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June/1979.

RECONNAISSANCE

of

SHORE-FAST ICE

FORT CHURCHILL TO CAPE TATNAM

HUDSON BAY

MARCH, 1963

for

SOGEPET LTD.

and

UNITED CANSO OIL & GAS LTD.

by
R. D. Johnson

April, 1963

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This report gives the findings of the ice reconnaissance of the Cape Tatnam area of Hudson Bay as outlined in my letter of March 7, 1963, and carried out March 15. The primary purpose of the reconnaissance was to make observations as to the actual midwinter ice conditions along the coast to assist in answering operational considerations. Secondary observations for the same purpose were to be made of the on-shore coastal area.

Arrangements were made with Thomas Lamb Airways Ltd. of The Pas, to position a Cessna 180 aircraft at Churchill for my use for an indefinite period commencing March 12. I departed Calgary March 10 and arrived at Churchill at noon of the 11th. Arrangements were made with Lamb's to fly the coast the following day. The weather was clear and cold (-20° to -30°) with a moderate wind (5-15 mph). The following day, March 12, was clear and good for flying but the aircraft was commandeered by the Department of Northern Affairs to carry out an emergency mercy flight. The following two days, March 13 and 14, cold weather (-30°) together with high winds (20-45 mph) with snow and blowing snow brought all travel in the area to a halt. On Friday, March 15, the winds and blowing snow diminished and by noon the aircraft was prepared for the flight; the temperature was -20° with winds of 15 mph. The flight from Churchill to the Kaskattama River and return was made between 1:30 and 7:00 P.M. under good observation conditions. A further trip was planned for the next day to spend more time in the area of Cape Tatnam to Fort Severn. By the next morning (March 16) the weather had changed to snow and blowing snow. The forecast called for these conditions to prevail for two days to be followed by a period of blowing snow. Under these conditions, I concluded the data thus far gathered was adequate to fulfill the main purposes of the trip and therefore left Churchill at noon on the 16th.

During the few days of inactivity in Churchill, numerous discussions were held with local individuals concerning ice conditions. The most rewarding of these were with Charlie Webber and Eddie Richards (Transair pilots), O. B. Johnson (Assistant Regional Administrator, Northern Affairs), and N. A. Harrison (Defense Research Northern Laboratory, Fort Churchill). All of these men appear to be accurate and reliable observers and reporters.

Webber, the most experienced pilot in Hudson Bay and the eastern Arctic, claims that an offshore lead is present in all areas around the Bay. The belt of shore-fast ice is relatively narrow, only a very few miles wide. The shore lead itself is unpredictable, opening and closing with the prevailing wind direction. Even in midwinter the lead may be many miles wide under strong continuing offshore winds. Beyond the shore lead is an area of perhaps twenty or thirty miles, showing action along fractures and leads. The number of leads become fewer in the central area, but are still present. The central area, the major bay area, is essentially a

group of large ice pans with occasional leads. Webber claims that shallow coastal areas, converse to general belief, do not necessarily have more extensive shore-fast ice than areas of steep coasts. Richards largely confirmed Webber's description and claims the shore lead is always present along the Winisk-Churchill coast.

Mr. Johnson has had no experience in the Cape Tatnam area but has personally travelled along the shore ice north from Churchill to Eskimo Point and beyond. There is no difficulty in moving "cat trains" along this coast. However, to the south Johnson would expect great trouble in the area of the Nelson River. His observations as to the open lead in the areas he knows, are in agreement with Webber.

Mr. N. A. Harrison's group at Fort Churchill (N.D.R.L.) have for several years maintained an ice and weather recording station on the ice of Button Bay, immediately west of the Churchill River estuary. This station and apparently all other ice studies by this particular group have been discontinued this year. The Button Bay station was normally established on the ice each year in late December or early January dependent on adequate ice cover.

Mr. Harrison described the ice conditions at Button Bay as normal for the Churchill area. He described the shore-fast ice as similar each year, consisting of a narrow relatively smooth area along the shore, followed by an area of very rough ice with blocks and ridges several feet high, followed by a relatively smooth area with occasional pressure ridges ending with a large pressure ridge (to twelve feet high) along the open shore lead. The ice station was normally established on the first relatively even area beyond the rough ice zone. Approach closer than one-half mile to the open lead was not permitted. Traverse of the rough ice is extremely difficult on foot or by vehicle. The ice station was unmanned but supported by light Nodwell track equipment. (See photos 2,3,4 and 5)

ICE OBSERVATION FLIGHT

The flight was made on March 15, between 1:30 and 7:00 P.M. The pilot was Don Lamb with Jim Spence (a Cree guide) and myself as passengers. The weather was bright with high overcast. Darkness was at 7:00 P.M. The temperature was -20° to -25°F. with winds from the southwest at 10-15 mph. A cloud of ice crystals was commonly rising and drifting seaward from the offshore lead. The flight traverse was flown at about 800 feet over the shore-fast ice between the coast and the shore lead. The traverse originated

at Fort Churchill and followed the coast in the above manner east to Cape Churchill, south to Port Nelson, then eastward past York Factory to Cape Tatnam and the Kaskattama River. Several loops were flown along the route to gain a better idea of ice conditions.

A landing on the sea ice was not attempted as planned, primarily at the pilot's discretion based on the unpredictability of the sea ice and the time consideration. A landing was made at 5:00 P.M. on a known strip of the Kaskattama River about three and one-half miles above the coast at the abandoned Hudson Bay Post, Kaskattamagan. The aircraft was refueled and the return flight commenced at 5:15 P.M. The return flight was made directly from Kaskattamagan to York Factory to Fort Churchill, arriving at Churchill at darkness.

Observations

Fort Churchill to Watson Point

Narrow false lead about one-half mile offshore. Main lead about one mile out, ice appears very rough.

Cape Churchill

East off Cape Churchill is an open narrow lead about two miles offshore. Beyond this half mile is a second wide lead.

Cape Churchill to Broad River

The open lead roughly parallels the shore about three-quarters to one and one-half miles out. The ice between the shore and the lead has no breaks and is generally smooth with rough patches.

Owl River

The open lead is two miles offshore. The ice condition is smooth due partly to extensive reflooding by the river. There is 95% snow cover with patches of glare ice.

Rupert Creek and Nelson Shoals

Nelson Shoals lie about ten miles off the mouth of Rupert Creek. Approaching Rupert Creek the lead is narrow and about one and one-half miles offshore. It swings seaward and appears nearly closed between the mainland and the shoals. The area of the shoals was obscured in an ice crystal fog, but the impression is that there is an area

of shore or bottom fast ice around the shoals. Between the mainland and the shoals it is doubtful if an open lead exists at all times, however a tidal zone of unstable ice undoubtedly always exists between the two.

Rupert Creek to Port Nelson

The open lead persists about one and one-half miles offshore following the coast to within three miles of Port Nelson, then crosses the estuary and runs eastward about two miles offshore to become perhaps five miles offshore northeast of Marsh Point. Upstream on the Nelson River above the open lead, the river is frozen across with clear fresh-water ice, much of it glare ice. Pressure ridges and rough ice persist along the shore. According to Jim Spence and others, no attempt should be made to cross this ice with equipment for several miles above the estuary. Minor reflooding of the near shore ice by minor streams is quite common along the coast.

Hayes River

Ice in the lower estuary appears broken and thin. The river is reported safe and good for winter travel.

Mistigokan River

The open lead is three to four miles offshore. The ice condition is generally rough. Photo #6 shows the outer shore-fast ice and open lead in this area.

Cape Tatnam and Tatnam Shoals

Tatnam Shoals lie north-northeast of Cape Tatnam from four to six miles off. As Cape Tatnam is approached from the west, the shore-fast ice comprises one mile of smooth ice at the coast, then two miles of rough ice extending to the open lead three miles offshore. The open lead swings seaward around the shoals, about six miles offshore. The ice between the shore and the shoals appears solid and unaffected by tides. There is about one mile of smooth ice along the shore. The remainder is very rough breccia blocks and small pans with irregular pressure ridges. Ice relief is estimated from six to twelve feet. At least some of the shoals show through as ice covered areas with peripheral pressure ridges. Photo #7 shows the nature of the shore to shoals rough ice zone.

Anabusko River

East of the Tatnam shoals the open lead swings shoreward again and runs about three miles offshore off the Anabusko River.

Anabusko River to Kaskattama River

A narrow lead exists in part of this area about two miles offshore. This lead is followed by an extensive ice area and could be a false lead.

Kaskattama River

A thin frozen lead was noted only one mile offshore. This could be a false lead or it may open again. The main lead appears irregular and about three miles offshore; however, the area was partly obscured by ice crystal fog. A vertical photo (Photo #1) taken in early February of this year illustrates the ice conditions of this area. Photo #1 is discussed elsewhere in this report.

Kaskattamagan Post

A landing was made on the snow-covered river ice for refueling. The river is about 100 yards wide with banks of about ten feet. The banks and nearby areas are covered by heavy spruce to forty feet with willow undergrowth. The abandoned Post consists of two buildings: a log building about 12 x 15 feet needing windows and other minor repair and a plywood building about 15 x 20 feet in fair to good repair. Other log buildings in poor repair were noted some 400 yards back in the bush.

The guide reports that the river freezes to bottom near the mouth but does not further upstream.

Kaskattamagan to Churchill

The bush cover is heavier than expected as far north as Rupert Creek. It consists mainly of spruce to thirty and forty feet heavily concentrated along drainage systems and old beach ridges giving a generally rectilinear pattern. Along the lower Hayes and Nelson rivers heavy deciduous cover was also noted. Between Nelson River and Rupert Creek the amount and height of cover diminishes. North of Rupert Creek the area in winter is a vast frozen plain with innumerable frozen lakes; the only cover being very dwarf scrub, both coniferous and deciduous, along the main drainage systems.

SHORE-FAST ICE DEFINITION AND DESCRIPTION

This section relates the information supplied by Mr. N. A. Harrison and others plus my own observations to the vertical composite photo (Photo #1), depicting the ice conditions from shore (bottom) to lead (top) immediately off the Kaskattama River. The scale of the photo is approximately 1" = ½ mile. The bottom margin of the photo is about 200 yards offshore. The shore-fast ice area at the time of the picture (early February, 1963) was four and three-quarters miles.

The ice as shown in the photograph lends itself to a three-fold division which is in agreement with Mr. Harrison's and my own observation.

Zone I - An area of rather smooth ice along the shore, presumably the result of early slush ice. This area would be bottom-fast. The width of this zone is less than half a mile.

Zone II - An area of very brecciated ice with many irregular ridges. The brecciated effect is suggested as due largely to tidal action. Zone II may be subdivided into shoreward and seaward subzones. The shoreward subzone is here three-quarters of a mile wide and is characterized as older and probably bottom-fast. The seaward subzone, one and one-half miles wide, is younger and is probably bottom-fast to a minor degree.

Zone III - An area of relatively smooth ice with occasional ridges, here two miles wide. This area is not bottom-fast and must float on the tide. Zone III may be subdivided into a shoreward zone of older ice and a seaward zone of younger ice.

At Button Bay, Mr. Harrison's group commonly traverse Zones I and II with light Nodwell equipment in early January, to establish an observation station on the shoreward side of Zone III (Photos 2, 3, 4 and 5). In the Kaskattama area, the observation in mid-March of a false lead in Zone II and the apparent reduction of the area of Zone III suggest that for areas not protected by topography such as a bay, tide and current action may cause leads to form in the seaward section of Zone II, and parts of Zone III may be totally plucked away.

Zone I appears to be a nearly continuous feature and suggests that along the shore travel by cat-supported wheeled vehicles is possible. In local areas of poorly formed Zone I ice, the lower beaches could be used. The most dangerous aspect of this type of travel is the river mouths which in each case must be scouted with a great deal of caution.

Zone II is the predominant ice type and appears to be everywhere present. The degree of roughness may vary considerably and be modified by drifting snow. It is a difficult area to traverse for either man or machine (Photo #4). The zone must be considered hazardous at all times until spot checks are made.

Zone III is sometimes extensive and sometimes absent. Its extent is probably largely unpredictable. This zone probably could not be used extensively for heavy vehicle travel and would not support a drilling operation.

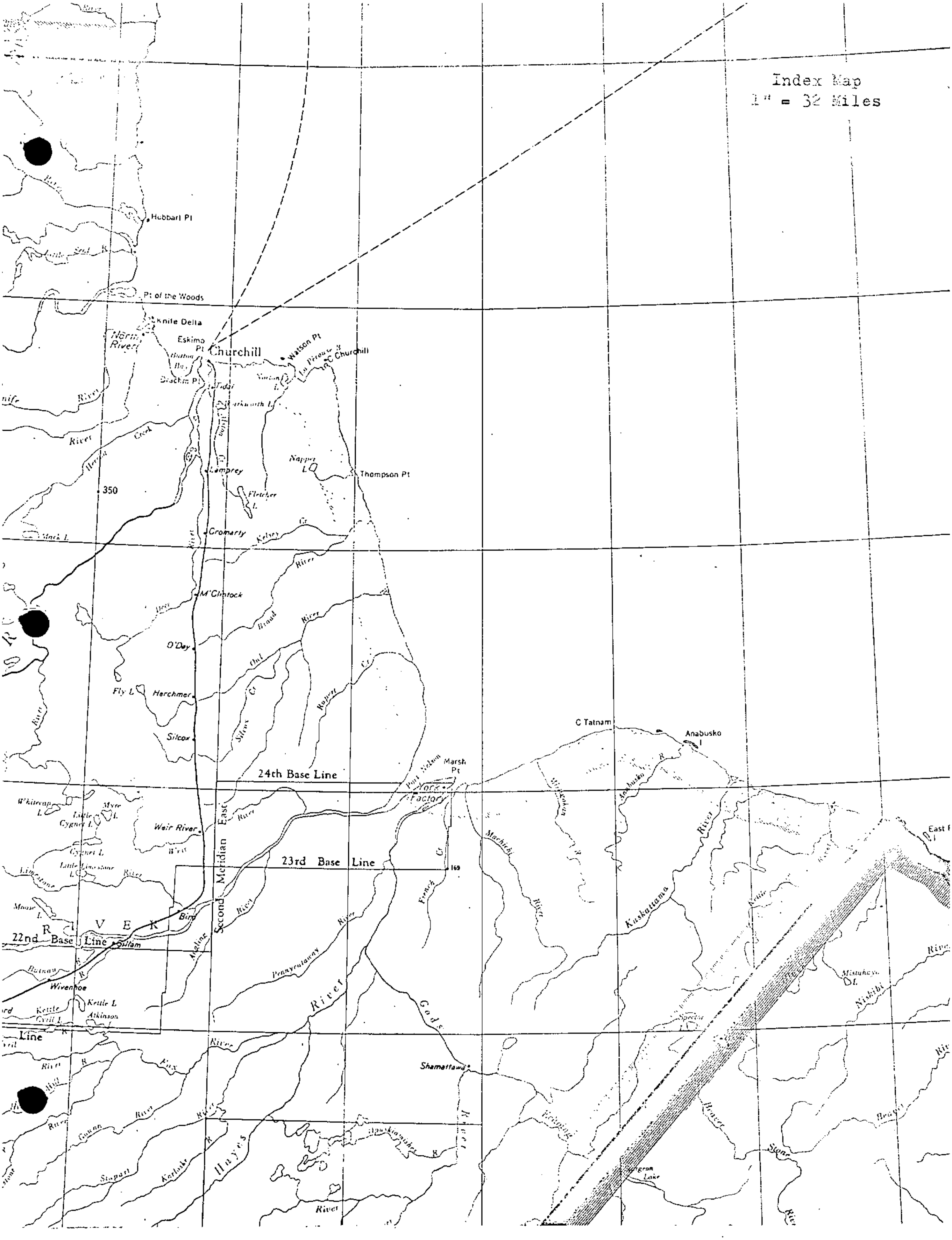
CONCLUSIONS

A zone of tidal action usually in the form of an open lead separates the shore-fast ice from the bay ice. This lead is found present everywhere from Fort Churchill to the Kaskattama River. The same circumferal lead is reported in all areas of Hudson Bay. Between Fort Churchill and the Nelson River the width of shore-fast ice at the time of observation averaged about one and one-half miles, somewhat less than the width of the tidal flats. The shore-fast ice between the Nelson and Kaskattama rivers averaged three miles, somewhat more than the tidal flats. The width of shore-fast ice appears to be governed by a complex inter-relationship of water depth and tidal action, current and prevailing wind direction.

The shore-fast ice was found to be of three types: Zone I, a relatively narrow zone up to one mile wide of fairly smooth, probably bottom-anchored ice; Zone II, a zone of rough brecciated ice which predominates the shore-fast area and is probably bottom-anchored only in part; Zone III, a sometimes present, relatively smooth outer area of unanchored ice. Of the above zones, only Zone I would appear completely safe or usable for heavy travel or drilling.

The open shore lead can vary from a few yards to a reported twenty or thirty miles in width. The bay ice is reportedly composed of large pans with pressure ridges and open leads are common (Photo #8). Ice thickness reportedly varies from three to six feet depending on the relationship of snow and minimum temperatures. The ice becomes unsafe by "rotting" while near maximum thickness, rather than by reduced thickness through melting.

In my opinion, the shore-fast ice along the southwest coast of Hudson Bay does not materially extend the effective land area for exploration purposes. If necessary, directional drilling from the shore would probably be an easier and cheaper operation than drilling on the ice of Zone I. The exceptions are such areas as the Tatnam Shoals, but not the Nelson Shoals, which are effectively connected to the mainland by traversible ice.



Index Map
1" = 32 Miles
Hubbart Pt
Pt of the Woods
Knife Delta
North River
Eskimo Pt
Churchill
Watson Pt
C Churchill
Thompson Pt
350
Lamprey
Cromarty
M'Clintock
O'Day
Herchmer
Fly L
Silcox
C Tatnam
Anabusko I
Marsh Pt
York Factory
24th Base Line
23rd Base Line
22nd Base Line
Weir River
Second Meridian East
169
Bird
Sultan
Wivenhoe
Kettle L
Atkinson L
Shamattawa
Pennycutaway River
Kaskattama River
Gods River
Hayes River
East Pt
Nisibibi
Stone

PHOTO #1

A vertical composite photo of the shore-fast ice off the Kaskattama River, taken in early February, 1963. This photo illustrates the three-fold ice classification suggested in this report. The photo scale is one inch to one-half mile. The shoreline is some 200 yards below the photograph, while the open lead shows at the top.

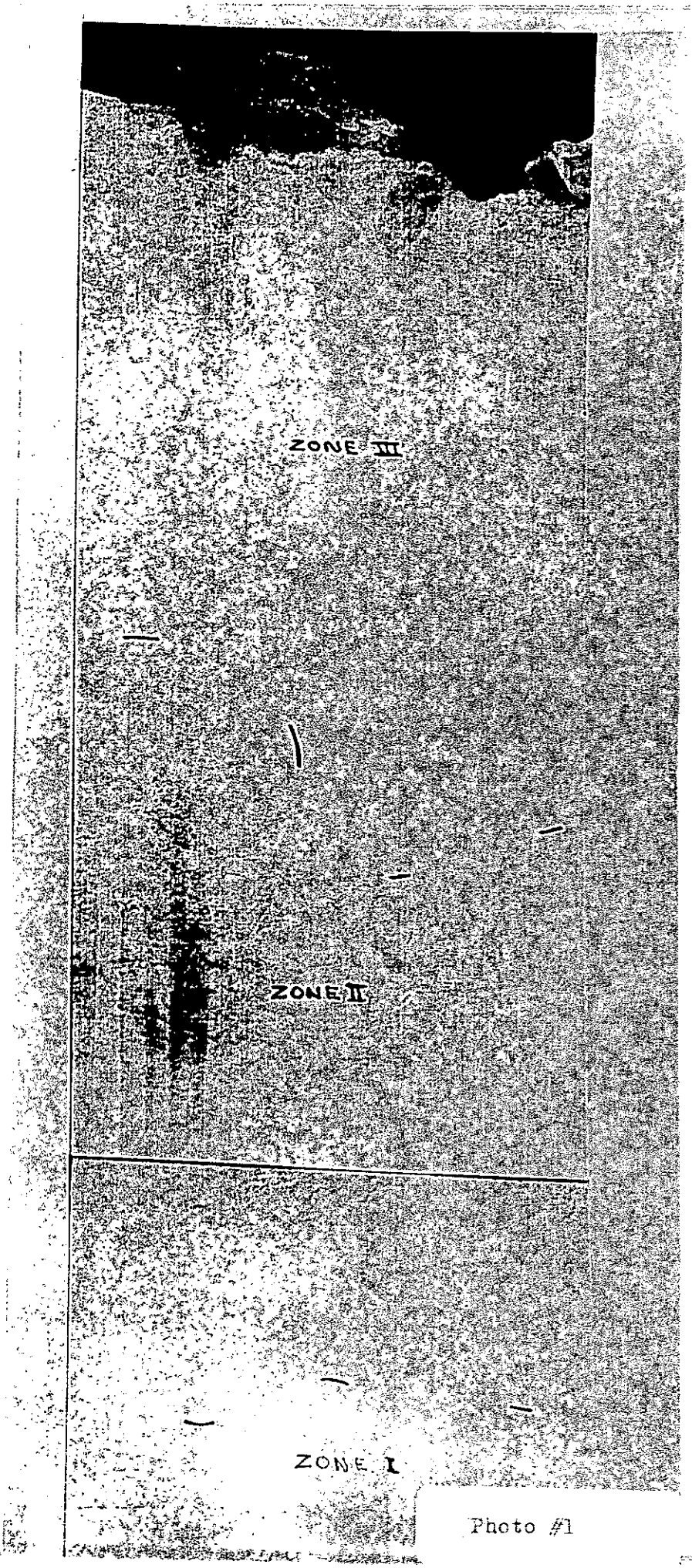


Photo #1

PHOTO #2

An oblique shot of the inner area of Button Bay, taken December 4, 1957, by the Northern Defense Research Laboratory. The photo shows Zone I, the shoreward smooth area, and also the shoreward part of Zone II, the rough breccia zone.

PHOTO #3

An oblique shot of the outer area of Button Bay, taken May 9, 1958, by the Northern Defense Research Laboratory. The photo shows a snow-covered Zone III and the open lead beyond.

Photo #2

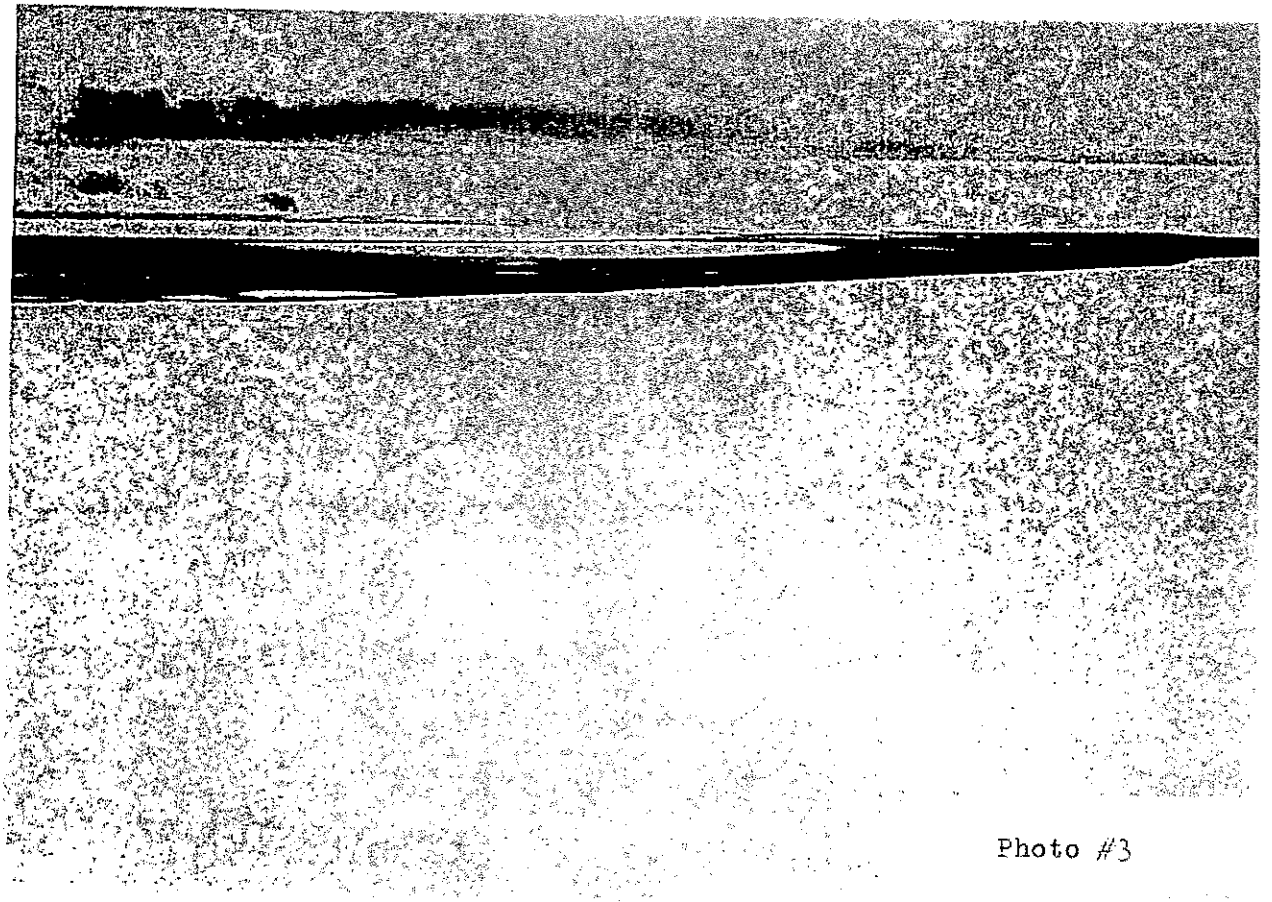


Photo #3

PHOTO #4

This Northern Defense Research Laboratory photo shows a light Nodwell track vehicle traversing the rough breccia of Zone II en route to service the Button Bay ice station.

PHOTO #5

This Northern Defense Research Laboratory photo shows the Nodwell carrier at the Button Bay station. The station is located on the shoreward margin of the Zone III ice. The view is seaward across Zone III.

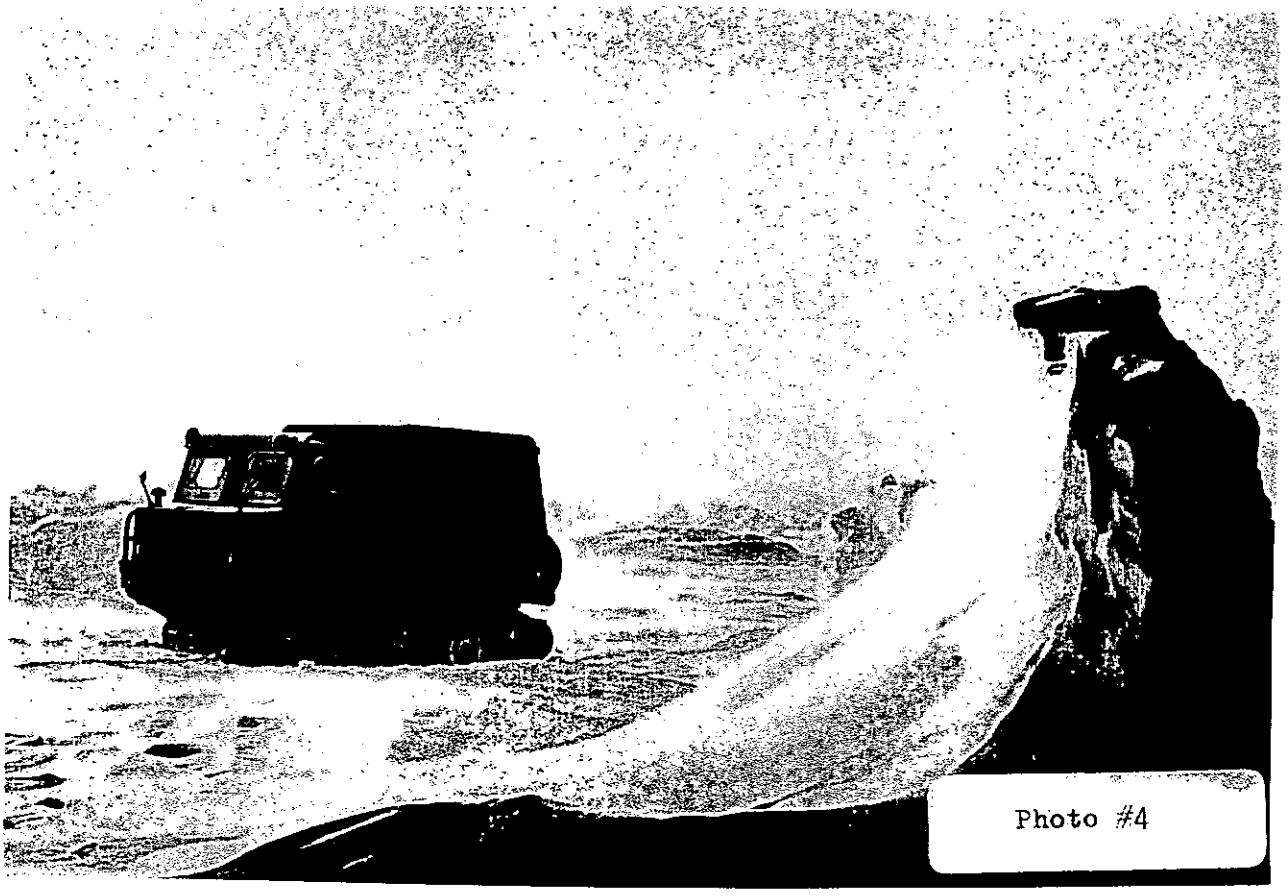


Photo #4

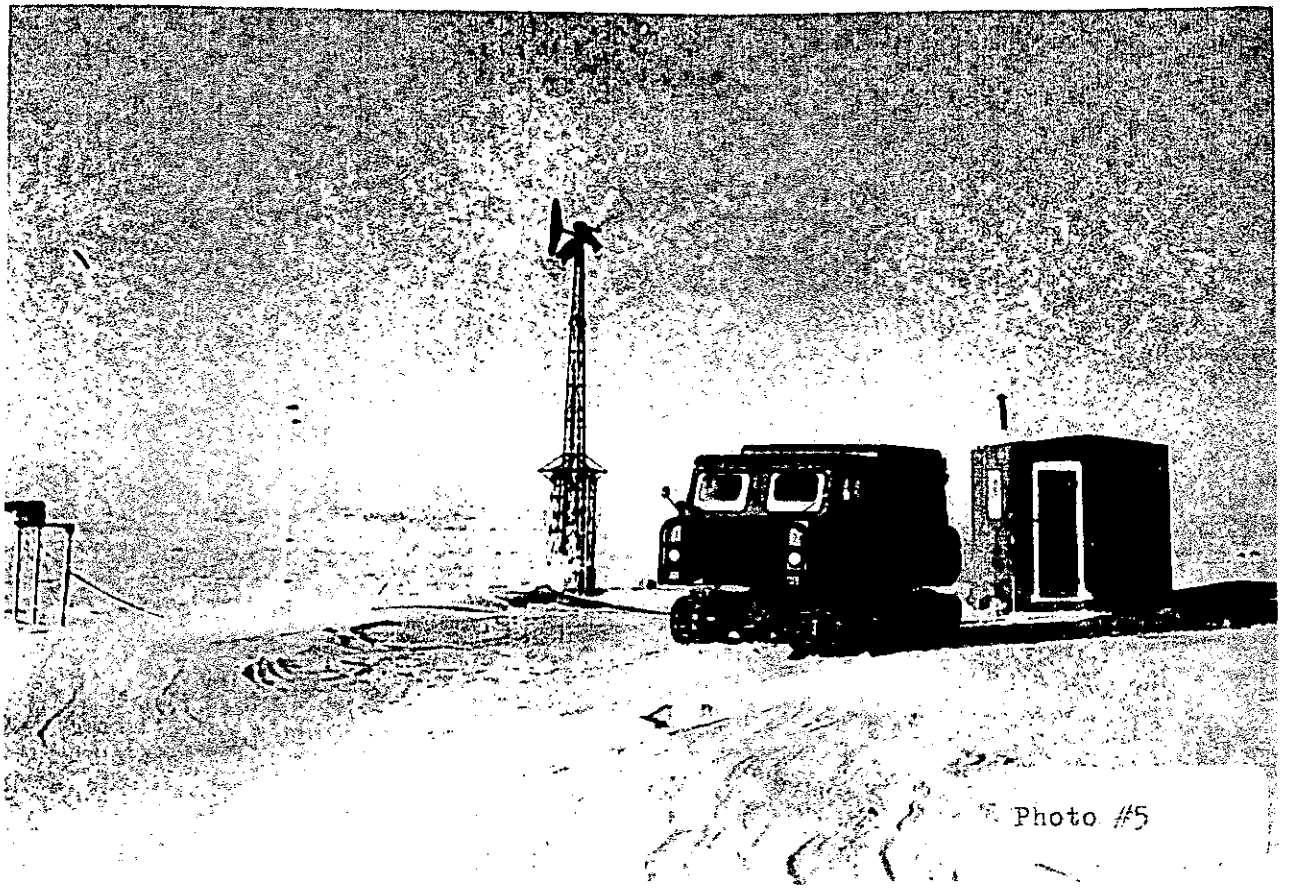


Photo #5

PHOTO #6

This oblique photo shows Zone II and Zone III ice off the Mistigokan River at the time of the present reconnaissance flight. The open lead as shown here is characteristic of the way it appeared over most of the flight traverse (March 15, 1963).

PHOTO #7

This photo, taken during the reconnaissance flight, clearly shows the character of Zone II ice. The photo was taken in the Cape Tatnam to Tatnam Shoals area. Ice relief to twelve feet is common in this zone.

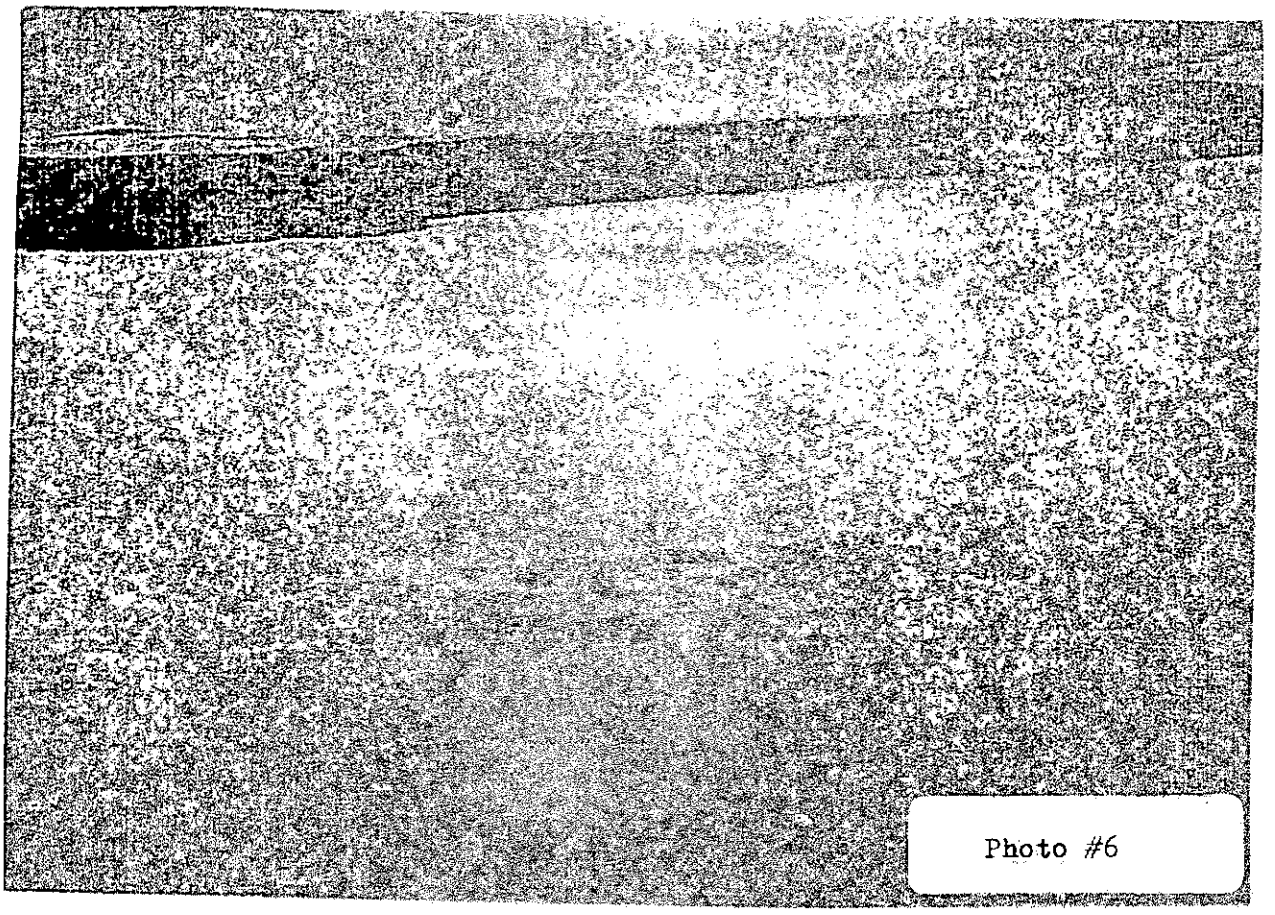


Photo #6

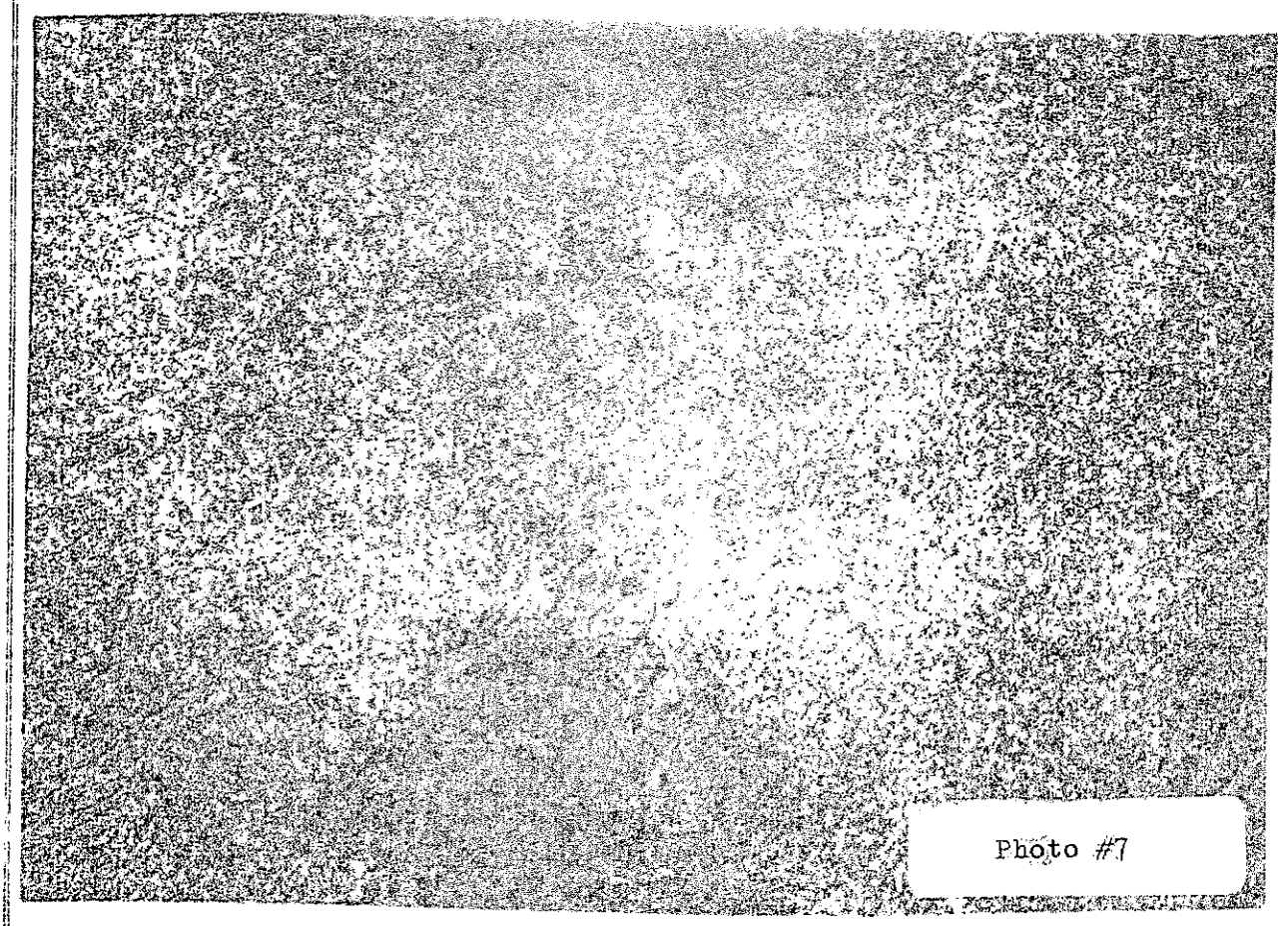


Photo #7

PHOTO #8

An oblique R.C.A.F. photo (not to be reproduced) taken in the mid-bay area between Cape Hopewell and Chesterfield Inlet in the early mid-winter period. The ice is fairly smooth but interrupted by numerous pressure ridge systems. Note the leads are largely healed with thin ice.

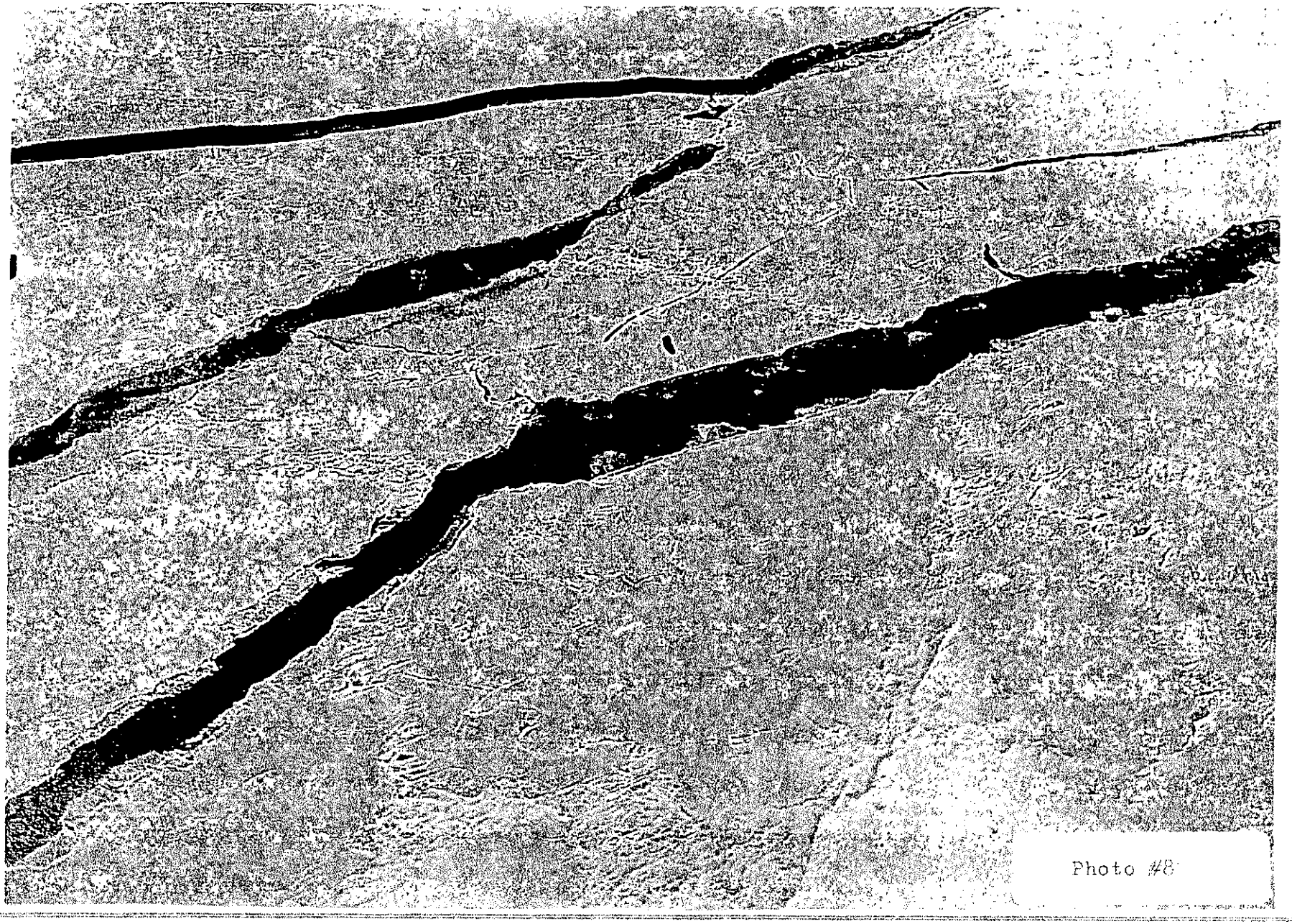


Photo #8