BLACK-LEGGED KITTIWAKE ECOLOGY, TUXEDNI NATIONAL WILDLIFE REFUGE. Summer, 1970

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(1970(?))

During the period May 25 to August 9, 1970, the black-legged kittiwake (Rissa tridactyla) colonies on Tuxedni National Wildlife Refuge were studied. Cliffs in the area were checked to determine the extent of present use by kittiwakes; and personnel from the salmon cannery at Snug Harbor and fishermen were interviewed in order to gain information on past use of the area by kittiwakes. Observations were made with the aid of 7x35 binoculars and a 20x spotting scope, mainly from the beach at the base of the cliffs. Records were kept of nests that were accessible from the beach (mainly at the south tip of Chisik Island) and of a group of nests on a headland that could be observed from above. Marking sections of nesting ledges with flat rocks on which letters were painted and drawing a rough sketch of each section with individual nests being assigned a number on the diagram facilitated relocation and identification of nests.

High tides, lack of continuous beaches beneath the cliffs, the unstable nature of the cliffs and the inaccessibility of the cliffs from above hampered study efforts somewhat. Most effort was spent gathering data from the main Chisik Island colony because a boat suitable to transport the investigator to the other rookeries was not always available.

Distribution

Black-legged kittiwakes were found nesting on four main areas. The largest colony occupies the sea-cliffs from a point approximately 2,000 feet southeast of the Snug Harbor cannery and extending for over a mile along the southwest side of and continuing around the south tip of Chisik Island. On the east side of Chisik Island, kittiwakes nest along the seaward facing cliffs beginning west of Duck Island and extending south for approximately 3/4 mile. On Duck Island and other tiny rock islands immediately adjacent to it, most suitable nesting sites are utilized. A sizeable kittiwake colony also occupies a cliff on the mainland southwest of the south tip of Chisik Island outside of Tuxedni National Wildlife Refuge. In addition to these four colonies, a small colony (85 nests on June 24, 1970) was found occupying a cliff along the east side of Chisik Island, approximately a mile north of the terminus of the main colony.

Past use of the cliffs northwest of Snug Harbor by kittiwakes has been reported, but the investigator did not find any evidence of present nesting in that area.

Features and Occupancy of the Cliffs

The suitability of the various areas of cliffs as nesting sites appears to be greatly influenced by rock type and structure as well as topography. All of the nesting areas in the vicinity are located on outcroppings of

sedimentary rocks which are part of a southeast-dipping homocline, the geologic stucture which makes up Chisik Island and the surrounding area (Detterman and Hartstock, 1966).

The main nesting site along Snug Harbor and around the south tip of Chisik Island is composed of two sedimentary members, an arkose and a siltstone. The arkose member consists of a massive light gray arkose with many thin beds of siltstone and pebble conglomerates interlayed, while the siltstone member is basically a thick sequence of massive to thin bedded siltstones which are often laminated (Detterman and Hartstock, 1966).

Some of the massive sedimentary beds are extensively fractured. The angular fracture patterns in these rocks and the contacts between individual beds form many shelves, notches and protrusions on which kittiwakes can build nests. On some rock faces which are at a right angle to the strike of the beds, these massive beds form fairly smooth cliffs on which very few nests can be constructed.

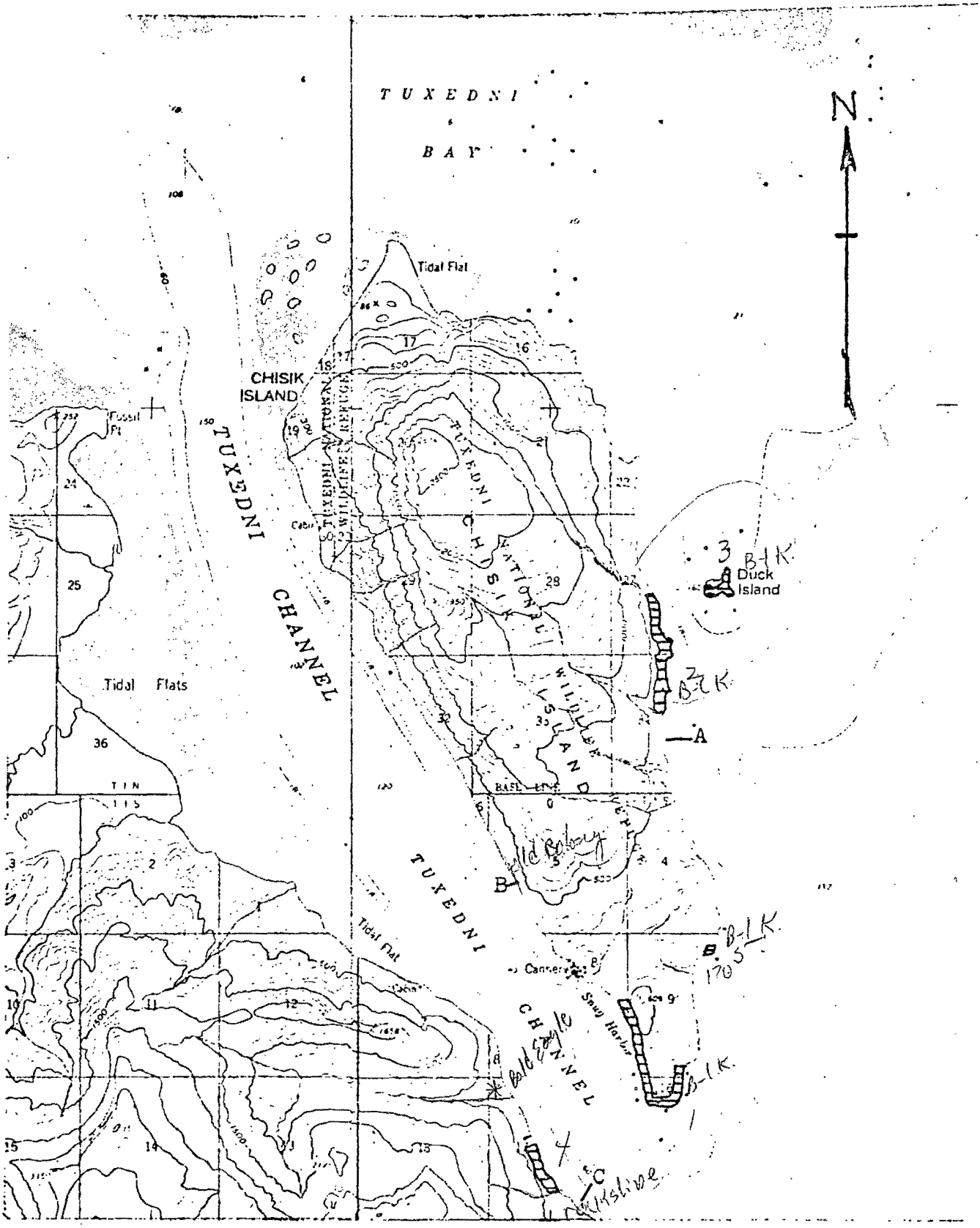
The thin bedded siltstones vary in resistance to erosion and weathering. Weathering of the less resistant beds has resulted in the formation of linear notches and shelves trending along the bedding plane on the cliff face. When deep enough, these notches are extensively used by nesting kittiwakes. On several of the cliffs in the area, white lines of kittiwakes marking the dip of these sedimentary beds can be seen from a considerable distance.

B - Black-legged kittiwake nesting areas.

A - Common murres

B - Cliffs on which past kittiwake use has been reported

C - Cliff buried in rockslide



Some kittiwakes were observed nesting in cup-like recesses in the cliffs formed by weathering out of concretions. Others were observed nesting on large boulders which had recently broken off the cliffs, but these form only minor nest sites.

On the east side of Chisik Island, sandstone and siltstone outcroppings are utilized as nesting sites. The kittiwake colony on the mainland west of the island is located on a thin bedded sandstone cliff. The nesting sites on Duck Island are located on extensively fractured and eroded sedimentary rocks.

Reports of past use by kittiwakes of the cliffs immediately northwest of the cannery at Snug Harbor can probably be discounted. These cliffs mainly represent an outcropping of a massive cobble-boulder conglomerate containing smooth cobbles which is mostly unfractured and has very few suitable sites on which kittiwakes could build nests.

The face of the main kittiwake nesting cliff on Chisik Island is occupied by kittiwakes almost to the complete exclusion of other bird species; the one noteworthy exception being 150-200 common murres (Uria aalge), which in 1970 occupied several ledges just inside the mouth of Tuxedni Channel. Glaucous-winged gulls (Larus glaucescens) were found nesting along the top of most of the cliffs in the area, and double-crested cormorants (Phalacrocorax auritus) nest in the bushes atop the cliffs along Tuxedni Channel. Near the south tip of Chisik Island where this cliff is lowest, horned

puffins (Fratercula corniculata) and an occasional tufted puffin (Lunda cirrhata) nest in burrows at the clifftop or in fissures in the rocks near the top. Scattered rock faces and ledges on Duck Island are utilized by kittiwakes, but a variety of other sea birds including numerous common murres also nest on this island. A portion of the cliffs on the west side of Chisik Island is occupied solely by kittiwakes, but the adjoining section of cliff to the south is mainly occupied by common murres.

The main cliff at the south end of Chisik Island and probably the other cliffs in the area are somewhat unstable. During the summer of 1970, an almost constant dribble of small pebbles rained from some portions of the main cliff; many of these were probably loosed by the activity of kittiwakes. Larger rock fragments up to small boulder size were observed falling from the cliffs occasionally. Several actively growing tallus slopes are present along Tuxedni Channel. Runoff from spring melt of clifftop snow, rain, and wind speed this sloughing off process. On some of the cliffs which are composed of the more massive type rocks, large tabular sheets of rock have been broken off the cliff face.

The unstable nature of the cliffs affects kittiwake nesting to some degree. Along the top of some of the actively growing tallus slopes, actual burial of nesting ledges was observed, and in other areas, nesting ledges have been lost when sheets of rock have split off the cliff face. To what extent these processes may create new nest building sites is

not known. In some places rock has peeled off in tabular layers leaving a smooth cliff on which kittiwakes cannot nest, while nest remains in the rock debris indicate that the cliff once was used for nesting. Some areas of the cliff appear to be too wet for nest building because of water seeps.

Personnel from the cannery at Snug Harbor report that a rockslide which occurred after the 1964 earthquake completely buried a cliff that was used by nesting kittiwakes on the mainland across Tuxedni Channel. The source of this rock was from several thousand feet above on the sheer face of Slope Mountain.

Prenesting Activity

According to the winter watchman at the cannery at Snug Harbor, kittiwakes were first observed in the vicinity on March 17, 1970. These birds soon departed, and not until 1½ to 2 weeks later did they return and stay.

Copulation was first observed on May 26, but it is doubtful that this represents initial copulation. During this period the birds mainly displayed on the cliffs or sat on the water in large rafts. At times these rafts became quite extensive with a band of birds extending along the entire length of the cliff to the channel mouth. Many of the birds in these rafts appeared to be sleeping while others went through bathing motions.

Several birds in what appeared to be a winter plumage were often seen on the water in late May. Before nesting began and all through the summer many incidences of aggressive behavior among kittiwakes were noted. Such hostile action usually began when one kittiwake pecked at another that stood nearby on a ledge or beneath the attacker. Most pecking appeared to be directed at the opponent's head. Often one bird would sieze another by the head, taking hold above the eyes and both would tumble from the cliff. These birds often struggled with one another on the water or beach for several minutes.

Nest Building

Nest building activity was first noted on June 1, but did not reach major proportions until a week later. This activity extended over the better part of the month of June and was still occurring when the first egg laying was noted.

Cannery personnel claim that nest building is usually initiated about the time of the first low (minus) tide in June (June 1-8, 1970).

Material for the earliest new building consisted of algae picked from rocks that were exposed at low tide. The majority of nest building material for the main colony on Chisik Island as well as the colony across the channel was collected from the tidal flats across Tuxedni Channel. During the peak nest building period, a steady two-way

stream of birds moved between these flats and the cliffs with mud and plant material. Some nest materials were gathered from clifftops and unused portions of the cliff face, and some birds were observed picking up floating debris from the water as the tide flushed in and out of Tuxedni Channel.

In nest construction, plant materials and mud are placed on the ledges (often over the remains of old nests) and then trampled by the birds. This trampling continues for a considerable length of time with an occasional pause to rearrange some of the material. Quite commonly kittiwakes were observed taking nest materials from other nests on the cliff.

The time of nest construction and the materials used may vary somewhat between the different nesting areas. Nests on that portion of the main rookery which extends from the south tip and on around to the east side of Chisik Island appeared to be made up mostly of plant material and contained much less mud than nests on the remainder of the main rookery. This may be related to the availability of materials and/or to the greater width of ledges in this area. On June 22 most kittiwakes on Duck Island and on the rookery on the west side of Chisik Island were incubating eggs, and nest building activity was not evident there, while nest building was very much in evidence on the main rookery after that date.

Unsuccessful nest building attempts were commonly observed at the south tip of Chisik Island. Some of these

unsuccessful attempts resulted when birds attempted to build nests too low on the cliff to escape the effects of wave action at high tide. Human disturbance may have been a factor in some cases, but the abandonment of nests at various stages of construction was also observed along cliffs where the investigator had not repeatedly travelled.

On a trip to the west side of Chisik Island on July 23, many nests were observed which the investigator was able to peer into while standing in a skiff at high tide. Several of these nests contained young. While the tides ran fairly high that date (+18.7 ft.), higher tides had occurred just previously (+19.9 ft. on July 21) and several periods of as high or higher tides were to occur before the young could be expected to fledge. Only in the absence of moderately rough seas during periods of high tide before fledging time could these young be expected to survive.

Egg Laying, Incubation, and Hatching

On June 19, eggs were observed in six nests at the south tip of Chisik Island. One of these nests contained 2 eggs, the rest one. Because of stormy weather, nests had not been checked on June 17 and 18. That egg laying was to commence soon had previously been determined by dissection of several female kittiwakes killed in rock slides between June 13 and June 15. Several of these birds had well developed ovarian follicles ranging from 1.56 to 2.72 cm. in diameter.

An attempt to follow individual nesting attempts disclosed that some of the nests, especially those on the lower portions of the cliffs, were abandoned at various stages of laying, and that some eggs disappeared from nests. The most reliable data that could be obtained on clutch size came from a headland at the southeast tip of Chisik Island where many of the nests could be checked from above. On July 5, 49 nests containing eggs could be reached on this headland. Of these nests, 35 (70%) contained 2 eggs and 14 (30%) contained 1 egg.for a mean clutch size of 1.7 eggs.

The investigator was absent from Chisik Island during the week of July 10-17. A check of the accessible nests at the south tip of Chisik Island on July 18 showed all but two to be empty. Of these two nests, one contained a single egg and the other a dead, downy young. On July 21 the other rookeries in the area were visited, and many of the nests on these cliffs were also found to be empty and partially destroyed. Few nests containing eggs or young were observed.

The poor reproductive success of the black-legged kittiwake can probably be attributed to a period of prolonged, extremely adverse weather occurring just prior to hatching time. Heavy rains, at times driven by high winds occurred on 6 days between July 10-17. Losses to such extremes in weather have likely occurred at Tuxedni in the past. While working in the Iniskin-Tuxedni Region in 1958,

Detterman and Hartstock (Detterman and Hartstock, 1966) observed a storm occurring on the night of August 11 in which 7.30 inches of rain fell in 8 hours. A total of 11.21 inches of rain fell during the 24 hour period and the storm was accompanied by winds in excess of 60 miles per hour.

Following the failure of a large portion of the nesting attempts, behavioral differences were noticed in the birds. Small rockfalls, human traffic beneath the cliffs and other such disturbances that had caused little commotion previously easily alarmed the birds. Although many of the birds still perched on the ledges, large rafts of birds frequently formed on the water as had been common before pairing and nest building.

On July 20 several birds were observed carrying algae to the cliffs at the south tip of Chisik Island, but such activity was not again observed on any later dates.

In late July and early August, kittiwake nestlings were observed in some nests,- mostly high up on the main cliff. Nestlings observed varied somewhat in their stage of development. Attempts to determine what proportion of nests contained young were unsuccessful because of the upward viewing angle and because nestlings were only visible when they stood in a position that made them visible over the edge of the nest. When groups of nests were observed for one-half hour and larger periods, however, the majority of the nests appeared to be empty.

According to the cannery personnel, it is normal to find numerous dead young at the foot of the cliffs. While visiting the main Chisik Island rookery on July 28, 1944, Gabrielson (1944) reported observing several dozen dead at the base of the cliff. Although the investigator travelled the beaches beneath the cliffs daily, only 4 dead young were found. This would seem to substantiate somewhat poorer than normal hatching success on the inaccessible portions of the cliff also.

Beached Bird Survey.

Mortality

Rockfalls were the most commonly observed cause of mortality among adult kittiwakes. Although falling rocks are a constant threat to kittiwakes on Chisik Island, observed mortality was greatest following periods of heavy precipitation. Over the period June 9-18, 30 dead or crippled birds were gathered from beneath the main cliff, these being only part of those killed or injured by falling rocks. More dead or crippled birds were observed out of safe reach and others were found partially consumed by glaucous-winged gulls. Probably most of the kittiwakes killed are washed away at high tide. Dissection of 29 of the birds gathered between June 9-18 revealed 19 to be males, 10 females. Dead and crippled birds continued to appear beneath the cliffs throughout the study period.

One dead kittiwake was brought to the observer on July 21 by a photographer who reported that is was one of two birds struck by a peregrine falcon (Falco peregrinus). The other kittiwake was carried off. Several observations of peregrine falcons were made near the main rookery. On June 13 two of these birds were seen on a ledge. Although the investigator did not witness any actual predation on kittiwakes by peregrines, he did flush a bird of this species off of a partially consumed kittiwake on one occasion. Several gyrfalcon (Falco rusticolis) observations were also made in the area.

On one occasion a kittiwake was found trapped between several boulders below high tide line, and on another occasion one that had been trapped when a mussel shell closed on its foot was observed. These freak accidents are probably very minor causes of mortality, but several people from the cannery have reported seeing kittiwakes trapped by mussels at low tide.

Because the black-legged kittiwake from Tuxedni Wildlife Refuge feed out in Cook Inlet, it is possible that much mortality goes undetected. Death from accidents at sea or possibly from effects of oil would likely go largely undetected.

Feeding

Evidence suggests that the kittiwake from Chisik Island feeds mainly out in Cook Inlet, probably in tidal

rips and other areas of current. Fishermen report seeing kittiwakes feeding in such areas, and the investigator has observed numerous kittiwakes in a tidal rip midway between Chisik Island and Anchor Point on August 9, 1970. Large numbers of kittiwakes were often observed leaving the cliffs and flying out over Cook Inlet at sunset. On July 25, a nearly continuous stream of kittiwakes was observed for 3 hours as the birds flew south past the mouth of Johnson River south of Tuxedni. In that instance, 1,207 birds were counted during a 15 minute period as they flew past the investigator's vantage point. On one occasion kittiwakes were observed feeding on small fish at the edge of a tidal rip north of Duck Island. Some of these birds dove into the water leaving only part of their wings visible above the surface.

Kittiwakes were never seen to feed near the cliffs of the main rookery to any major degree. Once the salmon cannery went into operation, however, kittiwakes were occasionally observed picking bits of waste from the surface of Tuxedni Channel.

Possible Effects of Human Disturbance

During the summer months there is considerable commercial fishing and related activity on and around Chisik Island making human disturbance of the kittiwakes very much a possibility. A salmon cannery owned and operated

by the Snug Harbor Packing Company, is located on 20 acres of private land less than a half mile northwest of the main Chisik Island colony.

Boats entering and leaving Tuxedni Channel must pass the main rookery. In 1970 boats using Tuxedni Channel varied in size from skiffs used to tend beach nets to tenders, freight barges and a Standard Oil tanker which delivered fuel to the cannery several times during the summer. Air traffic to and from the cannery also passes two of the rookeries.

Because there are no continuous beaches between the cannery and the main rookery at high tide, cannery personnel do not often frequent the area beneath the main rookery. Boat and airplane traffic cause some disturbance among the kittiwakes, but the degree of alarm that was exhibited by the birds did not seem any greater than that caused by the presence of bald eagles (Haliaeetus leucocephalus) or peregrine falcons in the vicinity of the cliffs. Beach netting was done immediately adjacent to all of the rookeries, and although this is a source of mortality for common murres, puffins, cormorants (Phalacrocorax auritus and P. pelagicus), pigeon guillemots (Cepphus columba), common eiders (Somateria mollissima) and perhaps other diving birds, no observations or reports were made of kittiwakes being taken during netting operations. The effects on the kittiwakes, if any, of garbage and other waste materials dumped into Tuxedni

Channel by the cannery and by vessels anchored in and travelling the waters near Chisik Island were not determined.

Some potential exists for oil contamination of the waters immediately adjacent to some of the cliffs. The cannery at Snug Harbor has storage facilities for large quantities of diesel fuel which are refilled by tankers several times during the summer. Cannery personnel report that a tanker operated by Standard Oil was hung up at low tide near the cannery in the summer of 1969.

Population

A series of black-and-white photographs which blanketed the main rookery were taken with a 35 mm. camera. Prints 8X10 inches in size were made and a count was attempted from these. This method prooved to be somewhat unsatisfactory for several reasons. The photographs were taken from the fairly narrow beach beneath the cliffs at low tide, so some birds on the higher portions of the cliffs were not visible and on other portions of the cliffs some birds flew away on the approach of the investigator. A lack of clarity in some photographs, poor contrast between kittiwakes and light colored cliffs and vegetation on some cliffs also posed problems.

Reliable counts were only possible for the lower cliffs at the south tip of Chisik Island. 6400 birds were counted on photographs of this area to which were

added an estimated 1500 birds which were perched on rocks at the water edge at the time that the photographs were taken. A rough estimate of 20,000 birds would probably be reasonable for the main rookery. The use of a boat and a larger negative size should allow a fairly accurate count of kittiwakes by photographic methods or by actual counts of birds on the cliffs. An attempt to arrive at a total population figure for all rookeries in the area will be made in 1971.

Literature Cited

Detterman, R.L. and J.K. Hartstock, 1966. Geology of the Iniskin-Tuxedni Region, Alaska. Geol. Surv. Prof. Paper 512. 78pp.

Gabrielson, I. 1944. Some Alaskan notes. Auk. 61 pp. 105-130 and 270-280.