highlands near Shageluk, but at the present time these are represented by a herd of about 12 or 15 survivors reported by natives to be still in the area. Caribou are not found in the immediate region.

Black bear are very common throughout the region, and grizzlies are found in limited numbers in the mountains. Wolves are common though not overabundant., and many moose kills were reported by trappers this winter. Coyotes have not yet penetrated the region in quantity, but one or two individuals have been trapped near Shageluk in recent years. Red foxes and their common color phases are plentiful, but are not greatly sought because of the present low prices for long-haired furs.

The other common fur animals are present in typical numbers as found throughout the interior. The are is outstanding, however, as a producer of beaver. During the recent trapping season

trappers came from as far away as Tanana, to trap beaver on the upper Innoko tributaries. This influx of new trappers, and the use of the area by natives of Holy Cross that had previously trapped elsewhere, is causing much discontent among the natives of Holikachuk. The area is very large, however, and unless more new trappers continue to arrive, there should be no serious difficulties either from overcrowding of trappers or from overtrapping of beaver. In recent years, thepopulation of beaver has been increasing steadily in the area, and along the upper river much barren habitat has been resettled. The lower river, nearer the villages, however was well cleaned out of beaver many years ago.

According to reports, the present beaver population is subject to a negligible amount of mortality. Certain colonies in the higher streams have been frozen out or drowned upon occasion, and wolves are accused of breaking into vulnerable lodges under some circumstances. The otter is generally disliked over the region because it too is accused of molesting beaver, especially those caught in traps.

The muskrat hunting during the recent season was generally quite poor, and the natives blame this on a recent extremely cold winter with thick ice which is said to have greatly reduced the rat population. The best muskrat area at present is in the vicinity of the Iditarod flats.

The snowshoe hare is present in limited numbers., but much of the area is made untenable by the long-persisting high water in the spring. In some locations this animal is found concentrating , and certain stands of willows along the lower river have been almost completely girdled during the winter. These small

trees were dying this summer, and it is conceivable that in some areas this destruction of browse would have an adverse effect upon the wintering moose population.

It was interesting to note the complete absence of porpupines over the entire region at the present time. This is rather unusual for about 10 years ago this animal is said to have been very plentiful everywhere, and could be counted on by the natives for a good meal at any time. Many trees still bear obvious signs of porcupine chewing, but it is all of many years standing. The natives have no explanation for the disappearance other than the usual answer that "disease" got them.

BANDING ACTIVITIES

RESULTS

The first bird banded in the Innoko region was a moulting adult White-fronted Goose captured on June 20th. This was an isolated instance, however, and although a few birds were banded during the ensuing two weeks, continuous banding activities did not actually get under way until the 8th of July. They were ended on July 29th when the supply of bands was exhausted. Table 5 gives a record of the number of birds banded daily during this period. When banding activities on July 29 and 20 are indluded, the total number of days on which intensive banding was attempted becomes 24. During this 24 day period, the average banded daily was 29, with a maximu m of 94 on July 28 and a minimum of 2 on July 29th. The grand total of all birds banded during the season was 695. Table 6 presents a breakdown of this total by species, age and sex.

The variation in the figures contained in the above-mentioned tables would be difficult to interpret without some explanation. For instance, the day to day differences in the banding totals are quite erratic and must be considered as being the result of several factors, such as the type of terrain being worked, local abundance of waterfowl, susceptibility of birds to capture, amount of effort expended daily etc. In general howver, a smoothing curve, applied to these result would indicate correctly that the greatest banding sucess occurred during the last two weeks in July. This was due to the combined effects of lowered water levels concentrating and making duck broods more availabld, an increase in

size of young ducks which brought about a change in habits making them more susceptible to capture, greater numbers of adult ducks entering the flightless stage of the summer moult, and lastly, more intensive efforts expended to capture birds before they developed to the flying stages which were imminent. Because of this latter condition, it is doubtful whether many additional birds could have been banded after the first week of August, and it is certain that the daily rate would have greatly decreased.

It will be noticed that Table 6 shows that of the 695 birds banded, 368 or about 53% were Pintails, and 276 or about 40% of the total werejuvenile Pintails. Although these ducks were the most abundant species in the area, the large numbers banded were the result of the greater ease in capturing this species rather than their relative abundance. Also the variation in the number banded of other species indicates their relative ease of capture or in some cases their availability in a flightless stage during the banding operations.

METHODS OF CAPTURE

In an interior breeding ground such as the Innoko River the majority of the waterfowl are found scattered over the best habitat and even in their greatest concentrations do not present opportunities for trapping, baiting, or other mass capture methods as used in the states. The nearest approach to an opportunity for capturing waterfowl in quantity is found in the large rafts of moulting adult geese, but when the field party is composed of only two men without of native manpower, even the traditional access to any reserve

arctic goose drive is not practical. For these reasons, the capture of birds for banding purposes usually becomes strictly an individual proposition with each bird or group of birds.

The methods of capture during this project were of two main types and were confined to the capture of either moulting adults or flightless young. The first method involved usually one bird at a time which was caught in open water, preferably shallow, by chasing it with the skiff and forcing it to dive repeatedly until it was completely exhausted and would permit itself to be picked up. This process used principally with moulting geese would ordinarily require about 10 minutes per bird and was quite unsatisfactory from the standpoin of capturing any large number of waterfowl.

The second and most successful method was based on driving tactics. Under this system, each brood of young ducks, or group of flightless adults was carefully circled with the skiff in such a way as to induce them to seek shelter on a favorable shore. By timing the maneuvers just right, the boat would hit shore immediately after the birds and usually at least part of them could be run down or picked up hiding in the vegetation. By favorable shore is meant one of sparse vegetation, without brush, and solid enough to support a man running, but at the same time attractive enough to the birds to warrant their attempting to escape ashore. This combination unfortunately was not always available and it should be definitely stated that the field worker may well use all the odds that can be mustered in his favor when attempting to match footwork with waterfowl on their home tundra. In ad

The word "usually " is underline above because one of the petty frustrations that can be counted on in this type of work is to spend a considerable period rounding up a group of birds only to have them completely disappear in hiding ashore, or just as completely outrun the field man who likely as not will be left behind stretched full length in the mud. This description applies to all the waterfowl but is especially true of the geese.

With both of the methods described above, long handled dip nets were almost indespensible for the actual capture of each bird. These were constructed in the field according to native patterns and were of two sizes, for use with ducks or geese. The larger net had a diameter of about 30 inches and a handle about 9 feet long. The smaller had a diameter of about 18 inches and a handle about 6 feet long. Each had its advantages under different conditions. Also carried was a 100 foot length of gill net(3 foot) for possible use in traps, corrals, or drift fences, but opportunity for its use did not arise during this project.

Although the techniques described here were the best that were developed under the conditions met with during the two months of field work this season, it is very possible that other more successful methods may be discovered in the future. One testimony as to the basic soundness of these techniques however, is the fact that they follow very closely the traditional Indian and Eskimo methods of capturing waterfowl under similar circumstances., and primitive though they may be in many ways, the natives are unsurpassed in ingenuity, particularly when it involves seduring food for their stomachs.

The individual differences in behaviour between the various species have a direct bearing on the success of the banding attempts with any given species. As mentioned before, the Pintail, especially the juvenile, was the duck captured most easily, even though Gilham (1941) cites the female of this species as giving better parental care to its young than any other duck in the Hooper Bay area. Of the ducks in the Innoko region, the Pintail could be counted on most regularly to lead its brood ashore when driven. As opposed to this the Baldpate a duck of therwise similar habits, would invariably refuse to lead its brood ashore under any circumstances, and it was only by selecting and pursuing individual ducklings that any capture could be made. Even this was difficult, and involved a great expenditure of time and effort for each banding record. The Mallard behaved in a somewhat similar manner, but under some circumstances, could be driven ashore. Most of the juvenile Teal captured were in large groups of several broods, occasionaly with a mixture of fligtless adults. This species as did all, exhibited definite characteristic of ist own in refusing to be driven, but in its habit of frequenting very small pot holes it often left itself no other choice but to go ashore. The most difficult ducks of all were the diving group. The Scaup was most vulnerable, being found occasionally in shallow water, but the Goldeneye and the Scoters were never successfully driven and captured. Their diving ability and general affinity for the deep water was so great that even the youngest brood refused to be cornered in any position to permit capture except after a long and persistent chase.

With all of the ducks, it was found that the most willing to go ashore were usually the flightless adults which apparently felt their vulnerability keenly while on the water and instinctively sought shelter.when threatened. This was particularly true of the smaller groups of "flappers". However, because of their greater endurance and running ability, these adults often escaped by scattering and continuing to run until well hidden far from the water or until another slough was reached. A stroke of luck was encountered with one group of these flappers. By chance a landing was made to inspect he shore of a slough, and a large group of flightless male Baldpates was unsuspectedly found hiding in the vegetation where they had apparently started back to the water after having been unwittingly frightened ashore earlier. Within a matter of minutes, 27 of these birds were picked up without any effort.

Adult geese behave somewhat differently than ducks during their flightless stage. Apparently realizing their diving and swimming ability, they usually prefer to remain in open water and are seldom driven ashore. When conditions are such that they can be cornered ashore, they invariably run cross county at such speed and for such distances that only a few may be captured from each group. Juvenile geese are caught much easier. They are more readily driven and when onland do not run as well and are usually fairly obvious when attempting to hide.

BANDING TECHNIQUES

It was unfortunate that when this project was begun early in June, the supply of bands available in the territory was somewhat limited. The initial issue to the field party consisted of a few hundred size 7 bands, less than a hundred size 6, and a few other assorted sizes too large or too small for use with the waterfowl. In July, when the banding was approaching its peak, an additional supply of size 6 and 7 bands were made available to the field party from a limited stock which was intended for use in other possible banding activities elsewhere. The total number received in sizes 6 and 7 was about 700, and of these less than 300 were size 6. Under these circumstances there was no alternative but to adapt the size 7 bands for use with ducks when the supply of size 6 was exhausted. This was done by very carefully reducing their size with a pair of side-cutting pliers, and it is believed that except for some additional weight due to the slight added thickness of the band, this procedure was quite successful and did not unduly handicap the birds. The same method was used in converting the size 6 bands to fit the smaller waterfowl.

Two types of pliers were used in manipulating he bands. One was the ordinary long-nosed electrician's pliers which could be used both to open and close bands when handled with care. The other was a pair of especially made banding pliers which had two rounded knobs on the inner side of the handles for use in spreading the bands, and a tapered opening in the jaws for use in closing them. By placing pressure the closed band could be squeezed open with the handles.

This was a very convenient method and worked well except that there was a tendency for the knobs to produce a sharp curled ridge of metal around he edge of the band which if not removed would cause damage to the bird's leg. In closing the bands, neither type of pliers was very successful, and it is believed that the type with holes of exact band diameters drilled in the jaws is far more desireable.

In handling large numbers of birds, the two-man team with one man holding the bird and the other applying the band worked very well. It was found, however, that the entire process, could be handled by one man using a certain technique in holding the birds. With this method, the band and pliers were made ready and the bird removed from the gunny sack or other holding device by the bander. Handling the bird gently but firmly to prevent struggling, its neck and head were folded back along one side under its wing in the manner sometimes used to prepare pheasants to lay for the dogs in a field trial exhibition. Holding the wing firmly over the birds neck, it was then turned over on its back in the bander's lap so that the head under the wing rested next to the bander's body. In this position it was found that the bird would usually lie quietly without being held and both hands could then be used to apply the bands.

It was interesting to note that in the Innoko region, contrary to published information, size 7 bands appeared to fit exactly the White-fronted Goose and Lesser Canada Geese(rather than size 8) and that the size 6 bands recommended for use with wild Mallards were definitely too small for this species which instead required

a size but slightly smaller than a number 7.

Weights of all banded birds were taken with one of two sets of hand scales, and an analysis of this information is contained in Table 7. It was found that the best method of taking these weights was to hook the scale under the newly-applied band and suspend the bird in this manner. By holding a hand cupped around the bird's eyes it could be discouraged from struggling and the weight recrod ed without harm or discomfort to the bird.

All birds were banded on the right leg and this fact is noted here with the thought that during another season's work in the area, the birds banded this year could perhaps be distringuished at sight from those of the next project by this characteristic.

During this summer's field work, many inquiries were mad e among the natives and local residents regarding previous recovery of banded birds in the area. Several reports were received of banded waterfowl being shot in the past, but none of the actual bands could be obtained. In some cases it was declared that the bands had been returned by mail or turned over to the proper authorities but no reply had ever been received. Because of this attitude little interest was shown in any possible recovery of future bands, and it is thought that any bands to be obtained from this area, especially from the natives, will have to be sought for and collected in person among the local population. It is more than likely that many bands are being saved as trinkets or are not turned in because of fear on the part of the natives that they would be exposed as having shot the birds illegally

as most of them perhaps are. In any event, it is thought that future representatives of the Fish and Wildlife Service in the area to seal beaver or for other reasons could perhaps devote some time to attempting to recover bands, or that the Holy Cross Mission and the Native Service teadhers in the area could perhaps make even more successful efforts to this end.

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APPENDIX

ANALYSIS AND RECOMMENDATIONS: The following conclusions are derived from the material presented above:

1. The Innoko region supports a heavy breeding population of shorebirds. The breeding population of ducks is nowhere actually heavy, but the region as a whole produces a large annual crop. Geese are abundant in some areas, and occur in greatest numbers in the vicinity of the Iditarod Flats.

2. The waterfowl population is subject to a normal degree of mortality, but no one factor could be considered as critical this season. Abnormal flood conditions in the spring resulted in poor nesting success locally among the geese this year.

3. The upper Innoko region is one of the richer beaver trapping areas of Alaska. Other fur and game animals occur in average abundance for the interior. Muskrats were at a low in numbers this year.

The following recommendations are offered:

1. Under the present conditions, there would be no immediate advantage to formation of a refuge in the Innoko region, or the exercise of any other form of intensive management.

2. The illegal kill by natives is not threatening to the waterfowl population in the area, but it does present a problem in enforcement and education which is common in the interior. It will require much attention before it will ever be solved.

3. Many bands could perhaps be recovered in the Innoko region and elsewhere in Alaska, but intensive efforts will have to be made to collect them from the natives in person. It is unlikely that many will be sent in voluntarily.

4. It is believed that the effective waterfowl banding period in the Innoko region would extend from the last week in June to the first week in August. It would start with the first moulting adult geese, and end when the juvenile Pintails took flight. It could be extended if juvenile geese were abundant or if successful methods were devised for capturing the juveniles of late-developing species such as the Baldpate.

5. For another year's banding effort, Philip Edwards can be recomended as a helpful and capable contact. It is believed that he could successfully carry on banding activities without supervision.

6. Local reports indicate that the "Pike Lake" area south of Paimiut, in the general region of t he Innoko, may support concentrations of waterfowl in greater numbers and variety than the Innoko. This area might be considered for future banding attempts.

DATA AND REPORTS: The field notes of the Innoko River survey are in the files of the Federal Aid branch of the Fish and Wildlife Service in Anchorage, Alaska.

The list of birds banded in the area is in the files of the Fish and Wildlife Service in Juneau, Alaska, and the numbers have been recorded under the permit of Charles E. Gillham in the files of the Fish and Wildlife Service in Washington, D.C.

A copy of the Hooper Bay report by Gillham is in the files of the Fish and Wildlife Service in Juneau, Alaska.

Prepared by Robert F. Scott Approved by War

Robert F. Scott
Biological Aid

Date October 12, 1948

Table 1. Dates of break-up and freeze-up of the Innoko River at Holikachuck, Alaska*

Year	Break-up	Freeze-up
1948	May 16	
1947	May 17	Oct. 14
1946	May 22	Oct. 31
1945	May 24	Nov. 2
1944	May 14	Oct. 27
1943	May 10	Oct. 28
1942	May 5	Nov. 12
1941	May 8	Oct. 16
1940	Apr. 25	Oct. 20
1939	Apr. 19	Oct. 13
1938	May 4	Nov. 1

* From the yearly Climatological Data Reports, Alaska Section, Weather Bureau, U.S. Dept. of Commerce.

Table 2. Check List of Birds Observdd in Innoko River region with approximate abundance indicated.

Abundance*	Common Name	Scientific Name**
GAVIIDAE		
U	Common Loon	Gavia immer
U	Pacific Loon	Gavia arctica pacifica
C	Red-throated Loon	Gavia stellata
COLYMBIDAE		
U	Holboell's Grebe	Colymbus grisegena holbollii
ANATIDAE		
C	Lesser Canada Goose	Branta canadensis leucopareia
C	White-fronted Goose	Anser albifrons albifrons
C	Common Mallard	Anas platyrhynchos playtrhynchos
A	American Pintail	Anas acuta tzitzihoa
C	Green-winged Teal	Anas carolinensis
A	Baldpate	Mareca americana
U	Shoveller	Spatula clypeata
U	Greater Scaup	Aythya marila nearctica
U	American Goldeneye	Bucephala clangula americana
R	Ruffle-head	Glaucionetta albeola
S	White-winged Scoter	Melanitta fusca deglandi
S	Surf Scoter	Melanitta perspicillata
S	American Scoter	Oidemia nigra americana
S	American Merganser	Mergus serrator
ACCIPITRIDAE		
U	American Goshawk	Accipiter gentilis atricapillus
S	Sharp-shinned Hawk	Accipiter striatus velox
U	American Rough-legged	Buteo lagopus s. johannis
S	Bald Eagle	Haliaeetus leucocephalus washintoniensis
C	Marsh Hawk	Circus cyaneus hudsonius
FALCONIDAE		
S	Duck Hawk	Falco peregrinus anatum
GRUIDAE		
U	Little Brown Crane	Grus canadensis canadensis
CHARADRIIDAE		
S	Semipalmated Plover	Charadrius hiaticula semipalmatus
SCOLOPACIIDAE		
A	Wilson's Snipe	Capella gallinago delicata
U	Hudsonian Curlew	Numenius phaeopus gydsibucys
U	Solitary Sandpiper	Tringa solitaria Subsp.

Table 2 continued

SCOLOPACIDAE(continued)		
C	Western Willet	Catoptrophorus semipalmatus inornatus
A	Greater Yellow-Legs	Totanus melanoleucus
A	Lesser Yellow-legs	Totanus flavipes
C	Long-billed Dowitcher	Limnodromus griseus scolopaceus
A	Western Sandpiper	Ereunetes mauri
PHALAROPODIDAE		
R	Red Phalarope	Phalaropus fulicarius
C	Northern Phalarope	Lobipes lobatus
STERCORARIIDAE		
S	Parasitic Jaeger	Stercorarius parasiticus
U	Long-tailed Jaeger	Stercorarius longicaudus
LARIDAE		
U	Glaucous Gull	Larus hyperboreus Subsp.
U	Glaucous-winged Gull	Larus glaucescens
S	Herring Gull	Larus argentatus Subsp.
A	Short-billed Gull	Larus canus brachyrhynchus
C	Bonaparte's Gull	Larus philadelphia
A	Arctic Tern	Sterna paradisaea
STRIGIDAE		
A	Horned Owl	Bubo virginianus Subsp.
R	Snowy Owl	Nyctea scandiaca
ALCEDINIDAE		
S	Western Belted Kingfisher	Megaceryle alcyon caurina
HIRUNDINIDAE		
A	Tree Swallow	Iridoprocne bicolor
C	Bank Swallow	Riparia riparia riparia
C	Barn Swallow	Hirundo rustica erythrogaster
U	Northern Cliff Swallow	Petrochelidon pyrrhonota pyrrhonota
CORVIDAE		
C	Alaska Jay	Perisoreus canadensis fumifrons
S	Steller's Jay	Cyanocitta stelleri stelleri
U	Northern Raven	Corvus corax principalis
PARIDAE		
C	Hudsonian Chickadee	Parus hudsonicus hudsonicus
TURDIDAE		
C	Robin	Turdus migratorius Subsp.
C	Gray-cheeked Thrush	Hylocichla minima minima

Table 2 concluded

PARULIDAE		
C	Yellow Warbler	Dendroica petechia Subsp.
C	Mystle Warbler	Dendroica coronata Subsp.
ICTERIDAE		
A	Rusty Blackbird	Euphagus carolinus
FRINGILLIDAE		
U	Pine Grosbeak	Pinicola enucleator Subsp.
S	Redpoll	Ananthis Sp.
A	Savannah Sparrow	Passerculus sandwichensis Subsp.
U	Slate-colored Junco	Junco hyemalis hyemalis

*Abundance has been indicated as follows:

A — "Abundant" -very plentiful. Observed everywhere in suitable habitat.

C — "Common" - Frequently seen in suitable habitat, but not as plentiful as above category.

U — "Uncommon"- Seen only occasionally in suitable habitats, not in any numbers.

S — "Scarce" — Observed on but a few ocassions.

R — "Rare" —Merely recorded as present. An isolated occurrence.

** Scientific nomenclature follows that of Bailey (1948) and Peterson (1941).

Table 3. Estimated Percentage Composition of the Duck Population in general over the Innoko River Region.

Species	Percentage
Pintail	30
Baldpate	20
Mallard	12
Green-winged Teal	12
Greater Scaup	8
American Goldeneye	8
Shoveller	5
Scoters	3
Mergansers	1
Other	1
Total	100

Table 4. Average brood sizes of waterfowl in the Innoko River region by weeks, between June 18, 1948 and July 29, 1948.*

SPECIES	WEEK					
	1st	2nd	3rd	4th	5th	6th
Lesser Canada Goose	4(5)	4(1)	4(1)	4(2)	4(6)	4(6)
White-fronted Goose	4(8)	5(5)	-	-	-	-
Pintail	8(1)	7(2)	-	5(12)	8(13)	5(2)
Baldpate	-	5(1)	-	8(16)	3(1)	8(9)
Mallard	-	-	-	8(2)	7(1)	-
Greater Scaup	-	-	-	-	7(2)	-
Green-winged Teal	-	-	-	7(3)	-	-
Goldeneye	-	-	-	-	-	11(1)
Shoveller	-	-	-	-	-	4(1)

* Figures in parentheses indicate the number of broods computed in the average.

Table 5. Number of Birds Banded Daily during Innoko River Banding Operations.

Date	Number Banded
June 20	1
21	1
29	2
30	5
July 8	4
9	8
10	15
11	19
12	30
13	23
14	17
15	4
16	17
17	18
18	83
19	15
20	40
21	29
22	21
23	57
24	74
25	42
26	20
27	31
28	94
29	25
Total	695

Table 6. Species, age and sex of birds banded in the Innoko River region during June and July, 1948

Species	Age and Sex	No. Banded
White-fronted Goose	Adult	61
White-fronted Goose	Juvenile	4
Lesser Canada Goose	Adult	36
Lesser Canada Goose	Juvenile	68
Pintail	Adult Male	65
Pintail	Adult Female	27
Pintail	Juvenile	276
Baldpate	Adult Male	60
Baldpate	Juvenile	12
Mallard	Adult Male	2
Mallard	Adult Female	1
Mallard	Juvenile	24
Green-winged Teal	Adult Male	28
Green-winged Teal	Adult Female	1
Green-winged Teal	Juvenile	22
Shoveler	Juvenile	3
Greater Scaup	Juvenile	2
Horned Owl	Juvenile	1
Short-billed Gull	Juvenile	1
Arctic Tern	Immature	1
	Total	695

Table 7. Average weights* of adult waterfowl banded in the Innoko River region.

No. Weighed	Species	Sex	Weight Lbs	Weight Ozs.
65	Pintail	Male	2	0
27	Pintail	Female	1	13
60	Baldpate	Male	1	10
2	Mallard	Male	2	10
1	Mallard	Female	2	8
28	Teal	Male	0	10
1	Teal	Female	0	10
58	White-fronted Goose	—	4	9
36	Lesser Canada Goose	—	4	8

* Weights were taken with hand scales; to the nearest $\frac{1}{4}$ pound if over 16 ounces. Scales were checked after completion of project for accuracy and weights corrected to conform thereto.

Table 8. Description and numbers of moose observed in Innoko River region.

Description	Sub-total	Total
Male		12
Yearling	3	
2 year old	3	
Over 2 years old	6	
Female		28
Without calf	18	
With 1 calf	6	
With 2 calves	4	
Unidentified		2
	TOTAL	42

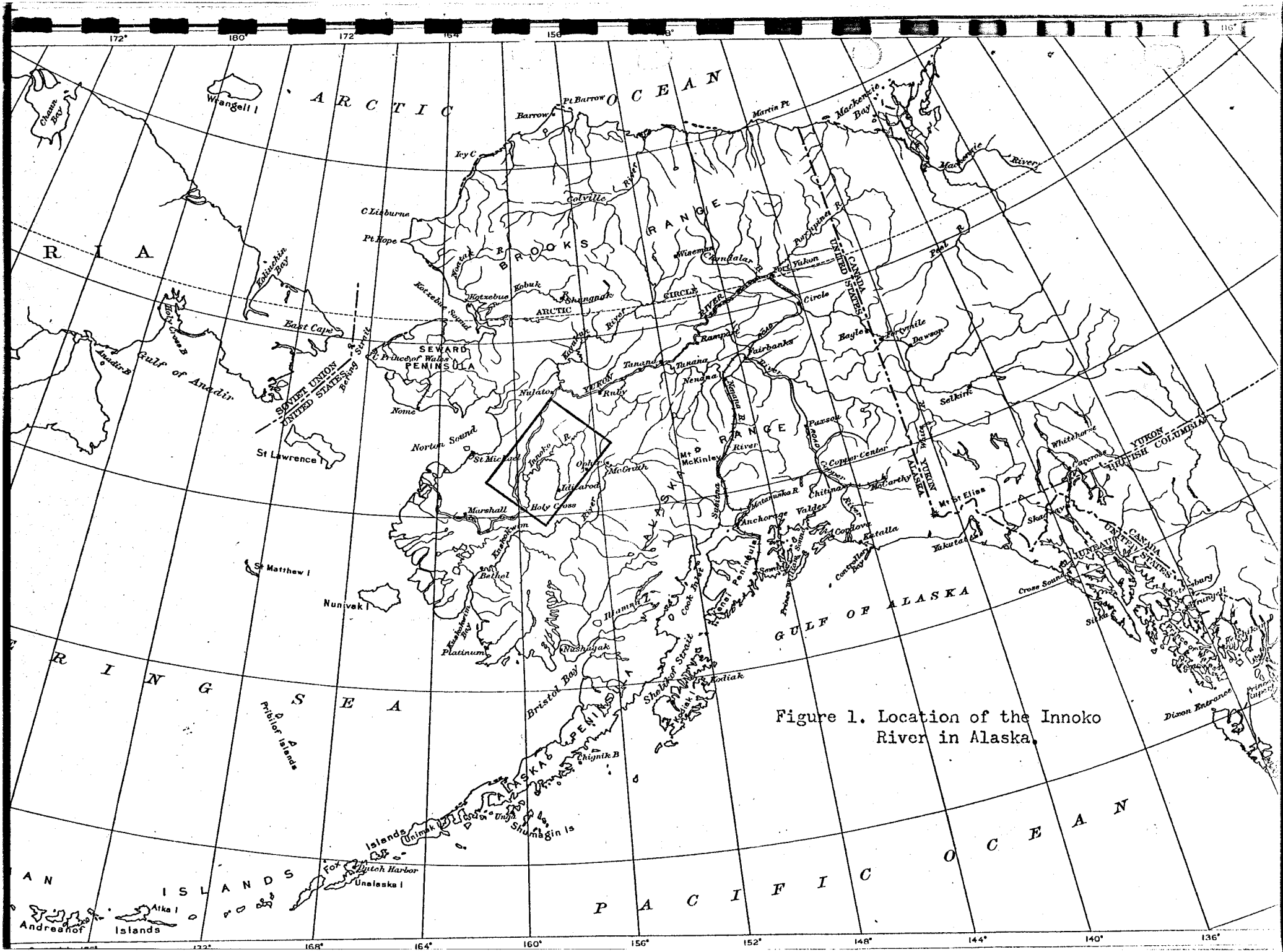


Figure 1. Location of the Innoko River in Alaska.

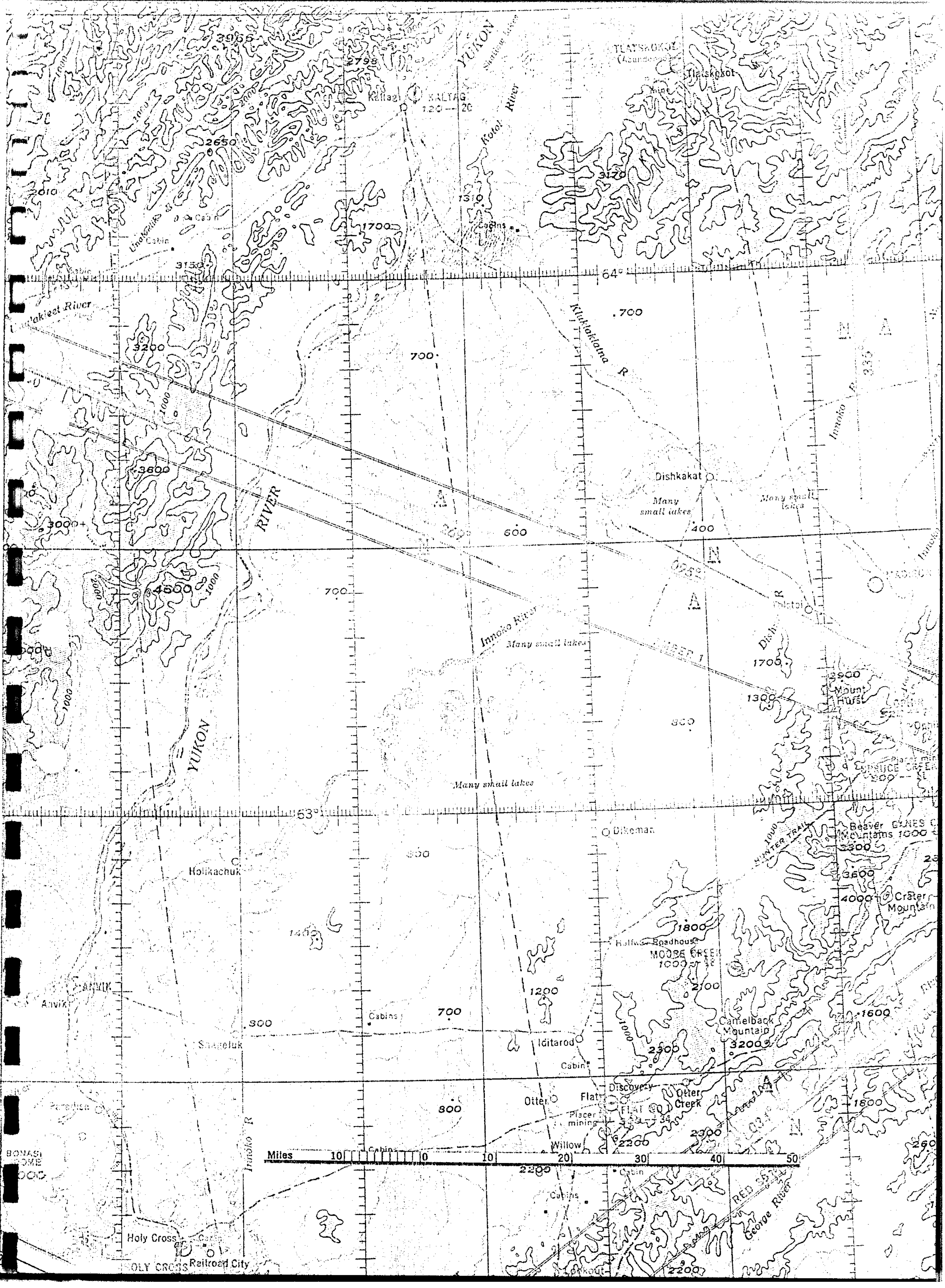
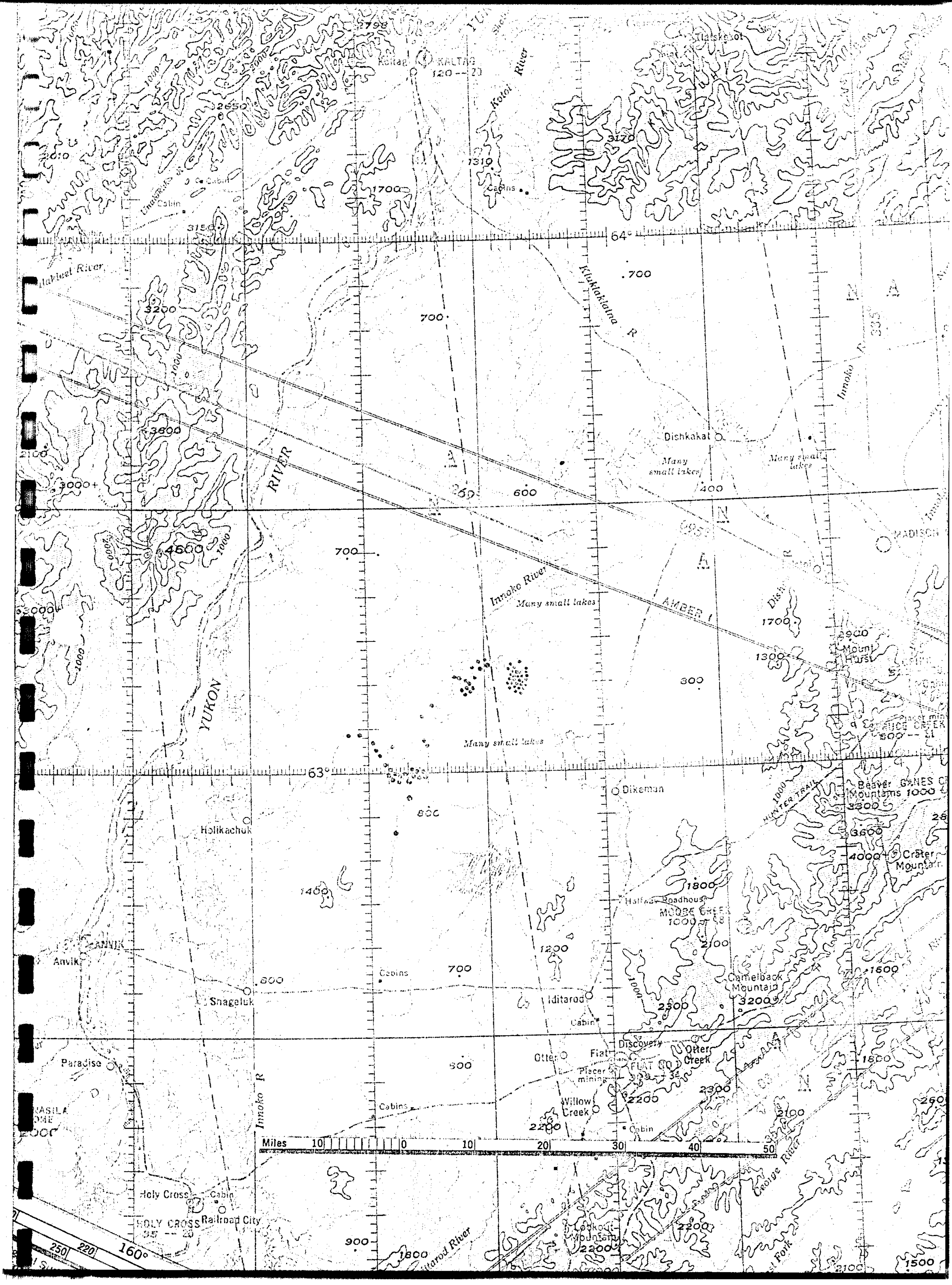

YUKON
Kaltag
KALTAG
Tlatskokot
Cabins
Cabin
64°
Klukluklatna R
Dishkakat
Many small lakes
RIVER
Innoko River
Many small lakes
Mount Hurst
YUKON
Many small lakes
63°
Dikeman
Holikachuk
Beaver Mountains
WINTER TRAIL
Crater Mountain
Halfway Roadhouse
MOOSE CREEK
Camelback Mountain
Iditarod
Cabin
Anvik
ANVIK
Shageluk
Cabins
Otter
Flat
Discovery
Otter Creek
Placer mining
FLAT
Willow
Paradise
Innoko R
Miles
10 0 10 20 30 40 50
Cabins
George River
Holy Cross
Railroad City
HOLY CROSS
Lookout

Figure 3. The Innoko River region showing distribution of birds banded. (Each red dot represents 10 banded birds or fraction thereof)



Kaltag
KALTAG
120 -- 20
Kotol River
Tlatskokot
2650
2010
3170
1310
Cabins
1700
Cabin
3150
64°
Khotol River
.700
700
Kluklaklatna R
3200
Innoko R
3600
Dishkakat
Many small lakes
Many small lakes
2100
3000+
RIVER
600
400
4500
700
Innoko River
Many small lakes
AMBER 1
1700
3000
2900
Mount Hurst
1300
YUKON
800
Many small lakes
63°
Dikeman
Beaver Mountains
HUNTER TRAIL
3300
Holikachuk
3600
4000
Crater Mountain
1400
1800
Halfway Roadhouse
MOOSE CREEK
1000
2100
1200
Anvik
ANVIK
Cabins
700
800
Camelback Mountain
Snageluk
Iditarod
2300
3200
Cabin
1600
Discovery
Paradise
Otter
Flat
Otter Creek
FLAT
300
1800
Placer mining
Innoko R
2200
2300
Cabins
Willow Creek
2100
2200
Cabin
Miles 10 0 10 20 30 40 50
George River
Holy Cross
Cabin
HOLY CROSS
Railroad City
Lookout Mountain
2200
900
1800
Iditarod River
2200
160°
250
220
1500
2100

Submitted:

Name Edward F. Chatelain

Title Asst. Leader

Approved by:

By

Title

Date 11/6/48

FEDERAL AID

ALASKA

Progress Report

Surveys and Investigations

Vols. 3 & 4 - 1948-1950