SUMMER BANDING IN LABRADOR, 1955

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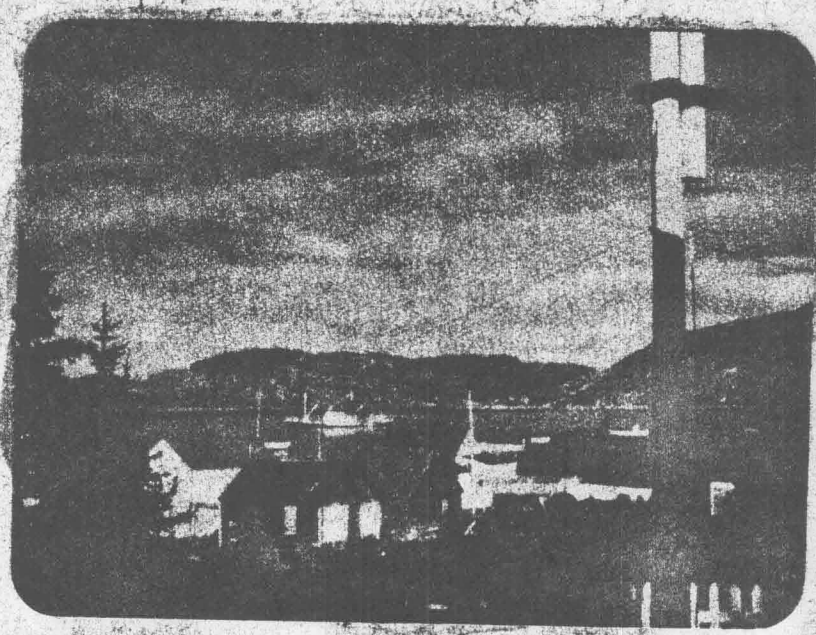


M/V TREPASSEY
at anchor in Nain harbor

SUMMER BANDING IN LABRADOR, 1955

by

C. P. Gilchrist and E. B. Chamberlain*

During the summer of 1955 the authors operated a waterfowl banding station in the vicinity of Nain, Labrador. In 1954 this station was sponsored by Ducks Unlimited and operated by Mr. Gilchrist. In 1955 Ducks Unlimited again sponsored the station, with the States of Virginia and Delaware supplying personnel and making a substantial monetary contribution as well. During both years overall direction and coordination was through the joint efforts of the Canadian Wildlife Service and the U. S. Fish and Wildlife Service.

Planning for this operation was started during the winter of 1955. The personnel left the States on June 27, arriving in St. John's, Newfoundland the following day. The original departure date (St. John's to Nain) was July 4. This was later changed to July 9 because of a change in schedule of the two ships serving the coast of Labrador. This delay was fortunate, since the boat and outboard motor to be used for the summer work, having been delayed by a shipping strike in New York, did not arrive at St. John's until the evening of July 7. Finally all supplies were loaded, the boat and motor processed through customs, and departure for Labrador made about 6 p.m. on July 9, aboard the motorship Trepassey.

The Trepassey arrived at Nain in the late afternoon of Friday, July 15. Unloading was completed that evening and over the week-end a guide was hired and plans made to commence operations on Monday, July 18. Since black ducks were moulting at this time it was planned to cover several different areas in the vicinity until moulting was complete and then to set up a permanent camp for the

* Waterfowl Biologists for the States of Virginia and Delaware, respectively.

bait trapping operation. The general plan was that the work would be divided into three phases, described below.

The areas covered in Phase I were Anaktalik and Anaktaluk Bays and vicinity. These are the bays immediately north and south of Camp Site 1 (see map, p.18b). Webb's Bay and Port Manvers Run, north and east of Camp Site 2, were also covered by the same method.

Phase I

This phase of the work was planned to cover the moulting period of the black duck. Actually, it should be started at least two weeks earlier to take full advantage of the flightless period. To achieve maximum success this phase should be started not later than July 1. This is clearly shown by the fact that on the first day of Phase I, July 18, 31 ducks were caught. After that date the most birds caught in any one day (by this method) was five, and by the end of the month it was impossible to find enough moulting birds to continue in this manner.

The method used was to run the flightless birds ashore with the boat and then run them down on foot and catch them by hand. This is no easy job. It was very seldom that even 10% of the birds known to have gone ashore were found. A good retrieving dog would add greatly to the effectiveness of this operation.

In addition to the small number of birds caught out of each bunch driven ashore there is one other factor that makes it relatively ineffective, and that is the fact that once a given bunch of birds has been disturbed it is usually never seen again. Observations by Gilchrist in 1954 indicate that black ducks will, under certain conditions, move as much as thirty miles when thus disturbed. This means that in order to band a large number of birds a very extensive area

must be covered or there must be a heavy concentration of birds in the work area. This is not a usual situation when working with moulting black ducks. It therefore becomes necessary to travel light and make many camps, staying not more than two or three nights at any one place.

Only adult male black ducks were caught by this method. However, as noted below, had goose bands been available, it would have been possible to band some moulting geese.

Phase II

This phase was undertaken as an experiment rather than with the expectation of taking a large number of birds.

Last year (1954) Gilchrist located a concentration of moulting goldeneyes at the head of Nain Bay. He was unable to trap them since they would not enter bait traps. Therefore, this year a gill net was included in the station equipment for the purpose of catching goldeneyes.

The first attempt was made on August 11. The birds were found in the same location as last year. It was estimated that there were at least 1500 of them. The gill net was set with one end against the shore and the birds were driven into the net by using two boats and slowly moving the birds ahead of the boats. Thirty-eight birds were caught in the net, of which six were drowned. Thirty-two were banded and released.

A second attempt was made on August 19. Because of wind and tide it was impossible to set the net properly and as a result only five goldeneyes were caught alive. These were banded and released. Several interesting observations were made during this phase of the work.

It was originally thought that all of these birds were American golden-

eyes. However, post mortem examination of the birds drowned in the net showed that Barrow's goldeneye was also present. On the second day of using the gill net in addition to the goldeneyes, three young geese, in full plumage but still too young to fly, were caught in the net. Also on this date, at the same location (head of Nain Bay) 28 downy young mergansers (believed to be red-breasted) were seen in one flock, accompanied by two females.

As noted above, this phase of the work was in the nature of an experiment. It is believed that with the experience thus gained it would be possible to catch and band a substantial number of moulting goldeneyes another year.

Phase III

This phase of the work differed only in location from trapping black ducks in the States. On July 31 the last temporary camp was abandoned and a permanent set-up made on South Aulatsivik Island, about 15 miles from Nain (Camp Site 3 on map, p.18b). The surrounding territory was covered thoroughly and the most promising trap locations were baited with whole corn. There was no difficulty in getting the ducks to take corn, even after traps were placed at the bait spots. However, they were very reluctant to enter the traps. It was not uncommon to find all of the bait gone both from around the traps, and inside the funnels as well, but it was not until August 13 that the first ducks were caught in a trap.

In an effort to overcome this difficulty several different trap entrances were tried (See Photographs, Appendix). The most effective entrance was a wide inward-swinging door, hinged at the top of the trap and held open by a string tied to the top of the trap, with the bottom of the door about two inches from the bottom of the trap. This allowed the ducks to push into the trap very easily, and

they were unable to find their way out, although the door was never entirely closed.

Because of the extreme range of tides it was necessary to place the traps in locations where they were out of water most of the time. In two instances they were nearly half a mile from water at low tide. This, and the fact that black ducks are normally more reluctant to enter a trap they must walk into than one they can swim into, accounts in part for the small number of ducks trapped. In the two locations where it was possible to place traps in small ponds with stable water levels ducks were caught with no difficulty, using the standard funnel-type of entrance.

The table below shows the number of birds caught and banded during the summer.

TABLE 1

NUMBER OF BIRDS CAUGHT AND BANDED

Species	Adult Male	Adult Female	Immature Male	Immature Female	Sex and/or age unknown	Total
Black	93	19	3	11	1	127
Mallard		1				1
Bl. x Mall. Hybrid	1					1
Goldeneye (1)	34	1	3			38
Wh. Cr. Sparrow (2)					2	2
Totals	128	21	6	11	3	169

(1) Both American and Barrow's.
(2) Caught in Japanese mist nets.

OBSERVATIONS

A. Waterfowl

1) Canada Goose

The first geese seen were in the Anaktolik River about one mile from the head of Anaktolik Bay. This was on 22 July. There were over 50 moulting Canada geese, two snow geese and nine downy young (remnants of at least three broods) in this bunch. The time was 9:30 a.m. Further up the river two more young geese were sighted. These were not accompanied by adults. Still further up the river (about four miles from the head of the bay) 23 more geese, including one snow goose, were seen. These geese went ashore on a steep bank where overhanging tree roots at the top prevented them from escaping into the woods. The only reason these geese were not banded was that no goose bands were included in the bands supplied for the summer.

At this point narrows and rapids were encountered and operation with the outboard motor became impracticable. However, according to the map, the terrain above the rapids is very similar to that below for a distance of at least five miles and possibly much further. It seems highly probable that this too is goose nesting and moulting habitat. All along the portion of the river that was explored flats, sand bars and willow thickets provide good situations for the use of drive nets.

According to reports from natives of the coast of Labrador there are similar situations, with moulting and breeding geese present, at least from Kaipokok Bay to Okak Bay, an airline distance of over 200 miles. Our observations, while much more limited in scope, tend to confirm these reports.

On 19 August three young geese (in full plumage but unable to fly) were caught in the gill net set for moulting goldeneyes at the head of Nain Bay. In

addition many adult geese were seen flying in this area.

Max Budgell, post manager for the Department of Northern Labrador Affairs at Nutak, reported that the area around Nutak (Okak Bay) is a definite goose moulting area and that sand flats and willows there would make it possible to operate drive nets with good results.

By 26 August geese were being seen regularly in the vicinity of camp on South Aulatsivik Island. They were present all through September and into October. It was impossible to determine whether the same geese were present or if this area is a natural flyway and the geese being seen were passing through.

No snow geese were seen after 22 July, when three were seen moulting with Canada geese.

2) Ducks

The primary objective of this operation was to band black ducks. That this was not a smashing success can be readily seen by a glance at the tabulation of birds banded on page 5. However, as will be pointed out later, normal numbers of black ducks were not present in the Nain area, in either 1955 or 1954. Data in Table 2, p. 9 , indicate that birds present in July were summer residents, since some of them were retrapped in September.

The small number of female and immature blacks banded would seem to indicate that this is primarily a moulting and congregating area rather than a breeding area. Only one brood was seen, and that late in the season. On 28 August, while investigating whether or not it would be worthwhile to move camp to a new location, a visit was made to Paul Island. In a small pond, about one-half mile inland, one brood of five black ducks was seen. These birds were not flying and were estimated to be about six weeks old. In the same pond there was also a feigning female green-winged teal. Although the area was thoroughly

searched neither brood nor nest could be found. It seems likely that the bulk of black duck nesting is inland, on the hundreds of small ponds and streams lying just to the west of the coastal mountains, only a short distance from the coast. This would account for the fact that only adult males were caught during the flightless period. The first female and the first immature birds were caught on 13 August, which was nearly two weeks after the last flightless blacks were seen.

As might be expected in this northern region large numbers of sea ducks were present and many broods were seen, especially broods of eiders. Also present in fair numbers were all three species of scoters, and broods of at least two species, American and white-winged scoters, were seen frequently during late August and early September.

Another duck nesting in the area was the red-breasted merganser. Broods were seen frequently. Although this species did not appear to be present in large numbers, it was well distributed throughout the territory covered during the summer. On 28 July a brood of nine (plus female) was seen in Tikialuk Pond. This brood was very young, estimated age being 3 - 4 days. On 7 August another brood of nine was seen in an unnamed pond near camp on South Aulatsivik Island. On 19 August, at the head of Nain Bay, a flock of 28 young mergansers was seen, accompanied by two adult females. A few other broods were seen, but no specific notes as to numbers and location were made.

Another duck, present but not common in this area, was the pintail. Last year (1954) Gilchrist banded a few at the head of Nain Bay. This year several small bunches were seen along the shore of South Aulatsivik Island. On 21 August two immature females were caught in a banding trap. These were killed by a duck hawk. On 7 September another immature female was found dead in a banding trap. The cause of death was not determined. The presence of these

TABLE 2

BLACK DUCKS RETRAPPED (No. of Times & Date)

No. of Band	Date Banded	#1	#2	#3	#4	#5
547-32004	8/21	8/29	9/7	9/17	9/27	
237	7/18 (H)	8/25				
282	8/29	9/2				
290	8/31	9/3				
005	8/22	9/5				
300	9/3	9/7	9/12	9/16	9/18	9/23 (D)
007	8/22	9/12				
223	1954	9/12				
292	8/31	9/14	9/30	10/8 (K)		
016	9/7	9/14	9/27			
296	9/2	9/14				
232	7/18 (H)	9/14				
026	9/14	9/16	10/8 (S)			
283	8/29	9/16				
274	8/13	9/17	9/23			
018	9/10	9/18 (D)				
017	9/7	9/23				
019	9/12	9/23	9/23*			
001	8/20	9/23	9/27			
028	9/16	9/27				
020	9/12	9/27	10/8 (K)			
242	7/18 (H)	9/27				
034	9/17	9/28	10/8 (S)			
036	9/17	9/30				
Foreign						
547-94428	?	8/20	9/23	9/27	10/8 (S)	
051	9/27	10/8 (S)				

* 019 In two different traps (Aulatsivik and Topsy Pt.) same day.
(D) - Dead in trap, cause unknown.
(H) - Caught by hand - moulting.
(K) - Killed by lynx (in trap).
(S) - Starved; too long in trap (weather).

immature birds indicates breeding in the vicinity, although no broods were seen.

Other species of waterfowl seen were green-winged teal, old-squaw and goldeneye - both American and Barrow's. Of these species only the goldeneyes were seen in large numbers, and these only in one location.

As noted above under "Phase II", there was a large concentration of moulting goldeneyes at the head of Nain Bay. It was originally assumed that all of these were American goldeneye, but examination of the windpipes of birds drowned in the net disclosed that both species were present. The small sample of dead birds gave very nearly a 50-50 species ratio. However, the sample was not large enough to judge if this ratio would hold true for the large number of birds seen, since there were at least 1500 moulting birds in this group.

1955

In addition to waterfowl seen there were reports from reliable sources of other waterfowl concentrations. One of the most promising reports was from Max Budgell (mentioned above under "Geese") who stated that in the area around Okak Bay he had seen black ducks, teal and widgeon in the same pond. He also found one black duck nest near Nutak.

B. Birds Other Than Waterfowl

The authors did not feel fully qualified to make identification of all of the small birds seen during the summer. Therefore the birds named below are only those for which identification was reasonably certain. There are probably several other species normally present in the area, particularly in the warbler and shore-bird groups, that were either not seen or not recognized. The following birds were seen and identified. Those marked with an asterisk (*) were seen either nesting or with young.

Greater Yellowlegs	Robin *
Least Sandpiper	Rusty Blackbird
Spotted Sandpiper	Myrtle Warbler
Semi-palmated Plover	Pine Grosbeak
American Pipit	White-crowned Sparrow *
Horned Lark	Great Horned Owl
Lapland Longspur	Osprey *
Great Black-backed Gull *	Rough-legged Hawk
Herring Gull *	Goshawk
Iceland Gull	Duck Hawk
Ivory Gull	Pigeon Hawk
Blue Jay	Raven
Labrador (Canada or Gray)Jay	Common Loon
Northern Shrike	Red-Throated Loon
Black Guillemot *	Willow Ptarmigan *
Spruce Grouse	

In addition to the ptarmigan and grouse, the yellowlegs, sandpipers, guillemot and black-backed gull are important, when present, in the diet of the natives.

A robin's nest in a tree in front of the Post Manager's house at Nain provided an interesting observation. On 15 July there were young birds, about ready to fly, in this nest. A few weeks later (in early August) this nest was again occupied by a female robin and another successful brood was brought off from the same nest. There was no way of determining if the same female brought off two broods or if two females used the same nest.

Although robins were commonly seen all summer, on 6 September, in spruce thickets on Amitok Island, large numbers of robins were present. These birds were obviously resting, thus indicating that migration was under way.

Other notes on migration:

26 August	-	Geese beginning to appear in flocks of 10-20, occasionally larger.
30 August	-	Gilchrist started fall migration via M. V. Trepassey!
31 August	-	First greater yellowlegs seen, several singles and a few groups of 3-10.
2 Sept.	-	Black ducks beginning to show in bunches of 5-40.
5 Sept.	-	250-300 geese in one flock near camp on So. Aulatsivik Island.
8 Sept.	-	American scoters and goldeneyes flocking in vicinity of camp.
10 Sept.	-	Several small bunches of old-squaws in channel near Seal Island.
23 Sept.	-	Mergansers beginning to flock.
2 Oct.	-	Many pine grosbeaks, apparently migrating, in spruce forest, Mission Park, Nain.
8 Oct.	-	Ptarmigan beginning to flock.
14 Oct.	-	Large flocks of eiders, scoters and goldeneyes around Paul Island.
17 Oct.	-	Chamberlain started fall migration via last trip of M. V. Trepassey.

C. Predators

Part of the lack of success in trapping black ducks can be attributed to the birds being harrassed during the day by duck-hawks and goshawks, and at night by great horned owls. This trouble started almost as soon as the first traps were put in position. Later in the season two traps were disturbed by

Canada lynxes. Two individuals were involved here, since one trap was on the mainland and the other on an island more than a mile from the nearest shore of the mainland.

Avian predators were kept under some measure of control by the use of pole-traps, shotguns and rifles. One persistent duck hawk, wounded with a high-powered rifle, refused to leave the vicinity of one of the duck traps. The following day the pole-trap in that location was missing and the duck hawk was not seen again. Total take of avian predators in pole-traps was three great horned owls, one common rough-legged hawk * and two goshawks.

It should be noted that these avian predators caused more trouble by harrassing the ducks than by actually killing them. Whenever one was seen in the vicinity of a duck trap waterfowl use of that area usually fell immediately to zero. After the predator was removed waterfowl use came back to normal in 3 - 6 days.

D. Food Habits

This is a major heading for what may well be a minor observation. However, it is felt that such observations should be recorded, if for no other reason than to get all of the information obtained into the permanent record.

It is well known that the north country produces, during its short growing season an abundance of flowers and fruits. The dominant fruit in the vicinity of Nain is blueberry, of which there are at least three species. These berries began to ripen during the second week of August and were available from that time until well into October. During this period they formed a major part of the diet of Canada geese and black ducks.

* Rough-legged hawk probably caught accidentally, since these hawks normally prey on small rodents.

Along the shore of South Aulatsivik Island two spots were found where there were dense stands of eel grass. This was much used by geese. On 23 September three geese were killed near one of these eel grass beds. Their gizzards were exceptionally large and were completely filled with eel grass.

RECOMMENDATIONS

In considering the following recommendations, three points should be kept in mind:

(1) According to our observations, and the best available information from local residents, the bays and inlets along the coast of Labrador from Kaipokok Bay as far north as Okak Bay are excellent, if somewhat limited, goose breeding and moulting habitat. Black ducks, mergansers, and to a lesser extent green-winged teal and pintails are also present, although breeding of the dabbling species is apparently concentrated on inland ponds. In the areas where geese are present there are several locations where drive-trapping could be successfully accomplished.

(2) For the past two years large numbers of goldeneyes, of both species, have been concentrated for moulting at the head of Nain Bay.

(3) During the past two years according to the natives, the number of black ducks present in the vicinity of Nain has been considerably below normal. Mr. Tuck, of the Canadian Wildlife Service, also reported seeing substantially greater numbers of blacks than were present in either 1954 or 1955.

With the foregoing in mind it seems not unreasonable to assume that another year of operation in this area should be considerably more successful, particularly if either of the authors are included in the station personnel.* It is

* With enough money to hire part-time labor as needed either of the authors could, with the guide, operate the station with little difficulty. If personnel familiar with the area were used there would be no need for more than one technical man.

felt that a reasonable estimate might be about as follows:

Black ducks - Not less than 125 could be banded. With a normal black duck population this should increase to around 300.

Goldeneyes - The pitfalls of this operation are now fairly well known. With some minor modifications of technique it is safe to say that 300-500 of these birds could be banded.

Canada geese - It seems certain that 50-75 geese could have been banded this year in Anaktolik River, had bands been available. The Okak Bay area, according to Budgell, should be more productive. Therefore it is estimated that from these two locations a minimum of 150 geese could be banded.

This should give a season total of:

Black Ducks	125 - 300
Goldeneyes	300 - 500
Canada Geese	150 - 300
Total	575 - 1100

However, it cannot be too strongly emphasized that the foregoing can only be accomplished if some means can be devised for getting the personnel into the area and ready to commence operations not later than 1 July. Under present conditions this is virtually impossible, since the first trip of the Trepassey is usually in late June. On this trip she carries provisions, fuel oil and gasoline and under Canadian law gasoline and passengers do not mix!

One way of assuring that station personnel were in place at the proper time would be to coordinate the project with the U. S. Air Force. Since they have major installations in the area it would be a simple matter for them to deliver the personnel to Nain (or vicinity), on a space available basis, at no expense to the project.

From personal contact with responsible personnel in the Air Force we know that such coordination is possible, but it must be initiated at a high level. Operational units almost always have aircraft and personnel available for such missions (often this could be arranged in conjunction with a mission already in operation), but the field commanders, however willing and capable, are reluctant to carry out such action without specific authorization. The proper place to obtain such authorization is in Washington, and this could be done by the Washington Office of the U. S. Fish and Wildlife Service working directly with Headquarters, U. S. Air Force.

With all of the above in mind we recommend that the Nain banding station be operated for at least one more year, if arrangements can be made to put the station personnel in position and ready to work not later than July 1.

ACKNOWLEDGMENTS

Probably this section should come first. Certainly without a great deal of help from a great many people the operation of this project would have been extremely difficult, if not completely impossible. To name all of the people involved would take up more space than is available. However, we feel that special appreciation should be expressed to the following people:

Mr. F. S. S. Sharpe, Bank of Montreal, St. John's, Newfoundland

Mr. "Jack" Pippy, W. G. Pippy & Sons, St. John's, Newfoundland

Col. S. G. Huey, USAF

w/o Ralph Settle, USAF

Mr. Leslie Tuck, Canadian Wildlife Service

Mr. Harry Walters, Chief, Newfoundland Wildlife Division
Dept. of Mines & Resources

John Matheson, RCMP, Nain

Mr. Walter Raymond)
Mr. Max Budgell) Dept. of Northern Labrador Affairs
Mr. Ted Baird)

Rev. F. W. Peacock)
Rev. Siegfried Hetash) Moravian Mission

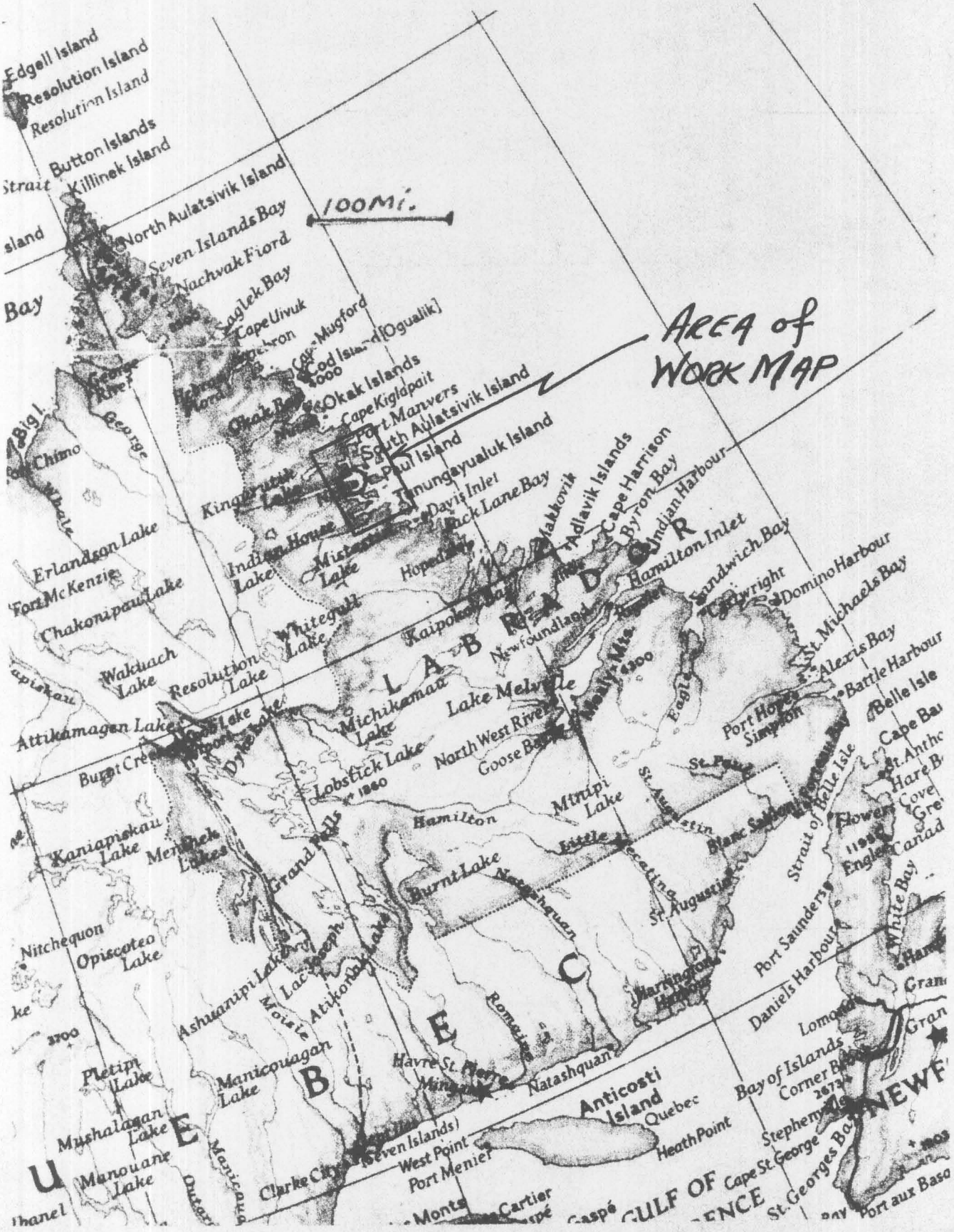
Nurse Dorothy Jupp, Moravian Mission

Mr. & Mrs. Hayward Haynes, Nain, Labrador

Last, but far from least, the Webb family, particularly Chesley Webb, who for two years served as guide for the project, and without whose intimate knowledge of the Nain area the operation of the project would have been seriously hampered.

A P P E N D I X

1. Maps
2. Photos
3. Expenses


AREA of WORK MAP
100 MI.
Edgell Island
Resolution Island
Resolution Island
Button Islands
Killinek Island
North Aulatsivik Island
Seven Islands Bay
Nachvak Fiord
Saglek Bay
Cape Uivuk
Okak Islands
Cape Kigldpait
Port Manvers
South Aulatsivik Island
Paul Island
Tunungayualuk Island
Davis Inlet
Black Lane Bay
Makkovik
Adlavik Islands
Cape Harrison
Byron Bay
Indian Harbour
Hamilton Inlet
Sandwich Bay
Domino Harbour
St. Michaels Bay
Alexis Bay
Battle Harbour
Belle Isle
Erlandson Lake
Fort McKenzie
Chakonipau Lake
Indian House Lake
Mistastin Lake
Whitegull Lake
Kaipokok Bay
Newfoundland
Wakuach Lake
Resolution Lake
Attikamagan Lake
Michikamau Lake
Lake Melville
North West River
Goose Bay
Lobstick Lake
Port Hope Simpson
St. Paul
Hamilton
Mistinipi Lake
St. Augustin
Burnt Lake
Little Mecatina
St. Augustin
Strait of Belle Isle
Kaniapiskau Lake
Menihek Lakes
Grand Falls
Nitchequon
Opiscoteo Lake
Ashuanipi Lake
Lac Joseph
Atikonak Lake
Moisie
Romaine
Natashquan
Port Saunders
Daniels Harbour
White Bay
Pletipi Lake
Manicouagan Lake
Havre St. Pierre
Anticosti Island
Quebec
Heath Point
Bay of Islands
Corner Brook
Stephenville
Mushalagan Lake
Manouane Lake
Seven Islands
West Point
Port Menier
Clarke City
Monts
Cartier
Gaspé
GULF OF
Cape St. George
St. Georges Bay
Port aux Basques
NEWF


= Moulting Goldeneyes
= Moulting Geese
O = Camp Sites
Cape Kiglapait
MAP SHOWING LOCATION of WORK
SOUTH
AULATSIVIK
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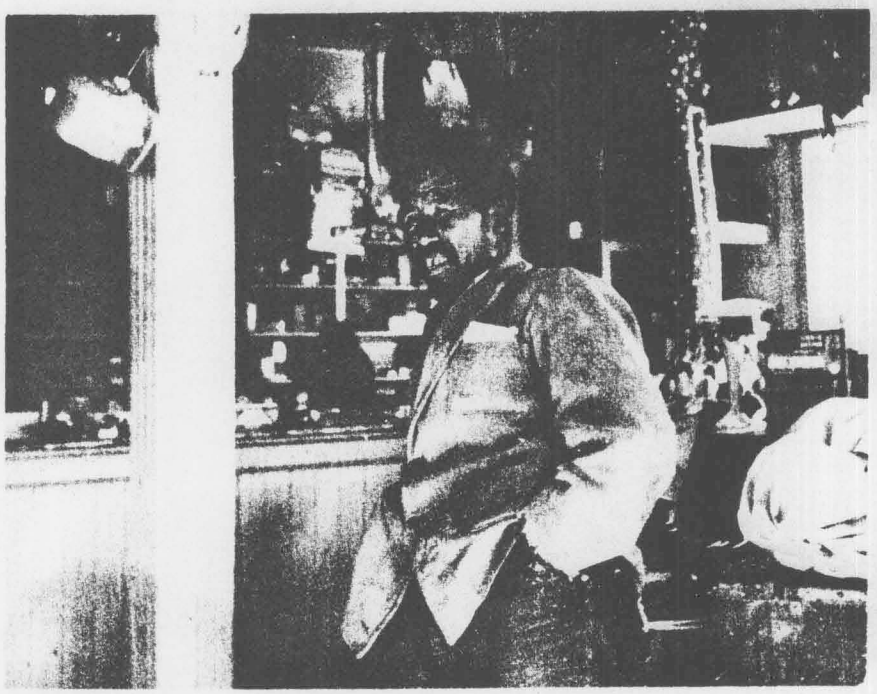
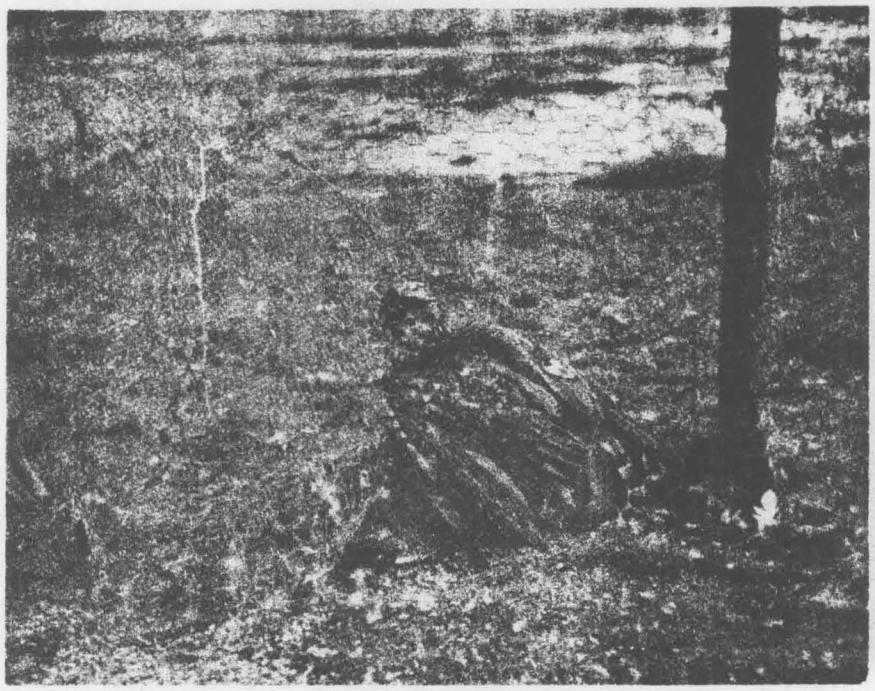
I.
25 Miles
Tunun

P H O T O S

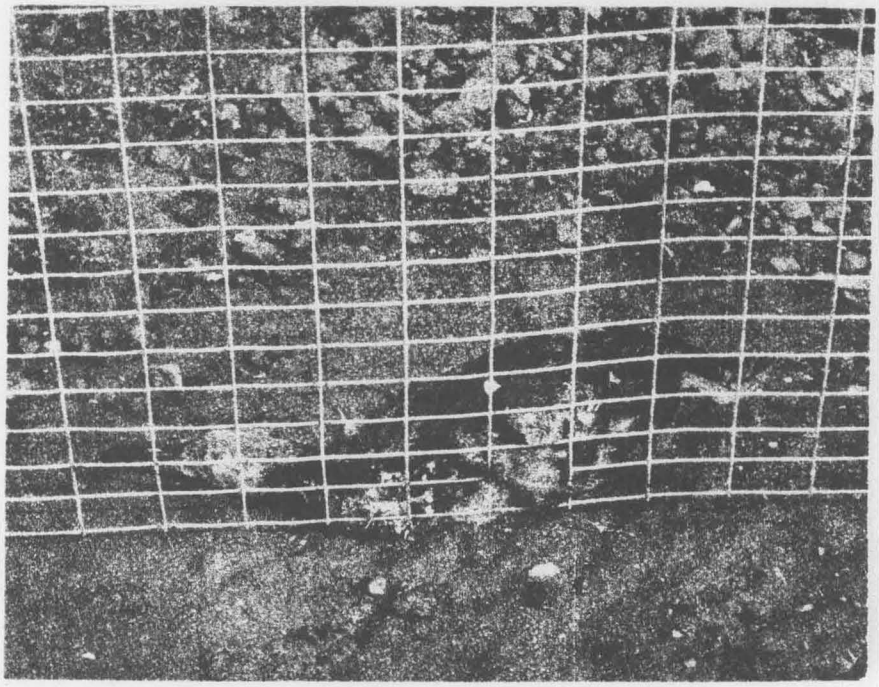
1. First camp. Sod-covered Eskimo house was used for storage. Guide Chesley Webb on "front porch".



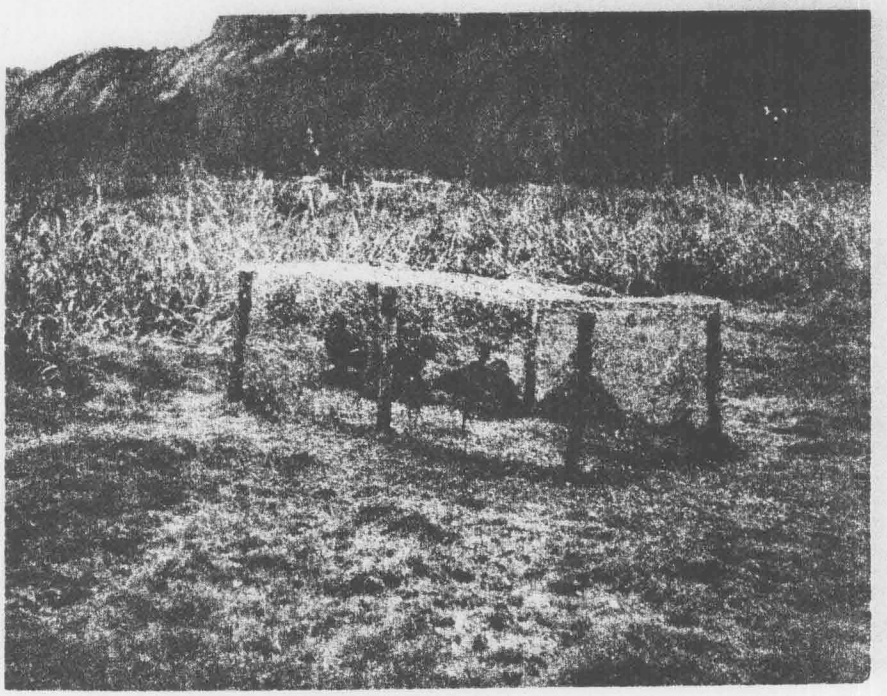
2. Typical Eskimo of Nain area. Photo taken inside DNLA store, Nain.



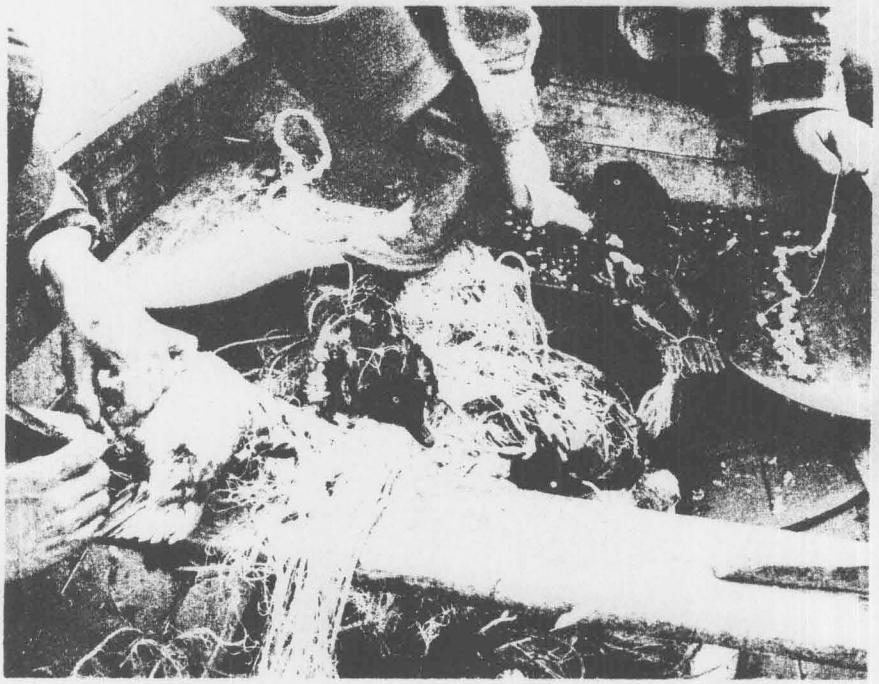
3. Immature goshawk in chicken-wire trap, 1954.



4. Welded wire was used in 1955. This kept predators out but still did not provide complete protection for trapped ducks.

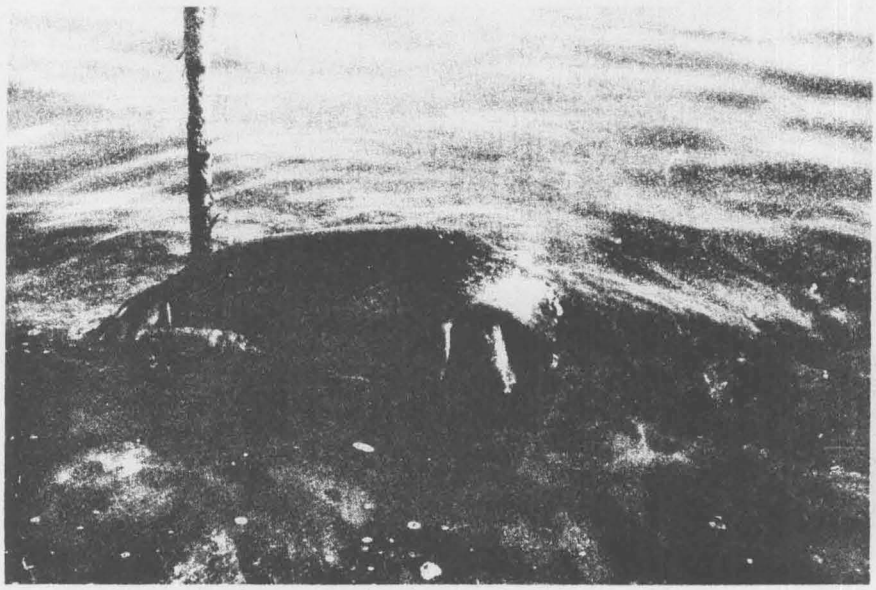


5. Black ducks in trap, head of Nain Bay, 1954.

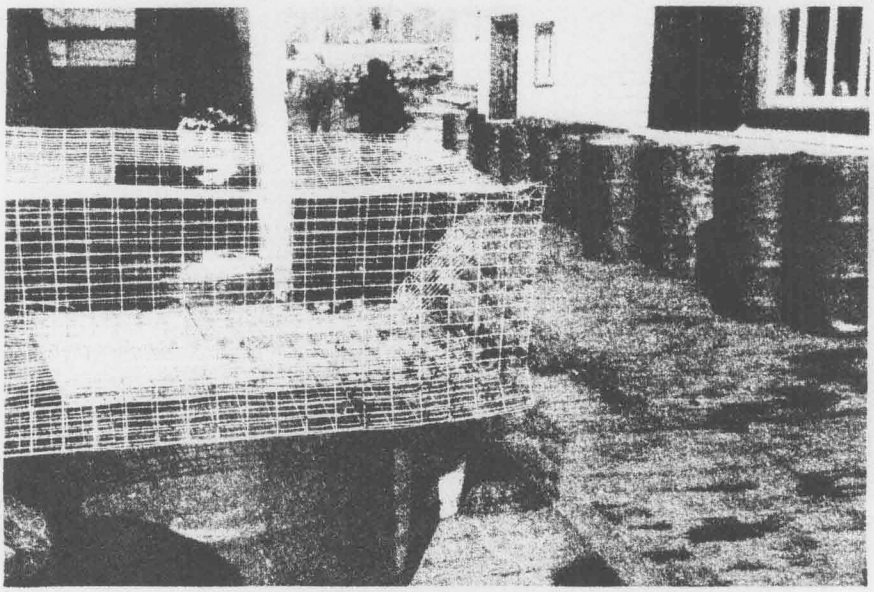


6. Goldeneyes in gill net, head of Nain Bay, 1955. Bird standing on boat seat ate bread crumbs readily while being removed from net.

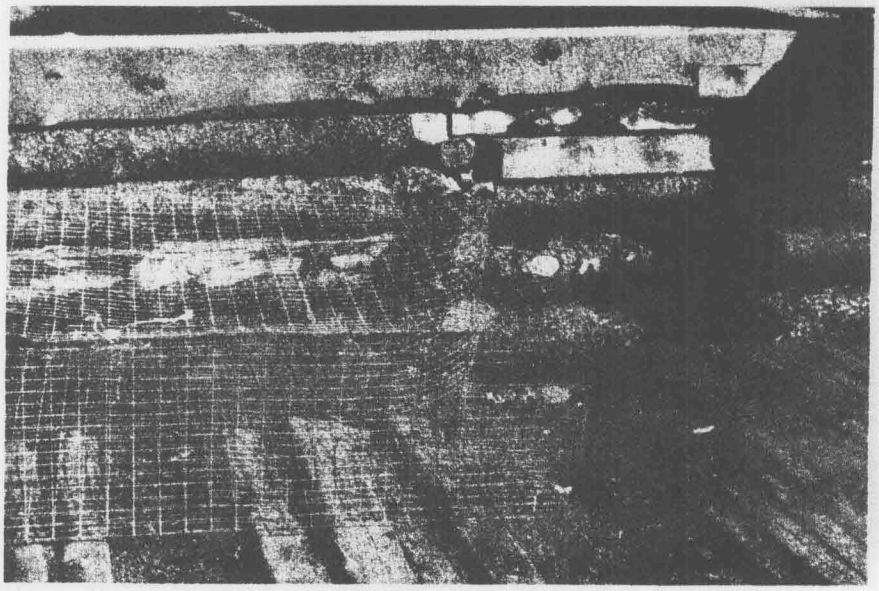
7. Photo taken looking from trap to bay, about 2 hours after high tide. 14' boat with 25 h. p. outboard indicated by arrow.



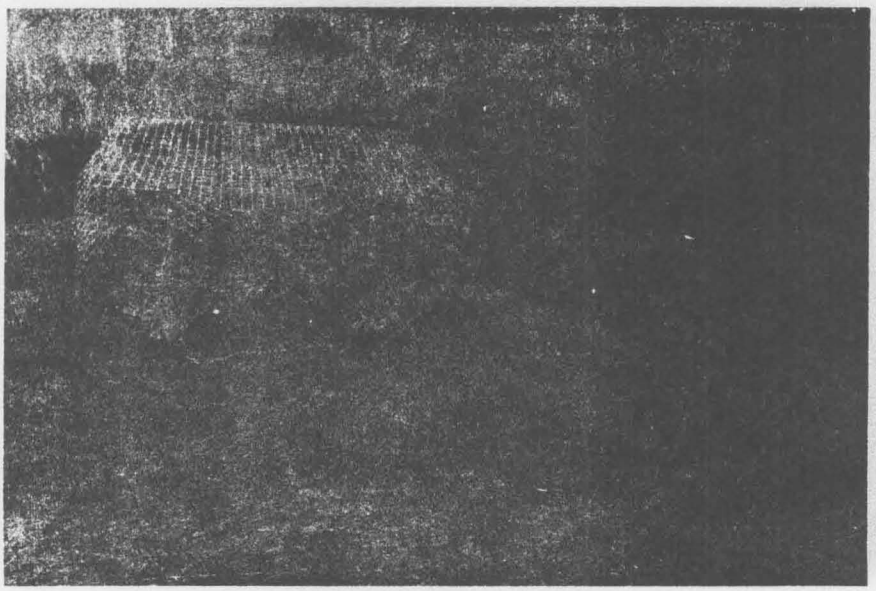
8. Fresh meat! Seal meat was a welcome addition to a diet of tinned foods. Seal liver is equal in taste to calf liver.



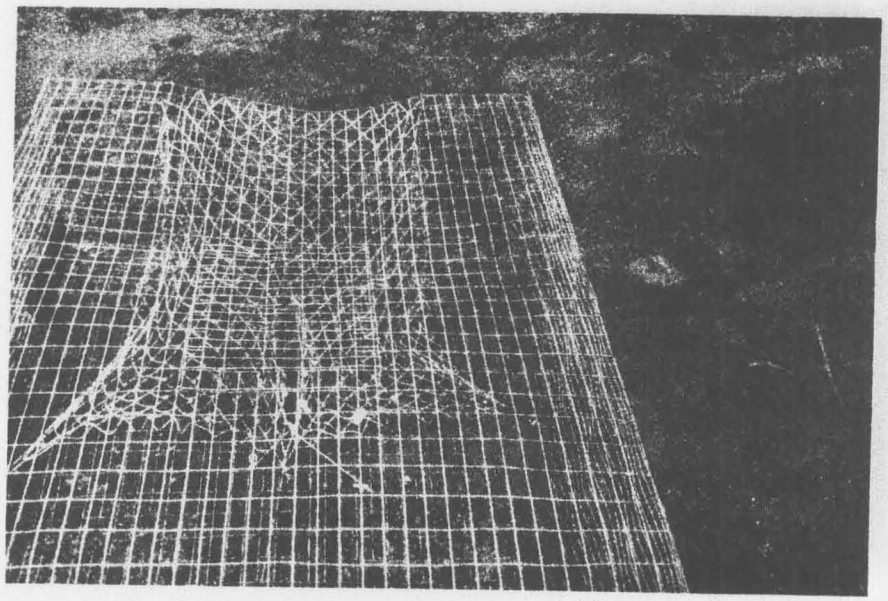
9. Swinging door entrance.



10. Modified funnel, made of welded wire.



11. Another type of entrance - net funnel - front view.



12. Rear view of net funnel type of entrance.

EXPENSES

The authors have made a detailed accounting of expenses to their respective auditors and Ducks Unlimited. Nearly all of the money allotted to the project was spent. Estimated cost of the project was $3,400.00. The actual expense was slightly higher, as follows:

	Allotted	Spent
Ducks Unlimited	$1,050	$1,050
Virginia	1,500	1,300
Delaware	1,200	1,200
Total	$3,750	$3,550

Since much of the equipment bought during the past two years is more or less permanent in nature future operation of the station would cost considerably less. It is estimated that, including the cost of an outboard motor and another tent, the next year of operation would cost about $2,500, if two technicians were used. Using one technician would decrease this cost by the amount of transportation and food for one man, or roughly $600. Further operation would cost still less since the outboard motor and tent would be permanent equipment, and the cost for these items would apply only to the next year of operation. Assuming a crew of one technician and guide, plus incidental labor as needed, the fourth and following years of operation should cost $1,500 - $1,700.