CWSC 760

WILDLIFE INVESTIGATIONS IN THE CAPE HAY REGION, LANCASTER SOUND
"ildife Jnvesti ations in the Cape Hay Region, Iancaster sound, 1957, by Lesile M.. Tuck

## Introduction

For some time it had been considered essential to the study of the distribition; ecology and copulations of murres (project $0-0-1)$ thet at least one season should be devoted to the study of a colony in the High Arctic. The Cape Hay colony in Lancaster Sound was chosen as it seemed fairly accessible fromo Pond Inleto: Pond Inlet is the most northern locality in the Canadian Eastern Arctic from which native assistance can be obtained.

The navicational season in that part of the Canadian Arctic is a short one. only one ship, the "C.C.C.D. Howe" serves pond Inlat, normally calling there in late August outward.

The plens or this summer's field work, finally approved by the Department, were that Louls Lemieux should study Snow Geese on the scuthwestern section of Bylot Island in 1957 and that I should study Murres ot Cape Hay in Lancaster Sound. Thus the expense, of à charter flight to pond Inlet would be borne by two projects. Lemieux and $I$ sent our food supplies to pond Inlet by the Arctic Patrol Ship in 1956, further cutting expenses. We arrived at Pond Inlet on May 28, 1957, in a DC3 chartered from Frobisher Bay, Baffin Island.

I left Pond Inlet by dogteam for Cape Hay on June 5 after spending five days at a small murre colony at Cape Graham Moore: I arrived at Cape Hay on June $I l$ and remained there until August 20 whence I returned to Pond by canoe. I reached Pond Inlet.' again on Aufust 25 and joined the C.D. Howe for home on Auçust 29. An entire breeding sesson had been spent at a single locality in the High Arctic.

I am most spateful to Mr. D. ctovenson, Hudson's Bay factor at pond Tnlet, who stored and cared for our suppiles over th: winter and who was most co-operative in other ways. Corporal pay Johinson had chosen Mucktar and his family to spend - the summer with me at Cape Hay. fmucktar proved to be a most capable assistant. Johnson also travelled with us in order to see us settled away for the summer.. The extra team for transnortation of eauipment as well as Johnson's interest was greatly appreciated. I am also grateful to "Corky" (Mr. Scott Emerson) at, Arctic Ray who, in spite of his mony commitments, maintained a" recular nishtly radio schedule with me:

It was a most successful season as the following report will indicate. In addition to the main project, valuable data on the distribution and movements of other birds and on marine mammels are obtained.

## Hi tory of Cane Ifay Colony

the sarliest, and only snecific, record of a murre colony in the Care Hay rerion was made in 1858 by Captain F.L. MiClintock ("Voyare or the Fox") who was searchirg for the lost Frankin Fxyedition: MClintock was prevented from "levying a tax unon it" due to movine pack ice which kept him three miles from the cost. Sure colonios or loomeries as they are called in the early liferature were most important to the early explorers as they were notential sources of food. I searched ä great deal of thé literature concerned with the Franklin Expedition and apart from a sincle reference to a load of coal landed at cape. Hay at the request of tady riranklin found no other information relevant to
the refion or to a possible murre colony. The search for the Franklin Fxpedition soon radiated from Beechey Island. It seems likely that the main navirational route to and from Beechey was alone: the south coast of Devon Island.

The cape जay revion is largely one of claciers, whf ch flow di roctly into the sea, and of, sneotacular cliffs of silurian limestone. There are no safe anchoraces, for larpe craft. such coastal indentations as appear to be safe are subject to jaming by drift ice at any time of the summer. The area is not $\because$ renerally accessible from pond Inlet in summer as thé ice breaks . un around Cors Hay and the entrance to Navy Board Inlet in late \& Jung while riclinse Sound may, not be free of ice until mid-August. I enderstand that geologists visited several points on the coast briefly durino the summer of 1953 and that a perty from the C.D. Howe linded at moud Bight by helicopter durin the summer of 1957. These are the only instances known to me of visits by white men ts the region during the summer. The area, for all practical purnoses, was comparatively unknown.

1. During the early part of the present century, Preuchen (Fifth : Thule Exnedition) and the Canadian Txpeditions headed by Bernier and Low reriorted on sections of Byilot Islind. Each expedition renorted on the zooloyy of the recion but made no mention of Cane Hay, In 1946, two U. N. biolocists, Duvall and Handley carried out some wildife lnvestigations in the Fastern Canadian Arctic. In a report to the Department concerning Arctic Murres they wrote: ". "at Cape Hay, many were observed scattered throughout the immense horde of dovekies which had been forced from their
ronkery by the noise of the esa-plone on, Aurust 28, 1946". An orritholongal exuedition snonsored by the New York Zoolocical Society and tho reticc Institute snent six weeks on Bylot Jsland Surine the summor of 1954. This expedition worked largely in the solithest onrner of the isleñ, but one of its members, Kathorine schermen ("sprinc on an Arctic Island", p. 131) roferred to a fulmar colny at-cape Hay. The status of the sea bird colony at One Hay had by now assumed a familar pattarn of confuston, which is the case mith most of the sea-bird colonies in the caradian Arctic. Neither fulimrs nor dovekies breed in the rorinn:
2. In 1955, Gorporal Ray Johnst, R, C.M. Police, formerly stationed at st. John's, Ne foundiand, was transferred to pond Inlet. Jrhison made battemt to reach Cape Hayin the summer of 1956 to clear un the matter for mo but could not ret beyond Tay pay becares of thed ice conditions. He informid me that althourh the ferion as tracoed rerularly in the winter months, no netives nöy living had ever remained there during the summer months. rost summors, however, natives succeeded in reaching the'near-by ollaston Islands where they hunted walrus. The nresence of numerous murres around the "ollaston Islands and in th t sectinn of Navy Board Inlet indicated a colony fairly near. "evemal of the older natives recalled ancient tales of the Akpa colony there and indicated on Johnson's map just where it should be.

## Jounney to Cane Hay

As mentioned in the Introduction, the trio to Cape Hay was !
made by dorteam from. Fond Inlet. ve started on June 5 \% our expedition was comprised of three teams: my assistant, Mucktar, a 22-foot canpe, a 15 h.p. outboard and his family in, one team; Ootoova with two drums of gasoline and own three months food 'surrly in another; Johnson, his helper Toonia, my equipment and I in another. The latter tepam was kept lisht pipposely as nart of our duties was to hunt seslis for the doss and notives en roulte. "e were an impressive sínt, and very nicely équippéd. Like parry I rerretted that my instructions were so explicit. Other:İse we mould have heen tempted to make a dash for the North Pole.
!e travelled on the sea-ice; moetly at nicht, as the snow Was alreedy Becinning to get soft. ...e made exceptionally good time, avera ine about 30 miles por day of 12 hours travelling. "e ran into our first rough ice at Tay Bay and reached the vicinity of the "ollaston. Islands on June 9. There we found that the floe edge was already at the entrance of Navy Board Inlet. : Unless a route could be found overland. I would be compelled to cäm at Navy Board until çonditions permitted reaching Cape Hay by canoe. Conseauently, the supplies were cached at Navy Board and Ootoova was released to retirn to Pond Inlet. Johnson decided to stay aday or two loneer to help us in an attempt to find an overland route.

The ovorland route was accomplished on June il. We left Mucktar's family bekind and travelled with empty, komatiks as large stretches of bare ground were'anticipated. Instead, the snow cover on the plateau was hard-packed añ three or four feet
thick. .'e mode a few sortios down the wrone ravines but all in dlI the trek, was quite pleasant. By accident we reached the coast of Lancaster cound at the exact point where a large murre colony began. The final trail, when it was 'laid out, took only eight hours.
"ithin the next two days, Nucktar's framily, out tents and some supplies mere brucht across. Nucktar rot the remaining sunolfes 1 ter in the month. The canoe and sasoline remained at Navy Board until navi巷ation by sea became possible.

Oir camp was set up behind an esker near the murfe cilffs after first eliminatinc a larye polar bear. Johnson assisted, with setting un camp and obtaining-radio contacts for me. He then left for Pond Inlet vía Iancaster Sound - the first time such a journey had been made at the time of the year.

Summer at Ca:e Hay
${ }^{1}$ he Cane thy recion is composed risinly of frost-shattered sediments. ev?ral seams of black ordovician sedimentaries were found and were nossibly the "coal" seams to which Low réferred. Hure mounds of rysum, some as white and of the same texture as pranulated sugar, were noted. Vegetation is extremely scanty along the coost. The temperatures were cenerally in the forties, lower at nirht, and several days oyer sixty. We did not get the high
—winds which were experienced at Pond and other areas around us. This was nosilbly due to the shelter of the surrounding high hills as:
rancaster sound was usualily quilte turbulent. Fog was frequent until late July but for some reason, possibly because of the differences in the temperatures of the sea-water and the alacier plateau, was either et'hirh or low altitudes. 'Consequently, even on foggy days we could
$\because$ work either at the base or the top of the murre cliffs.
Norine mammals, especially Narwhales and Harp seals, were nost abundant. Data were obtained on a very definite and large mirration of Harp seals westivard throuph lancaster sound. similar data were ohtained for Norwhales anc ơther marine mamals. polar hears were faifly ahundant. .ie were not bothered by them, homever, is they avoided a flappine tent and the dors tied near by We lost one yioun dor to a bear. ©ur most exciting adventure was while transoortine fourteen dors in a $2 \dot{z}$-foot canoe to Navy Board Inlet in late hurut. Because of flostinf piecas of ice we did not notice a swimmine bear until we were nearly uron it. $\Lambda$ s we swerved, the bear lunced and stripped part of the outer canvas away. I. can!t. think of anythine more unwelcome then a bear-in a $22-$ foot canoe loaded vith do s.

The bird life was most interestinp. Lemleux and $I$ were able to add a number of new snecies to the area as well as extend the breeding ranges of several, some hundreds of miles.

Mucktar yas a most capable assistant. He had earned his canoe ard outboard motor durinc the three previoús winters by trapping, foxes while they vere still at a low. His dog team, was considered to be no of the best in the area. His wife Koopah made herself renerally useful around the camp by mending the tents when necessary, maloin socks and washing clothes. Nucktar was not concerned with the lonf hours of ten required in my studies. He was most haopy when working and as spais and walrus wore easily procured most of his time was at my disposal. He soon learned to keep aocurate field notes. $\because o=t$ of the projects were joint endegvours. Much of the. success of this summer's field studies is due to him.

The murre enlony referred $t$ in this renort is not located nrocisely at ?

- Trlet. The cliffs are of silurian limestone and renerally vertical: They extend for to miles but because of deed indentations cover sli htly mone than'three lineal miles of coast. The helght varies from some 200 reet at the eastern extromity to 100 feet at the western, but the rreater nart is from 1,000 to 1,500 feet in heirht. lurres nest wherever there are suitable ledges or niches, ritht to the top. Larfe sections of the cliffs are chair-formation; a drop of several hundred feet, then several hundred feet of benched scree after which the cliffs fall off astain. The murres attain their hl hest breedine density in those reoions. The fock is britto and frost-shattered and very dancerous for climbing. nnly tie ancels could be hapny bandine there. Ermorectinc anc utilization of nostinc sites
is soon os oben water anrears nt thin the vicinity of the pretic murre coloniss in Lancaster cound or Davis strait, murfés crowd: infin it and restiessly fly back and forth. There is very cood evidence thet three areas of water in Davis strait and Lancaster cound are pormanently opeņ. Thus the arrival at the traditional nestinc cliffs in the sprine is rérulated by the floe-edge in the vicinity of those cliffs. Murres were in the arly stages of prospectincyat Care raham Moore on May 31. They were in the last stares at fape hay on June ll. In the former instance the floe-edge vas some ten miles from Care Graham Moore. On June li, it was about tivo miles from the murre cliffs at Cape Hay.

Sinultanecus with the arrival of prospecting murres in the leads and onen sea within the vicinity of the traditional nesting cliffs, pre-nuptial activities commence. It is quite likely that pairformatlon tekes plece at this time.. There is arereat deal of cimultaneous posturing, diving and underwater flights; large fiocks whatede to the air apparently without any reason or purpose. More end more frequent visitg will be made to the cliffs and the duration of stay at the cliffs rfmain lónger each day Finally, about one week before laying comnences; the birds settle in permanently. Mating was not recorded. until. the females had chosen their nesting sites red settled down to en incubating position (although the eggs vere not yet laic).

On Noy 31, 1957 , the floe-edge was still some ten miles from the murre cliffs ot Cqge Gratiam Moore. All during the day (and ni eht) $r$ smali flocks would fly in high over the lee pack, swing by the cliffs and a few birds would alight briefry. Two days, later, the flocks were more frequent, more birds alighted and their stay on the cliffs wasslonser.

At Cape Hay, on June 1l, the prospecting stare was largely over. and the selection:of nest sltes was in progress. Everyo iedge, crovicé and tiny niche of the three miles of cliffe was crovied with murres all with thefr, backs to the seta. Banks of snow undor waterfalls and in gulches, were almost obliterated by crowding murres. (Later, murres nested on the margins of such locations only to have their eggs. washed away by the spring thaw). There was ifttle flying back and forth $\therefore$ at this stape but the birds mere noisy - their constant かalls echood back from the cliffs like on immense waterfall.

For the next rour days $I$ studied the cilffs from the sea-1ce. There dja not arpear to be any significant changes in populations during this time although the birds became more restless around mic-day. There was a gradual tondency during those four days for the birds to restrict themselves to potential nesting st tes and move away from the snoz banks. (I should explain here that many dynamic chanfes, tue to frost action and the nature of the cilffs; occur annually at cane Hay. Thus, regardless of the tendency of the murres to return arnually to their former nesting sites, alarge number must. find new one each yearl.

June 15 was a.most memorable day at Cape Hay. I had finished my preliminery census of the bird cliffs. It wes our warmest day so far find the snring thaw had commenced. It was also the day that tre-kittiwakes arrived.

Three or four thcusand kittiwakes were attached to the colony on our arrival ond were in two separato localitjes on the margin of the mes.n murre colony. . At ebout o. p.m. on June 15 , I was back st camp when I realized that the usual clamour of murres at the no ar by cliffs was repleced by that of kittiwakes. I oxamined the cfiffs thrinherinocilars and could see only kittiwakes boiling over the torin olouds. I Inmediately returned to the cliffs and found hundredrof thousands of kittiwakes chin oing to the cliff faces or flutterine about near it. Less than ten thousand murres remarned and those were entrenched in gulches or deep pockets. A large mass of murres flew back and forth outside the bolling multitudes of kittiwakes. The murres flight is strong and direct while the kittiwake's is alry and erratic. The latter gerved as e most
effective barrier. At the time $I$ was not so much concerned with the possibility that $I$ was witnesping a reversal of bird species at a sea-bird colony as with the horrible thought that this might not be murre colony at all. To shorten the sad story, taree days Iater on June 17, the majority of the kittiwakes departed as suddenly as they had arrived and I could continue my mure studies. The, kittifwake nonulation was now much bidher, nearly fifty thousand pairs, but rather insignfficant compared with the hordes that had been milling around the cliffs duping the few days in question. I could view the nheromena 1 th more detachment after they had left me in neace. F snent the remainder of the summer wondering whether they wore en roite to more northern nestine cliffs or whether they were an excess nonulation with no place to breed.

## Mest buildins

Al thouph the Aratic murre lays, its egg on an exposed (itudation, it does not build a nest in the accepted sense of the * word. The Arctic, murres at Gape Hay - at least most of them oftompted to btild nest's with pebbles which were in the immediato vicinity of their nest sites. These pebbles were nicked up by the bill, brpurht down alone the breast and dropped between their feet. A fê vare noted to move rather large pleces of rock in this manner. 'n' such piece measured $3 \times 4 \times 1 \frac{1}{2}$ " but was of rather light limestone: There does not anpear to be any definite pattern in this attempted nest. building. One bird shuffled alonf for two feet picking up and dropping
, pebbles as it moved; another reached out for pebbles near it and droppe them justas ésually around its feet. A few held pebbles for some tim and then dropped them disinterestedly. Tho se observations were made
on ledges, which had small pieces of rock available. Some of the githes hed none. I have never noted a bird to fly into the nest i sitte with a pebble or attempt to gather sea-weed and vegetation as does the kittiwake, for example.

Thether such behaviour is a "throwback" to pre-historic nestbuiling or whether it is the beginning of a tendency to build nests is not important at this point. The fact remains that many eggs are prevented from rolling off the sites by a fow pebbles gathered torether and soon cemented by sediment and excrement. As suah they nffer protection to the eqg - which after all is the practical purrese of any nest.

## 3reeding population Dynamics

As will be recalled from the preceeding, the Arctic murres had settled in at Cave Hay by June li. However, on this date and for the next week or so, the total numbers occupying any specific ledre, wes some $25 \%$ hifher than it was two weeks later. There was anjther rise in the total population after the middle of Juaty as birds, obviously laying for the first time, settled in along the frinres of the colony and in the marginal sites. There was a still further increase in the total ponulation after the first week of iurust. These were ovgr and above those which had lost their eggs and ceased to replace further. They were assumed to be young birds nrospecting for the first time. One distinctive feature of their behaviour was they they would flush very easily from the tops of the cliffs and take off, in large flocks inland at a great height. The chances in the seasonal populations are shown in fig: i. which is a schematic drewinf based on sample counts of ledees during the entire
season. Thus the seasonal chances in the total populations during the summer ( Fig 1.) may be further illustrated thus:

1. The cliff attained $90 \%$ of its maximum population during midJune. This levelled off to some $80 \%$ as the prospectors left and the traditional nesters settled in.
2. On and after the first of July young birds, presumed, to be breeding for the first time and almost certainly the prospectors referred to above, returned to settle permanently on the fringes of the colony.
3. On and after August 1, the population was further increased by approximately $10 \%$. Those are assumed to be late prospectors. In any case, they did not breed and had no brood patches.
4. On and after the middle of August, the total numbers began to dining as the meme fledged and the adults went off to sea.

## Diurnal Changes in Populations

There are diurnal changes in the populations as well as seasonal. Those pres illustrated in Fig 2. The data for those statistics wore obtained from the recorded goings and comings of 50 pairs of marked birds for a continuous 24 hour period. I think it can best be explained thus:

Early in the breeding season (June 20) there was a maximum numbs of pare present during the day. Egg laying was just approaching its peak, copulation was frequent, and there was a tendency for both birds (of the pair) to remain for long periods on the ledges.

Midway in the season (July, 20) one of the pair was dally relieved for a great portion of the day (nest relief?) but returned
to the clinfs at nifht to roost.
During late August (August 18), feeding was in full swing and. the movements of the birds were somewhat erratic. It was interesting to find, Apever, that elthough some feeding was carried out all during the day, there wers.three distinct neaks of abundance. The hichest was in the morning between 10 and 11 am.; another peak of feedinf activity (when both birds.were present) was between three art six p.m. and a third but.lower one between seven and nine p.m. $\hat{i}$ : there was only a comparatively short twilight period (actually the sun at its evenine ebb shone directly on tho cliffs) the "roostinc pertod" when both adults were present on the ledges at nioht was much shorter than on Akpatok Island.

The chances 11 lustrated by Fig 2.) should be considered typical nf a "normal" day. Hed the weather been especially stormy on those Aevis, there mulz have been less movement avay from the cliffs.

Actual nonulations.
The murre cliffs at Care Hay wero extremely aayy to, census as all the nesting sites could be studied from the sea-ice (or water) or from the ton ort to eqeret extent from both. The total breoding nosulatinn ff cone fay was finally estimoted os slfohtly more than Яの, ○jo nairs. Thus with non-breeding birds, the actual ponulation on the cliffs was close to one million individuals.

The ponulation dynamics of the murre cliffs at Cape Hay occupied a considerable portion of my summer. was able to refine ry techniques consiterably. As a consequence, I shall revise my ertimates for "olstenholme downards some $30 \%$ and those for Akpatok unwards some $20 \%$

- In order to have a fairly represontative sample to determine egG mortality and renlacement, four sites were chosen each differently lonated. One tas a flat ledre, another a sloping ledre, a third a tiered ledee and the fourth a compination of all. three. Wore than 500 pairs of murres and their eggs were involved in this study. . Special consideration was given to the bias notential of human interference. liortality was high (c. $18 \%$ ) on tis account in spite of every preriautinn. Such oggs and nairs were elimineted from the data analysed. The data to follow are concerned wj. th the case histories of 400 pairs only (to keep to round numbers).

Nearly all the adults were barded. In addition most were merked with coloured rilastic bands on other distinguishing mrokers. Sketch maps wero kert showing the losation of each edg and its distinctive colour and markings. Thus we had thrie checks aminst any nossible error. All efos wone marled on the day they were lofd by bail-point nen on a strir of plastir bandaid. Deccuse the morkinr was indented, it raroly required replenishing. There was sufficient stretch in the plestic to prevent peelinf when the egE was warm. In addition the plastic is Waterproof.

Fig. 3 illustrates in percentages the egg mortality and renlacement data obtained from the case histories of the 400 pairs of murres analysed. It will be noted that ezg mortality commenced almost immediately and continued throughout. Replacements commenced ten dajs after the egp was lost (earliest) and extended over period of 21 days.


From a sample of 100 murre effs, the mortality of which was deternined, the following statistics were tabulated
Fell or more suspeted to have rallenbecause $0^{n}$ their rositson.$72 \%$
Smashed by rook falle ..... $19 \%$
Rolled into crovices ..... $8 \%$
Taken by oredators. ..... 1名

The fall of eegs was hikhest during atormy nights. possibiv adults ore mare than usually restless on such nichts. I heve actually noserved efrs in exposed situetions blown off cliffs. Such incidents ara probably rare as usually tre ede is coverad by ne of the edults. Nevertheless in jostlinf and in nest relief there are frequently brief moments when the efe is axnesed and therefore vulnerable to rollinc. There was not the continunus killirs of adults hy frlline rocks at Cape Hay in 1957 es mas roonded at Akpatok in 1954. However, there were froquent rock cledes, osnecially durin, the sprine thaw, which killed adults and sment away eges.
, Predation on erss at Cane Hay in 1957 was slisht. Foxes could easily heva procured geps especially those from the marinil sites. Al thoush old fox den ${ }^{\ddagger}$, were seon, not a single fox was neted in the immediate vicinity of the cliffs during the summer. Glaucous culls vere feirly numerous but they existed largely off the romante of marine mammals which were aburiant in ths area. An exominstion of 75 gleucous ciulles nosts indicated that murre ease were $n$ vory miror item in the food hought to thin


[^0]younf. Dhenly reedator of anyleonseauence ws the raven. The Iorpest number of rovens recnaed armun the ollifs at any one: time was seven and their occurrence vas sporadic. Other prodatory birds, Yyr Falcons, Pergerine Falcons, Rourch-leased Haviks and nowy owls were recorded occasionally. ris far as I could debermine trey all reyed exclusively on young kittiwakes. Three species of Jaesers :قere observed in the vicinity from time to time but were never noted to patrol the chiffs. Lemmings were abundant on Bylot Island durine, 1957 and; wity the merine food aveilable to the Gloucous Gulls, may account for the low predation at, そane Pay.
zonlacemont if eke

* Nore than fifty years ago, Klrkman (1912) wote that murres "lay one ece, unless robbed, when they will lay a second, and if thi: 1 E taken, even a thirdet othor authors have made similar remarks but as for as I can determine these were not backed up b acturi field rosearch. Fossib?y the first field mork concerninr rorlecenert of murres eggs was carried out by Russian biolosists. In oxneriments carried out by icr unov (1925) and Krasovski (1937) roukhly 67.3\% eges wore replaced. our sample of $4 C O$ pairs laje a total of 632 ens; a replocement of $52.5 \%$ $\therefore$ s replacement is largely a matter of egg mortality, the actual percentage of replacement is not very important. It appeared to me that it was more importent to determine replacenent potential or the ability of the adult to replace.

This is fllustrated in Fig. 4 which shows that $56 \%$ of our sample retained their original eggs, 30 laid one replacement, 11 laid two replacements and $3 \%$ did not relay. This is somewhat
at valonce with Krasovski (1937) who stated thet fernles, when in full develcment of their reproductive faculties. can lay a third efg in cgse of loss of the second but thet this is a rare phenomenon. Weven per cent is scarcely a phenomenon. Gizenko (1055) stated thet old birds beran to lay two weeks after loss of the erfe suctins Krasovski (1937). Tw interpretation of
 "e found at cape liay that replacements variod from 10 to 16 days after the oft wes lost. one bird lost its original ege, and the next and laid a third (i.e. two reolacements) within 26 days. "e acgulred sufficiont data to establish that the speed of reolecement was larsely dependent on the length of incubation of the erg lost. It seems likely that the number of replacements is reculeted by afe. It was not established that the $3 \%$ which did not, reliy were younc birds. However, most of the eggs lost by this rroup fellin the incubetion period during which they should have been rorlaced. No efg, in our cample, lost after July ll was renlaced.

Our findings at sape Hay agree falrly closely with those of Uerenckl (InG6) whe generalizes that nrimarily $50 \%$ of the eggs aro lost but as $60^{-}$of the adults are able to relay, the total is only 20\% loss. It is possible that the Russian biologists vorked with a more rerresentative sample than $I$ in that they included birds layine for the first time. I could not press my luck by trying to handla a láreer sample than I did. I espectially avoided the frince areas where very young birds are most liable to settle down for fear of desertion.

In a cearch throuch the iiter ture for information on the incubation period of murres, I obtalined the following for the Common iurre (U'ria aslge):

## Reference

Tiodmann's "Anztomy und Naturgeschichte dor Vo氏el" '(1814)
celby's "British ornithology" (1833).
gecolllivray's "History of British
Bircs" (1852)

Cwen's "Anatcmy of Vertebrates" (1866) Saxby's "Bircs of Shetland" (1874)

Yarrell's "History of British Birds" (1885) , $\quad$ 国 nearly a month

Modern liternture gives thirty days as the incubation period of the Common purre without fupther comment. Nevertheless, Evans . (1ع०1) hatched two Common Murre egas in an incubator one egg reçuired zo days to hatch and the other 33 days. A Common Murre's ece placed urcer a hen hatched on the 3lst day. According to Heinroth (1922) incubation is shortened only from six to twelyes hours in an incubetor.

Althouch the incubation for the Arctic kurre is also sometimes stated to be 30 days, Krasovski (1937) determined that it was 35 days at Novaya Zemlya.

The case histories of 100 marked eggs at Cape Hay indicated that the incubation period, as determined from the time the egg wos first laid to the time the chick emerfed completely, varied somewhat (Fi\&. 5) . Thus ten per cent of the chicks emigred completely 32 deys after the eqps were laid; $30 \%$ emericed 33 days later
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Pic. 5. Incubation period of 100 Arctic murre eggs, Cape Hay, 1957.
and sod emerged 34 days later.
$\because$ The murres arneries/ to lay in the quiet hours of the early morning. The actual patching was either observed or determined within an hour or so. There should not be more than li hours of error in those calculations. Some chicks emerged several hours after first pecking through the shell; others required nearly two days. If the membrane lining of the egg dried out reasonably quickly it. appeared to become tough. In a few instances the adult was noted to neck nearly all the outer covering of the shell away and thus facilitate the emergence of the chick. Thus the variation may be largely due to micro-climatic conditions at the nest site.

## Testing phenology

Twelve. sites wore marked off to study nesting. phenology as a supplement to the main study area. $\because e$ commenced to study those particuler sites closely after July 24 which date was the first lietchinc on the cliffs. It also haprened to be the day after the lest egg mrs recorded. At each site 100 plus egress were marked. Those which fell or were smashed by hum interference were elminated from th . data. Although the study termingter on Aurcust 20 , data for several additional days were obtained from pipped eggs ardor the condition of the nestlings on that day.

Tor the first week those sites were checked daily. Later it was determined that checks on alternate days provided sufficiently accurate information All final statistics have been derived from the, case Kistories of 100 eggs at each site.

Fig. 6 illustrates the continuous mortality as well. as the hating and fledging platforms at one of those sites\% It, will be

 lorfely boname erormotality veries ot oach:
mole 1 ummerizes the relevant data obtrined at those sitese It mill he 今een hrit on arkrerate nf 67. 6 of of the efrs in situ an July 24 eventuilly hatched while the mortality of nestlings $\because \because 5$ 11.5".
"ites $\because$ enr L (see Table l) were exrerimential. In the case of $\because$; the -1 e $\because$ improved by removinf a few rocks and placing an
 ledre wris cleareden debris and the utermost rim lined with rocks. he crester a tepush. It is jnterestine to hoee that survival of hoth er $r$ and nestinnes at those two sites wns movt favourable.

Mnstinr motali +
Noctinf montality in the arferate vas 11.5 (Table 1). 4.Ithoim the noziting is 3uscentible to mortalfty (disease, falls, predatijn stc.) suninc lts entire stay on the cliffs, we found tie Ju semplo no 100 the nesviest moritality was betiven atet and End day; t!. f fter the sixth day motality was light. However, そrinined rrfyinvsly we did not ericounter any serinus predation
 fills or ocourbed occesionally elserhere. The mortality of the 100 noctlinge in nur semple was due to the following causes:
$\square x p o$ sure ..... $38 \%($ sic.
Folling into crecks. ..... $12 \%$
Falinf off teheestor.prsaumed. ..... $11 \%$
Unlmown ..... $9 \%$

Nontalityor the gobve nestling on arl causos, broleon into ace-srouns snd a ain expressed in per centames

> Theo daý $24 \%$

Four tn $51 x$ datgs. . . . . . . . . . . . . . . . . . . . . . . . . . . . $25 \%$
Sevon तavs unwards..................................... $7 \%$
Thoorotically, the mortality at to ay so shuld be hirher than thot, in the three day rour. Nup cample was obyously too small to rov this. So at its bert, it mirht morely indinato the montalyty in tho low-ase rouns and the hith survival after six days onvaras. lomally the nestlinf from six days onwards has reat vitality nnd has develnned both tho tendency and abllity to sline to a neqearinis position. Ur to three or four daye of are, the nestilnc if knocked over on its back is just as liablo. to roll tomaris the cliff edge as tomards safety.

Tsueniski (1J56) recorded tho sibuses of nosting mortality at Novaya Zanlya whish \#o did not observe. He statied that 6 . 6 of murre ne-tlines' in one colony and 9. $6 \%$ in arother in lons starved: At one of the coloniss lo died from inflammation (sic):

Uspenski also stated that the loss of nectilngs at Novaya Zemlya in lofe as relatively hich. It was hi her than the ere los. He attributed the hioh mortality (68. $\% \%$ to cold weather. The mortality was hirpest for that, cause up to 8-9 days after which the chicks had reached a state of thermo regulation. Low ntemperetures weme also a, secondary cause as the nestings moved around morg and fell of the ledges. Mortality from this cause as hishest in small colonies.

Kaftannosk (, es at temr wed to clone tho nological ainicicunco ofth onlon ap nemíni or the murres (uria adeo and U. lomvia) $\left\{\begin{array}{c}\text { n the Novaya Jemlya colonies by calculating the }\end{array}\right.$ nercentare in the destruction of eass shel yount in the defferent bunos of confmiss. In 'vory dense nlots the degth rate did not exceed 7 ner osnt, while nn snarsely occuried plots it attained
 foctor uas tho noodatory activity of gulls (Larus arsentatus and L. moirnus) (mullswere not a serinus problem oither at Funk ysund or Gane Hoy.

1ednin:


The fledrat woes not heve its primarjos fully doveloped cr: loves the ledio flying larcely on its secondaries. As it Is inmaxhlon artoirod flloht, it flops in to the sea at a domany ontle ค $45^{\circ}$.

A Cumple of lop merked nestings whfch successfully fledged shnoed that the fledrunt period at cane Hay ronied from 18 to 25 lag th the magrety $(60 \%$ ) $n$ the nostlinge fledeinf at 19 days nare (aty 7) . thotr wishts ranor from 175 to 215 proms.
wotlines modicurros fleded at lkpotok in 1954 botwoen
 fledes nt olvtonhoime in 1955 betwon 12 nd 25 days of age on hin jetruee 200 and 225 grams. Kartanovski jsteted that they fledeed at Novaya Zemlya (in 1937?) betweon 20 and 24 days, of age veishins 250 rrams.

The fore foine suggest a great variation in fledgling waights $a^{t}$ different onlorifes. This could be largely due to food. NJ. fingines are the nutic cod (Bjreogadus) is the rrimary food of
the nestlln Arctic Auree ( cavelin or ammotyos of the Common Vurre): it olstenbolme and oane Hay there nas a protiosslyoly hirher intake of amphinods. Also the fledrilne wolrhts, on the averare, were lower.

Provions studies (Akpatok) have onom that:Aretic hurre nestlins aro not sufficiently thermo revulated to tolerate arctic waters until they are more than two weeks of age. Exactly when the tolerence is acquired has not been determined. Presumably it mould vary comemhat with the individuel and may be the deciding factor which precinitates or retards flederinco
qole of adults at fledrinc

Exnariments at Aknatak Island in 1954 fndicated that any J. available adult, not necessarily the paront, took possession of a fledplinz once it struck the water. This method of adontion :\%as studied further at Folstenholme In 1955 and in no instance could it he detnrmined that an actual parent obtained rossession of the nestlin arton it had fledred. (There surely must be instances when this 1s so). (tt Cane Hay in 1057 we recordod that merked adults returned to the nestinr sites after the inesting had fledged and remined there more or less continunusly for as long as six days. young is nat unusual. I have obserrait in Elder Ducks, Snow Geese, Arctic Terrns and Sabine Gulls to name a few arctic species. The adontion of a fledgling Arctic Murre by an adult other than its parent anpears to be a tradition rather then an unusual event. The cledgiing is not independentias soon as it reaches the sea and will not become so for another weak at lesst.
－
Tha setorn at the rurro clifé inta matratins such a
 ？n：un in the contei ne mossibly 10,000 mlline adults．At Sape Ony in las7 rarrly $60 \%$ of the adults are withor youne when the rist in round errived．Thoso unattichod cirds vere in the unge＂ajnity at the base of the fliffost the time．

$\therefore$－Lule 11 tn Tulv， 33
－ample af an netrs nrobued $62 z$ ages．tr which 324 were10st
Thevernve，nis nratinod nor nitr． ..... 1.58
$\therefore$ An，？nった of gars ..... 51.26
$\therefore$ T．ll 24 to nurust 20
＊＂emple ne 1800 errs rendiced ale nolitres
Therefnre，los：nf nestlinfs ..... $11.50 \%$
$\therefore$ İ～ッロース

$: \quad .71$ less $32.33 \%$（3）or ． 47： .17 less lJ．50\％（C）or ． 41
： 11 fledglings ner $1 C 0$ pairs


Tox track verse noted all alone our route on the sea from Pond Init, to Cere Hay. Several foxes were seen at the base of the murre cifyers at Cape Hay in June. They were feeding there apnarentlo on dead netting Kittiwakes which may have blown unto the ice during- the winter. "e did not record a single fox in the immediate vicinity of the murre cliffs during the summer althourh old dens were found in several places especially in gypsum deposits.

We say three or four foxes in the facial valleys en route to bond Inlet in late trust. Lemmings were abundant but as those were the only fox observations I had the immersion that foxes were
 on Blot island are stay and would he ouserve rarely in any case. Pad Fox (yulnes fulva) --

I understand that a Red Fox was tran nod at, Arctic may during tho \#inter ant several at Ioloolik fertior south. Fe e aw larne fox tracks on the sea ice near Pay av on June 8 which the natives assured me was the lar e colt en fox. If so, it mil cont constitute a most northerly mooord.
Vessel ('ustele eminem).:
Torieux caught several in trons on southwest Bylot Island but me did not, see it for the sum er.

Arctic Fire (r,epus ercticus).-
We saw the occasional hare hero and there as we travelled along the south coast of Rylot. We did not see this species in the Cape Hay resin but drownings near our camp and in the lee of every boulder on the under plateau suggested that it frequented the reaction in the winter at least.

Caribou ( ancifor arcticus).-


Miller (1954) reports that the last ceribou were killed off on bylot Inland in 1743. In any case, the natives claim that there are no caribou on the island at the present time. Lemieux did not ser any on the blains in southwest "ylot during the sumner. Johnson dit not sen any during his trip salon" the north coast in June. From my nresent knowledm of the island I would consider it remarkable then caribou child remain on pylnt $I$ spend duran: central rapt of the island is racier or nd field, tho high rides in the 10 virus are. wind suint and relotivefybore or veretalon. The lacier valleys are filled with snow in titer. . There is an old account, althourh I cannot place rit just now, concerning large numbers of caribou doming while crossing the ice at Canada Point. "hue the ryle Is lond caribou may have crossed from the mainland turin" the early spring and returned during the early winter. We found the remnants of very old.antlers near Cane Hay. The missionary at Pond Inlet tola me that antlers can still be round on the glaciers some ten miles inland from the southeast coast. The last caribou yore kilted on runt Island on the northeast enact (M1 lex, 1954); a ne ion mot cord only he react ed under present climatic conditions $\because$ crossing laciens or travelling sea-ice. It is doubtful if the Geo: boy rain onuld be reached by caribou unless they travelled alone the coast from Canada Point.

- "alrus (ntonenus rosmarus)


Deveriol and Freuchen (1935) say: "Lancaster Sound has many walruses. Usually they co into this strait keeping to the north side", and " t wollaston Island a little west of Navy Board Inlet

In tho be inrine of hriil we sam valrus in the water movine eastwards". From this excellent account we learn that walrus most likely reman in the open water in Lancaster Sound during the winter. At least Dererbol and Freuchen record them at Cane Crawford on April 30,1924 . On the other hand, Ellis $(195 T)$, states that valrus anear at Putton Eoint in April and vay. Preuchon also prote: "ns a enanol rule the walrus dnes not sojurn in the vicinity of Ponds Inlet; in spring, however, when the thaw sets in, they are constantiy movin: southwards, and the remerlyable feature about them is that they are then always hunry. Thev canrot cet mussels there but live exclusively on flesh, and it sometimes haprens that when Eskimos aro rlensinf narwhales durin the preat slaurhter in the Sprin: a worus will leap up on the ice: From a lonc distance they singll the meet ond the blood, and rasin with hunger, they will flop alonc to meat and blubser and eat them, even if there are peonle standinc three steps away". The same authors noted that on July 1 , 1924, "two welruses pasced qufton Point on Bylot Islend coine south and on Au-ust, 8, a very thin bulf was caurht there. Two others in. company ath it "disapreared to the south".

Prom the roremon one infers that walrus if they winter in Lancaster Sqund have limited food supplies and move out as soon as
 ice conditions nermit. Nevertheless, Eskimos from the Pond Inlet reaion traditionally hunt walrus in the sumer at the mollaston Islands. Miller (1955) stated "One of the northernmost breeding rrounds of the walrus is the Wollaston Islands". Eliss (1957) points out that the sides of the Nollaston Islands are too steep for walrus to haul out on; with which $I$ agree.

We san sikyelrus of Button Point on June l. . $\%$ de did not observe any at Cape vay putil June 27 when we sav e herd of nine moving
westrand at the ne-sde. Por the next ten days only the occasional :olrus wes soon datly off Cape Fay. On July 8 a herd of $50-60$ animals were observed travellin westward towards Navy Board Inlet.
... pasced by the \%ollaston Islands on July 15 and noted 15 mirue on en ioe shelf alon the inrermost island. Lrater I examined the coastine on the two inner 1 slands and most of the outer. There wå no low-lyin shelf̆ or rocks anymere alon the entire coast. Whevtan told me that they hunted wolrus in tre shallow waters betwen frio tion inren inlonds. At that noint, there was a low sand bar on which walr:נs en ld conesivably heul out - if they use sand bars.
 vicinity aftor July 15 only the occasionel lalrus was seen end those int the vicinity of the islands but on floatin ice pans. All durir the sumner, up until we left Lancaster Sound on iu ust 20 , $\%$ sc.. balrus; sometimes sin ly and sometimes in two's or threes, nover more. Mucktar shot tyo durin the summer. They :قere both ret er smallish males.

Dineed ceal (phoca hisoida).-
This is the common seal of the rorjon and it appars to be sedentary. The bulk of the food of the 度skimos and treir dogs is comprised of thats snecies. The skins are used for Famik and= Dther articles of clothing. The skin of the immature (silver Jar) is purchased by the Hudson's Bay Company.
"e recorded as many as 40 sunnin themselves alons, a liead egrly in the snring. More frequently they were encountered solitary or in stall rouns.

This sool keons his oreathing holes open during the winter.


Oe hunted them on rolite to Cane Hay mainly at- those gites. They seem to be the vreferred food of the roler bear. occasionally We found a Rinced ceal on the ice away from the lead ne its hole. "'e assumed thiat it micht have come u" on the jee by a crack to sun itself. The crack then closed and, its retreat was cut off. We

- did not ohsorve this snecies movinc in herds durin the summer as dad the Harn real.

Bearded seal (Trimnathus barbatus).-
This species is not especially common in the pond Inlet rerion, norhens because they are hunted extensively there and may also he sedentary to a reat extent. It is not so nonular for food as the ninged ceal but is used for doe food at all times. The tough hide is used for rones and for the soles of kamik. Conseguently, each. Eskimo remires at least tivo Bearded Seals annually.
"'e foun the porded seal rather common in the cape Hay re ion Derhans beceuse it hed never been hunted extensively there. They were usuaily rocnrode sincly. vucktar shot four durinc the summer; the hides of winch were made into karik soles and ropes. The food ras lrurely erimen to the dors. I noted an immense quantity of intestincl flures in all four seals. ucktar and his wife were fond of the lower intestines; the flukes (most of them) were squeezed out and the intestines were braided and then boiled.

Hooded Seal (Cystophora cristata).-
Miller (1954) states that this species was rare at pond Inlet and एclipse Sound: "No more than three have been seen in a year". "e saw it on about a dozen occasions at Cape Hay., Dererool and Preuchel (1935) obsorved them in Navy Board Jnlet and Lancaster Sound. They considered it one of the commonest seals in Lancaster
round.

Eariour ceal (Fhoca vitulina) -
"either !'iller (1954) nor Pllis (1957) mention this spocies for 3ylot. Tsland. Derarbol and Frouchen (1935) recorded a single incividual af rond. Inlet in 192 कnd ronored on horsay that they Fore fairly numoroige in lilne Inlet. I heard the same story at . nond Tnlot; thet [nrbjur eeals were sòmotimes shot in !ilne Inlot and occacirnolly nt the mouth of calmon Piver near pond Inlet. "e se: a sin lo animi nn four nccasions at the minth of a glacial rivor noor gnne Fiay. Anderson (1946)"includes "llesmere Island within the rones this suecies.

Harp seal (Fhoca roenlendica).-
riller (1954) stated thet larp ceals are found in Navy 3oard Inlet at the enc of July or early in Ausust during an annual mi-ration into Tay ound, He also stied thet they remained in in Tay cound until about ceptember 25 and moved out acain into the open sea as ice befan to form. Moreover, lillor's conments ne: besod on en uiry rether than actual obsorvations: Flils (1955) wrete thet the Horp eal had not been seen in 1255 et pond Inlet ur to must 5 .

Prouchen (1935) recorded Harp sals movins north in large numbers nt, rutton roint in the beginninल of July. He also wrote: "They nly ro into celfnse cound on their way north, and often they ro rether a lon way into Nilne Inlet, but, turn and go through Mevy Board Inlet". Freuchen omitted to mention that the iceln Tclipse round loes not normally break up until Ausust. Miller (2954)
"ives $\left\{\begin{array}{l}\text { in }\end{array}\right.$
 consecutive yeers of. Boarded reals and larwhales in telfose sound compared with the dotes of break un. Those data surrest that Harp feals could not normally be exnected to penetrate Navy Board from "clipse sound until late July ot legst.

The summerine ran e of the Harp eals in the Candan fretic is imnerfectly known. They miprate siuth alon: the Labrador coost from necember ontiards and whelp on the nack-ice off the northeast coast.nf Nemroundand in late pebruary and early parch. They, aro a ain racorded movine northwards alonf the Labrador coast in iay "e sav lnmense numbers, micrating westward alon" Cape-Hay in late June and all throurhout July.

The herds nassine along rape Hey varied in size from 10 or 12 individuals to over ne hundred. There was some daily and sonsonal variation in herd-size. For instance, the herds were smallest. in the mornine, lareest in the evenine and lerpest of all (in total) cilrin lote July. A characteristic feoture of theirmicration was "toris they moned alon- the surface they hurled themselves nearly out of the vater. This feature is described by Freuchen (1935) but I am unable to rire in the literature that this surface micration is carried out lercely while they are on their backs.
:".e sew our first Harp Seals miareting on June 26. An estimated 5,000 seals vassed westward on that date. By then, most of the ice hed gone. The seals dipped in towards a small deep bay west of the Capo Hay an then passed along the murre cliffs about one half mile off-shore. As they dived and surfaced at almost the exact snots alon this route, their numbers were easily tabulated. They remained on the gurface from five to ten honutes after each dive.
"e wrie ls miruto counts on the hour while the seals were passing throurh. Those deta are sh wn in Fief. 1. Mucktar was very good at this sort of thing. On several occasions lucktar and $I$ made serarate counts too miles apart and obtained identical results. Is the tarulations could be made either from the murre cliffs or from our camn fite ovorlookin the Sound, the final results are considered to be rossonably accurate.

As will be seen from 'rif. Q; thero were four distinct waves if mirretinn moh lostinn from three th eleven days. The first Heve cocurred murin a neriod when we also recorded Reluea and - Irus for the first tirle. The neak numbers if Narwhales coincided with the noak numbers of Herp seals. Consequently, there may be some cor-relstion between the movements of Harp seals through Iancaster cound sme that of other marin'e mamels, ospecially Mar:ahales (at:-2).

The riak Haro seal migration at Cö Hay occurred in la te July when ror two days we recorded 19,000 moving westward daily. rin those deys there was a constent strean of herds spaced about half mile apart, I was slad that we vere makinreprecise counts as the imrressinn wos meny more seals than actually occurred.,
"e \#ere unsble to determine whether or not the mirration was on a broad fronton if it were restricted to the coast. In any case, there cin he no assumption that the mirration is restricted to the ssuth coest of Lancaster Sound. Consequentiy, the total mirration throurh IEncaster sound micht be an impressive one.

Lancaster cound is the only open water route to the Eastern Canedian Arctic out of Davis Strait in June and July. Therefore
the mirratory marine mamials must use this route to reach the main watervays. Lancaster found theñ, is a Northyest Passace in more ways than ons.

The Harn seal herds nassine vestwards from Cane Hay dippod slimatly into Moard Tnlet, cut across north of the wollaston Tslands and continued vestwards. "e did not.rocord a single instance of an sastward movement in Lancaster found up to August 20. - But while we were returning on Aurust 22, large schools of Narwhales came into Navy Board Inlet west of the \%ollaston Islands accompanied by therds of Herp reals. on the 23rd we recorded large herds of $\sim$ Herp seals movin north in the vicinity of Tay Bay (east side of Navy Board) and out towards Lancaster Sound. It mirht be that the southward migration had already becun ard on their return from the waterways west of Lancaster sound they "dfped" even more deeply into Navy Board Inlet.

I was diven the impression at Navy Board Inlet that Harp Seals mierated throurh the conter of aclipse sound.: This was not backed un by actual observations and I exnect it is an assumption based on their occurrence at both Tay Bay and Button Foint, As they hug the coast in their mirration elsewhere in the revion, there seemed to be no explanation for their failure to do so in Eclipse ound; that is, if they actually used this route to any extent.

Delura ( Delphineptsrus leucas).-
A school of 30 or 40 at the floe-edze on June 26 at Cane Hay and a single one on July 4 were our total observations. All were movine westward.


Prarinale (aroron onoceros).-
The firet maroliales seen at Cone may mere or July 3. By this date, the lee had cone out from care Hay and fron all the promotorias westwand towards Mavy Board Inlet. The lfloe-odre was minly confined to the deeper coastel incentations althourh loose,

on Tuly 3 ลr? on tho followine day small schools of Narwhales continuously nessed :testward. The schools were smál, rarely rione then ten eninils and usually three or four. lales alth tusks \%ene rocent os ore females vith the younc. .e reckoned that at least 1,500 Mermhales had passed westward on these two days.

To others ere seen until July 10 vhen from 7 a.m. to 4 n.m., they passed restward at the rate of 300 per hour. A ain the schools were amell, mostly family schools, but, occasionally as many as ten torether. After 4 p.m., the freauency slowed down. to about 50 per hour. ve calculated 2,500 for that day.

A third wave passed westward on July 19 from ll a.m. to . 5 n.m. The herds mere closer, tomether ard larfer. cur calculation サes 2,000.
on Au-uet 20, Narmhales began to enter Navy Do rḍ Inlet via the west side from tancester cound. ©n the 22nd Hucktar went across with his canoe and outboard and drove nine ashore at a ñotive camp. luckter told me that there were at least a thousand Narwhales in the Inlet.

Just before Aucust 20 we had a lone stretgh of northeastenly winds. I had the impregsion that immense numbers of amphipods were brucht into lavy Board by the, surface currents. For the next few
movs, $\because$ tohed rnoctocular numbers of vittivakes, plimars and Gabine rulls feedine in Navy 3oerd Inlet on emphipods.

Narmeles तf: not occur at Pond Inlet until Aurust 25, olthor h they hac ween prosent at rutton point in early may. It is a remarkabe fact that mainly females only occur at pond Inlet. Killer hale ( Fromus onç.).-

I did not personally see this species but mucktar reported a schonl in llavy poard. Inlet on numust 22.
"reenland "hsle (relaena mysticetus)
I kert a somial watch for this srigeies but int Cape Hay sa\% only a noc nf three rather close in-chore on July 4. I saw non other on Murust in Pavis Streit.
I- VT:

- Moifjest smi tholominal account from uvlot I sland was made by Feter reuchen (2937) on the Fifth Thule pxpedition. Fresehen sment from Varch 25 to Au ust 3 , 1204 , in the vicinity of Fonf Trlet, but also visited mution roint and sevaral other localities on rylot Island. D. V. Dllis (1956) recorded a number 2f. bird observation, mainly at uutton Point', fn the snrine of 1955. The late Tr. Tosselyn van Tyne et al snent six weeks durino the sorine nnct early summer of 1954 on the southrost constrf Bylot Tsland. This $\Delta x$ ed tion, smonsored by the wey vork toolornal cociety anc the fretic Institute of Morth America, was larcely ornitholorical in scope but so fer. hes nublishod very. lit.tle concernine itt fincincs. Katherine coherman, a member of the exneditinn, loter mrote a verv intorestine bock, "eprinc on an Arctic trland" hased on their visit. come of tho bird observitions mate by the xnedition are wentioned by frs. scherman.
rnnis tamioux nd (es remed in moronorts) suent the srrire ond sumor of 1957 on wylot'tsiard, manly in different areas. Tho followine account or the avifauna no the resion includes norfinert teta sumbied to me by Lemieux.

Common Loon (ravia inmer).-
Preuchen (1937) recorded this species fairly common off pond Tnlet in ló?4, and on Juiy 26, 1924, wrote: "The Great lorthorn Divers so nov ir the water at Pond Inlet, each family with two youns". snyder (1956) includes Bylot Tsland within the breedinc ranse of the commontoon. :e did not, record it during 1957 nor did
 for Enct Tn? et.

Faofic Lonn (ravia arctica).-
Greuchen ( $10: 5$ ) renortod this sbeniss from rilne Tnlet and


Ded-thmetad Tomn (Cavia stellata) - rouchen (10,i) renarded the rothrnted toon as early as Tore ?, loze, at "inn Tnlet. Cemieux first rocorded it in sputh"estern nolnt 'rland on Tune l4. Lemienx reenriod e nest of two abon only o, ond another netwn eras on Julv 10. I found a nest in tun o... in thy ?opo foy moinn on July lo. nhe entiest n mones wrahint note ans in Iovy Boarg Tnlet on July 17 . Ded-
 ant rubronce in the Gane hay rowin whore not more then three netre nosted. lodelines weme rocorded in Nove 3ord Tnlet as ghulv as an:ut, la, althonh some had not left roeir, natal pond in

 (1) 11.

Thmar (uzmpias lucialis).-
口llis (lose) reoorded pulmers nt the rloe-edee near Button, Fnint on "nvile, 1e55. We recorded them at the same locality on ray 2e. pulmars uere reonrded in Fclinse some and Navy mord Trlot as soon as théres moved ort. They areraute abundant in Lamisoter : ounc all summer espoislly off cone fay f few birds


 rev and baflard nay". The more recent mans nore those lonalities


 nont, rom the ompraltr Tnlot colong, is lomelrely that, the frlmer fram trav sony at coutt's Tript moinl verome to rane Hay rimin tine numor. lintives inrommed me thot thore is a fulmar
 lnestot on the mane ars the"bastiane". schurman (1956) erroneously stotod that there was a fulmar colony ot Cone Hay.

Janola socec (monty canadensis)
Lerieux sow n sincle Sansta roose iri assoctation with onow Ceese in southesestrm 5ylot jeland. "ith reater snow reese as comn=rison for oiza, Lemipux considored it ásamnle, of g.c.
 uanncle ヶnive (sranta leucopsis):-

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## Jinrod vlover (horacriushiaticula histicule)

e f!nat rean"das this Turopan rice on June 8 then a rpoun. of three wein roted displayinm on, s shinoly beach ot caneda foint. ©n June 9 , a sinle bird ás observed in a similar location, forty miles furtier wsit. Jt was comparatively rare in the northwest relion of $B y$ yot Tslend. "T could not determine that morie than three pairs nested there. Lemieux located the territories of three or four paire in routhwestern pylot $T s l e n d ;$ found a nest of three eges on.

June 28 and youngabout one week old on July 29. I found 1t'all along the coast in late August with a high total of 32 in one. locality on August 24.

Golcien Plover (Pluvialis dominica).-
Lemieux recorded the arrival of Golden Plovers on June 14 : He found it more abundant than the Black-bellied on the low-iying plains of southwestern Bylot Island. I did not record it at all in northwestern Bylot Island. My firsit observation was a single bird in Tay Bay on August 21. For the next few days, I saw the occasional small family group along the coast eastwards but by this time most of them had probably departed sauthwards.

Black-bellied Plover (Squatarola squatarola) :-
Lemieux recorded the arrival of this species in southwestern Bylot Island on June 15. It appeared to be more common generally on Bylot Island thanthe Golden Plover. About fifteen pairs were breeding in the northwestern region where the Golden-Plover was not observed at all. Black-bollied Plovers were rare" in the interior of the island after the middle of July, although the odd individual was recorded there up, to August 26. Most had probably left the island by the third week in August.

Turnstone (Arenaria inteppres).-
Ellis (1956) recorded two birds at Button Point and one at the Aktineq River during June, 1955. I saw a single adult near Cape Hay on July 15, and a single juvenile in the same locality August 8-10." Several small flocks of juveniles 解e noted along the coast on August 23. No specimens were collected. It is likely, however, that those should be referred to the European race A. 1 . Interpre

Knot (Calidnis canutus).-
I saw a group of four near Canada Point on June 7. On the same day Lemieux also saw four, fifty miles farther east. A single bird was observed on the platedu near Cape Hay on June 14 and was located acain on the following day. There were no further observations of this species and the exact race is unknown.

Purple Sandpiper (Erolia maritima).-
The only published record of the occurrence of Purple Sandpipers on Bylot Island was by Freuchen (1937) under the date of July 5, 1924: "One pair of Sandpipers, presumably Tringa maritima on the island." I saw a single bird near the Aktineq River on June 5, which was nearly a week before any other shorebirds were seen. Purple Sandpipers were observed in pairs and triplets near our camp site on the northwest coast, in full breeding display on June 9. Later, it was determined that this spedies was a fairly common breeding bird in the northwestern region. Both adults and juveniles, were still present along the coast in late August and several flocks were recorded-at Pond Inlet on August 29.

Pectoral Sandpiper (Erolia melanotos).-
Ellis (1956) recorded a pair shot by an Eskimo on June 4, 1955, at Button Point. Lemieux believed he might have seen it on one or two occasions during the summer in southwesterh Bylot Island.. I did not record it at all.

White-rumped Sandpiper (Erolia fuscicollis).-
Recorded by Lemieux in southwestern Bylot Island on June 10, where it was a fairly common nesting species. I did not record the first
arrivals in the northwestern region but it was fairly well distributed there in the summer also.

## Baird's` Sandpiper (Erolia bairdii):-

This is an extremely common breeding sandpiper on Bylot Island; possibly the most common land nesting species. I first saw it on June 10 in the northwestern region. Downy young were recorded from July 15 to August 16. I. suspect that the extended breeding period was due more to snow conditions than to second nestings. A great deal of its eventual nesting habitat in the northwestern region was not free from snow until early July. This species was still present in hundreds along the cosst in late August. On one extensive mud flat on August $24 ;$ I estimated approximately 900 Baird's Sandpipers feeding within an area of two acres.

Sanderling (Crocethia alba).-
Freuchen (1937) recorded Sanderlings at Pond Inlet on July 28, 1924. Lemieux recorded two in southwestern Bylot on June 11 but could not confirm breeding in his locality. At least two pairs, possibly three, bred on a frost shattered strip of coast on the Navy Board Inlet side of the northwestern region. A female with a well developed brood patch was collected there on July 20.

## Red Phalarope (Pahlaropus fulicarius)

Lemieux recorded the first arrivals in southwestern Bylot Island on June 21. On July 25, and for the next several days, he recorded large flocks of presumably non-breeding birds, perhaps females. I did not record it at all in the northwestern regions. In late Aupust, phalaropes were seen in small flocks all along
the coast from Canada Point to Pond Inlet in late August.

Pomarine Jaeger (Stercorarius pomarinus).-
Lemieux recorded at least three pairs with territory some five miles inland in southwestern plains.

Parasitic Jaeger (Stercorarius parasiticus).-
This soecies was well distributed over all suitable localities on Bylot Island. It was more abundant than the Long-tailed in the northwestern region; something like three to one. Nests or young were recorded in both regions.

Long-tailed Jaeger (Stercorarius longicaudus).
While travelling along Eclipse Sound on June 6 the following groups of Long-tailed Jaegers were noted, either flying across the Sound or resting on the ice; (4), (1), (19), (1), (11), (4). Small. flocks were also recorided for the northwestern regions on June 9. At least four territories were recorded for the northwestern section during the summer, but only one nest was proved. Lemieux recorded seven nests, all of two eggs, in southwestern region. I noted that one young bird was just barely able to fly at Tay Bay on August 22, although flying young had been observed ten days previously.

Glaucous Gull (Larus hyperboreus).-
Glaucous Gulls were present at the floe-edge at Button Point on May 30. Corporal Ray Johnson confirmed that they bred in the murre cliffs at Cape Graham Moore, and reported another colony at Cape Bathurst. These gulls nested singly or in small colonies along the coast from Tay Bay west to Cape Hay and on the Nollaston Islands. No more than half a dozen pairs actually nested on the immense murre
cliffs at Cape Hay, although there were small colonies on its fringes. Glaucous Gulls; rarely patrolled the sea-bird cliffs at Cape Hay and an examination of 75 nests indicated that murre eggs or nestlings were minor items of the food brought to the young gulls. Marine mammals were abundant in the region, and it was apparent that the gulls depended on and obtained sufficient food from the remains of marine mammals.

Thayer's.Herring Gull (Larus argentatus thayeri).-
Singles, pairs or groups of three were recorded at Button Point on May 30 to Cape Hay on June 11. At this time both Eclipse Sound and Navy Board Inlet were still frozen over. The gulls would be invariably disturbed from a polar bear's kill or at the vicinity of a seal hole. A pair nested among some Kittiwakes at Cape Hay and hatched four young. The young had not left the nest by August 20. , In August 21, I located a small colony of 26 pairs in Tay Bay. Very few of the young were on the wing on this date. Nearby was a Glaucous Gull colony and the Herring Gulls never permitted them to encroach on their nesting cliffs. Similar behaviour was noted at Cape Hay, where both adults of the pair drove any prowling Glaucous Gull away from the immediate vicinity of their nest.

The iris of Tahyer's Herring Gulj is brown; a warmer brown than I had suspected from its description in the literature. Snyder (1956) states that the feet are flesh coloured. I would describe them as rich pink. In the soft light of evening and from below, the legs often appeared intensely red.

Ivory Gull ( Pagophila oburnea).-
Ellis (1956) stated that Ivory Gulls appeared occasionally at the floe-edge near Button Polnt in May and June. The only observation

I have is a sincle adult near Cape Hay on August 19. It was feeding on the remnants of a walrus left on the shore.

Kittiwake ( Rissa tridactyla)--
The count of occupied nest sites at Cape Graham Moore on May 30 was 2,100 . The next pay it was higher, approximately 3,000 . Elifs (1956) recorded approximately 2,000 birds on the same cliffs on June 6, 1955 and only 1,000 two days later. It is apparent that the numbers on the nesting cliffs early in the season 4 s ) very variable. "

An estimate on June 12 indicated that there were slightly less than 3,000 occupied sites at Cape Hay on that date. However, on June 15, Kittiwakes arrived at those cliffs by ten's of thousands, driving all the murres, except about tien thousand which were deeply intrenched in a couple of gullies, from the cliffs. The Kittiwake's flisht is lirht and airy while the murre's is direct and strong. Consequently the murres could not get through the barrier of milling Kittiwakes and remained for the most part fiying back and forth some distance from the cliffs. It was impossible to estimate the numbers of the Kittiwakes present at this time. My guess is at least 300,000 . On the 17 th the majority of Kittiwakes left as unexpectediy as they had arrived and the murres returned to their ledges. A later survey indicated that approximately 50,000 pairs nested at Cape Hay in 1957.

Although I could only give casual and often interrupted attention to the kittiwakes, $I$ obtained evidence that the first arrivals may be all males. Pair formation and mating takes place at the nest site with solicitation by the female. For instance, a female may solicit several males before being finally accepted.

After a rainy period on June 19, and for the next three days, Kittiwakes congrogated in hundreds on the slopes near our camp, gathering large gobs of turf. This was largely a social activity. Some of them flew directly back to the cliffs with this nesting material, others settled down for a while on freshwater lakes on the 1 ce and commenced to bathe. Few Kittiwakes passing by could resist joining a group of others, whether they were resting on an 1ceberg, gathering nest material or merely bathing.

The first egg was recorded on June 20. Young were in all stages of growth on August 20. I had'not noticed any first year bird on the wing up to that date. Very few second year birds were observed in the vicinity of the nesting cliffs at Cape Hay, and those only late in the season. Late in August, second year birds were quite abundant in Eclipse Sound and Navy Board Inlet.

When we arrived at Cape Hay on June 11, we noticed the remnants of dead fledglings on the scree at the base of the cliff. Others were found "on top of the snow" on the upper plateau. In many instances foxes and ravens had fed on the carcasses and had probably carried them to some of the locations in which they were found. I am merely guessing that pack ice moved into the area last.fall,. discouraging the adults from making long foraging excursions for/food. On the other hand, food (surface amphipods) may become pregressively scarce during the season. Fulmars also feed largely on plankton. Therefore, it is interesting to report that similar mortality occurs In the Fulmar colony in Admiralty Inlet. Corporal Ray Johnson passed along that colony in winter and noted dead young fulmars on the ice at the base of the cliffs. Freuchen (1937) and Ellis (1956) recorded similar observations.

Sabine's Gull (Xema sabini).-
Freuchen (1937) recorded that Sabine's Gulls bred in association with Kittiwakes at Button Point and Tuarpat. I am unable to locate Tuarpat, but there is a kittiwake colony at cape Graham Moore near Button Point. The only other kittiwake colony at present seems to be at Cape Hay. It would appear to be highly unusual for Sabine's Gulls to nest in the type of cilffs preferred by kittiwakes. Snyder (1956) describes their breeding habitat as "flat; low terrain, either on coastal islands or inland tundra not too remote from the coast."

On August 22, I observed 50 adult Sabine's Gulls feeding with kittiwakes on amphipods in Navy Board Inlet, a few miles south from Tay Bay. On the following day, some twenty five miles south from. Canada Point, $I$ saw a flock of 65 adults and 3 fledglings resting on the shore. Arctic Terns were nesting on a sand spit in this locality. Investigating the locality, I discovered two adults attempting to drive a Long-tailed Jaeger away from the vicinity of a nestling sabine's Guil. There were a few other Sabine's Gulls on the spit but as a storm was approaching, I decided that the above observation was sufficient to determine broeding in that locality. About one mile further east, I came across a flock of 41 fledglings barely able to fly and five adults resting on the water Mucktar was quite familiar with this species and told me that they see it each summer in Ecilpse Sound. He had not, however, previously seen any nests or nestlings,

Arctic Tern (Sterna paradisaea) --
Lemeiux recorded the first Arctic Terns for southwestern Bylot

Island on June 21 when. 34 arrived near his camp site. He noted the first nest on July 7, the first young on July 29 and the first fledgling on August 20 .

The only Arctic Terns noted for the summer in the vicinity of Cape Hay was on August 3 when a flock of eight passed eastwards up Lancaster Sound. On August 21 and thereafter, Arctic Terns were noted all along the coast of Bylot. Island from Tay Bay eastwards. They apparently nested in small colonies in many localities along the coast. Some young had not fledged as late às Augus.t.26.

## Arctic Murre (Uria lomvia)'- <br> See main reoort.

Dovekie (Plautus alle).-
Ellis (1956) recorded Dovekies at the floe-edge at Button Point on May 17. We did not recprd any on May 30 although the natives informed us, that they usually occur in that locality in the spring. Wynne-Edwards (1952) report that they breed at Cape craham Moore is based on a misunderstanding of the information received from a missionary at Pond Inlet. The report of Duvall and Handley (1946) to the immense horde to dovekies which had been forced from their rookery at Cape Hay by the noise of the sea-plane on August 28, 1946, is most certainly an error. At present there is no evidence that Dovekies breed in Canadian territory at all, although it would not be surprising if a few small colonies were located along the northeast coast of Baffin Island. I found Dovekies abundant along the northeast coast of Baffin Island in early September but they could have originated from the immense Greenland colonies.

## Black Guillemot (Cepphus grylle).-

Probably a permanent resident as natives told me they find them In open leads during the winter. It was quite a common nester along all the higher parts of the coast; certainly the mow widely distributed sea-bird. The nesting density was quite low along the steep murre cliffs at Cape Hay but at the Cape itself which is largely a mass of frost shattered rubble, Black Guillemots were quite common They were also common on the Wollaston Islands.

Snowy Owl (Nyctea, scandiaca).-
It was a fairly common breeding bird in 1957 with its highest density in the glacial valleys on the southwestern plains. Lemieux recorded'nest of seven eggs, and one just hatched on July 4; a nest of six hatched and another hatching, plus two eggs on July 5; and a nest of seven young on July 9. Thus the species was quite successful in 1957 which was undoubtediy due to the abundatn lemmings. snowy Owls dotted the coastine during our trip from Cape Hay to pond Inlet in lgte August.
Hoyt's Horned Lark (Eremophila alpestris hoyti).-
A common nesting species in the southwestern plains and in the glacial valleys. nuite rare in the northwestern section. Lemieux recorded them first on June 14.

Raven (Corvus corax) .-
Ravens were observed in the vicinity of Pond Inlet (according to the Police) all during the winter although for a while the temperature dropped to fifty below. We recorded several on our arrival on May and observed them all during the summer. Fkying youn were noted at Cape Hay as early as July 4。

## Pipit ( Anthus spinoletta).-.

Lemieux ecorded it breeding in the southwestern plains. Scherman (1956) claims that this region is its most northerly breeding site. I did not find, any in the northwestern region but at Tay Bay on August 21, and every day thereafter during late August, loose flocks of Pipits were noted along the shores of Bylot Island.

Lapland Longspur (Calcarius lapponicus).-
A common breeding bird in all suitable parts of the island. Lemieux's nesting data: six egge on June 26; six young on July 10; five egzs on July 10; five young on July 12 ; five young on July 15.

Snow. Bunting ( Plectrophenax nivalis) --
Males were present at Pond Inlet when we arrived on May 25 and we were told that a few had arrived during the previous week. Both males and. females were present in the northwestern region on June 11 although most of that region was still covered with snow. It was a common nesting species everywhere especially in the Cape Hay region with its valleys of rubble. Some brief notes were kept on a nest near the tent at Cape Hay. The first egg was laid on June 20, then one was laid on each successive day until a cluthc of five was completed on June k4. The exact incubation period was not determin but the last fledging left the nest on July 19. The time from the first egs to the last fledgling was therefore 29 l days.

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P1ate 2. Aproachine Garie Eraham Moore. May 30, 2957.


Ploto 3. Akns clifrs at fone rrinsm ion re, May 30, 1957.


Plote. A. Akna cliffs at Cone Sraham Hoore, May 30, 1057.


Plate - Tn noute to Cane Hay. Navy 3oard Inlet, June 5.
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Fla' le nverland to Caṇe ffav, June 10, 1957.

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\text { Plate } 12 \text { o overland to Care Hay, June } 10 .
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Plate 11. Overland to Care Hay, Jung 10.


Plate 15. An:roachinc Lancaster sound, June 11.



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Plate 18. Fucttar and Koopah brineinm bear back to camp at Cono lay.




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Plat $2, a$ fikna clifre at Carve Hay Come 40,000 pairs of mupres nested on bluff low ri ht foresround.


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Plate 25. Akpa cliffs, Cape Hay. Photo about mid-way. Some 36,000 pairs of murres nested in and around gulch in foreground


Plate 26. Extreme western end of Akpa cliffs, Cape Hay.


Plate 27. Akpa cliffs, Cape Hay. Photo to show nesting density.

plate 28. Akpa cliffs, Cape Hay. Photo to show nesting density.


Plate 29. Akpa cliffs, Cape Hay. Photo to show nesting. deñsity.

Plate 31. Akpa cliffs, Cape Hay. Photo to show nesting density.


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