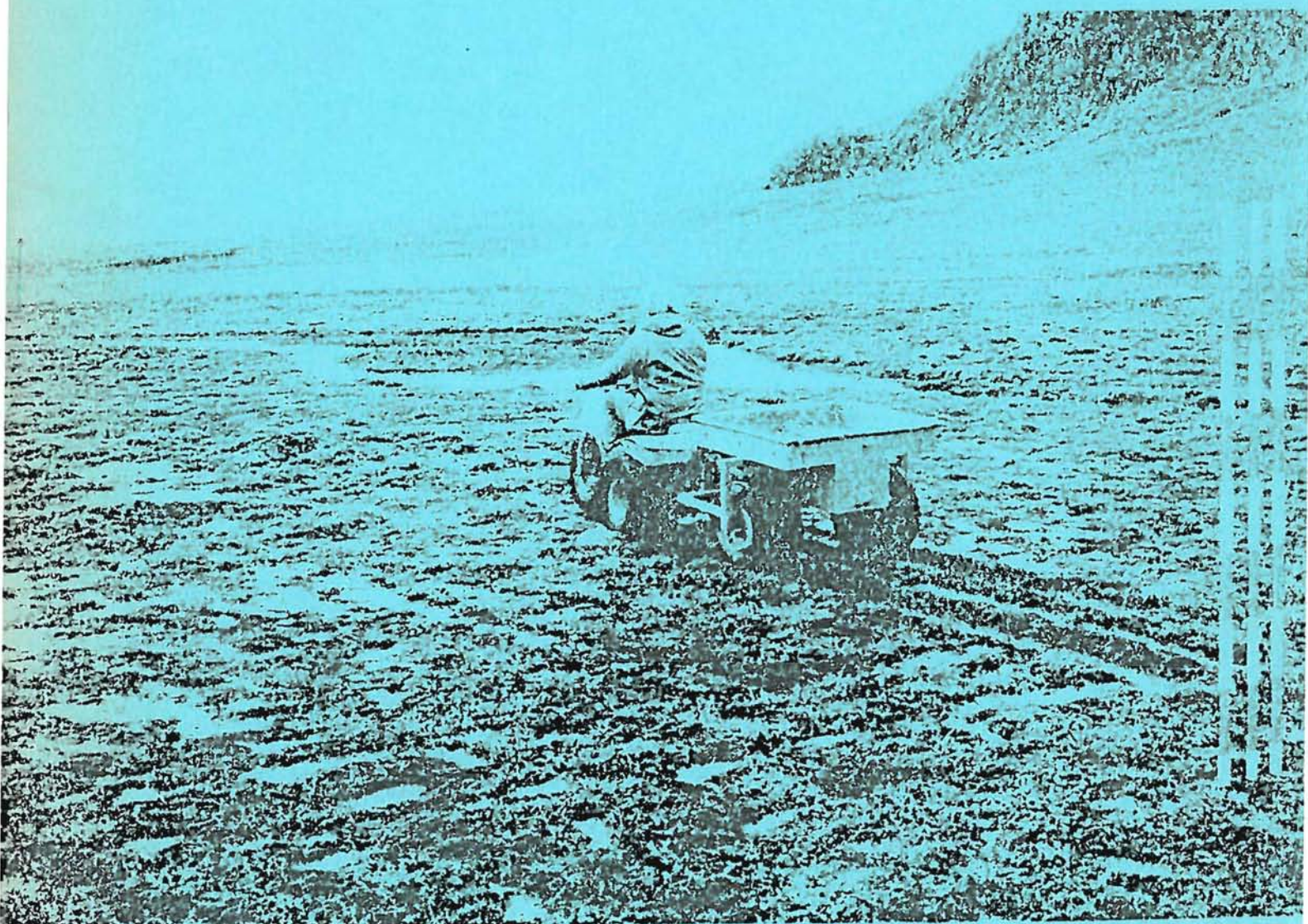


**GREENLAND FISHERIES INVESTIGATIONS**

**Effects of an All Terrain  
Cycle (ATC) on Fen  
Vegetation in Jameson  
Land, NE. Greenland**



**GREENLAND BOTANICAL SURVEY**

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GREENLAND FISHERIES INVESTIGATIONS  
TAGENSVEJ 135  
DK-2200 COPENHAGEN  
DENMARK

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EFFECTS OF AN ALL TERRAIN  
CYCLE (ATC) ON FEN  
VEGETATION IN JAMESON  
LAND, NE, GREENLAND

BY

SUNE HOLT AND CHRISTIAN BAY

GREENLAND BOTANICAL SURVEY

## INTRODUCTION

The fens on Jameson Land are among the most important vegetation types in relation to grazing by muskoxen and geese. Only a few percent of the area in Jameson Land is covered by fens. These are most frequent in connection with lakes and rivers in the lowland. Since the areas covered by fens are relatively small and their importance to grazing is great, it is necessary to protect the fens as much as possible against any kind of damage.

The structure of the peat layer, the height of the water level and the species composition varies greatly between the different fens, and even within the same fen. This leads to great difficulties when estimating the effect of human activities in these types of vegetation, and a generalization as to a common effect can not be based on the few preliminary results of the ATC and ATV tests.

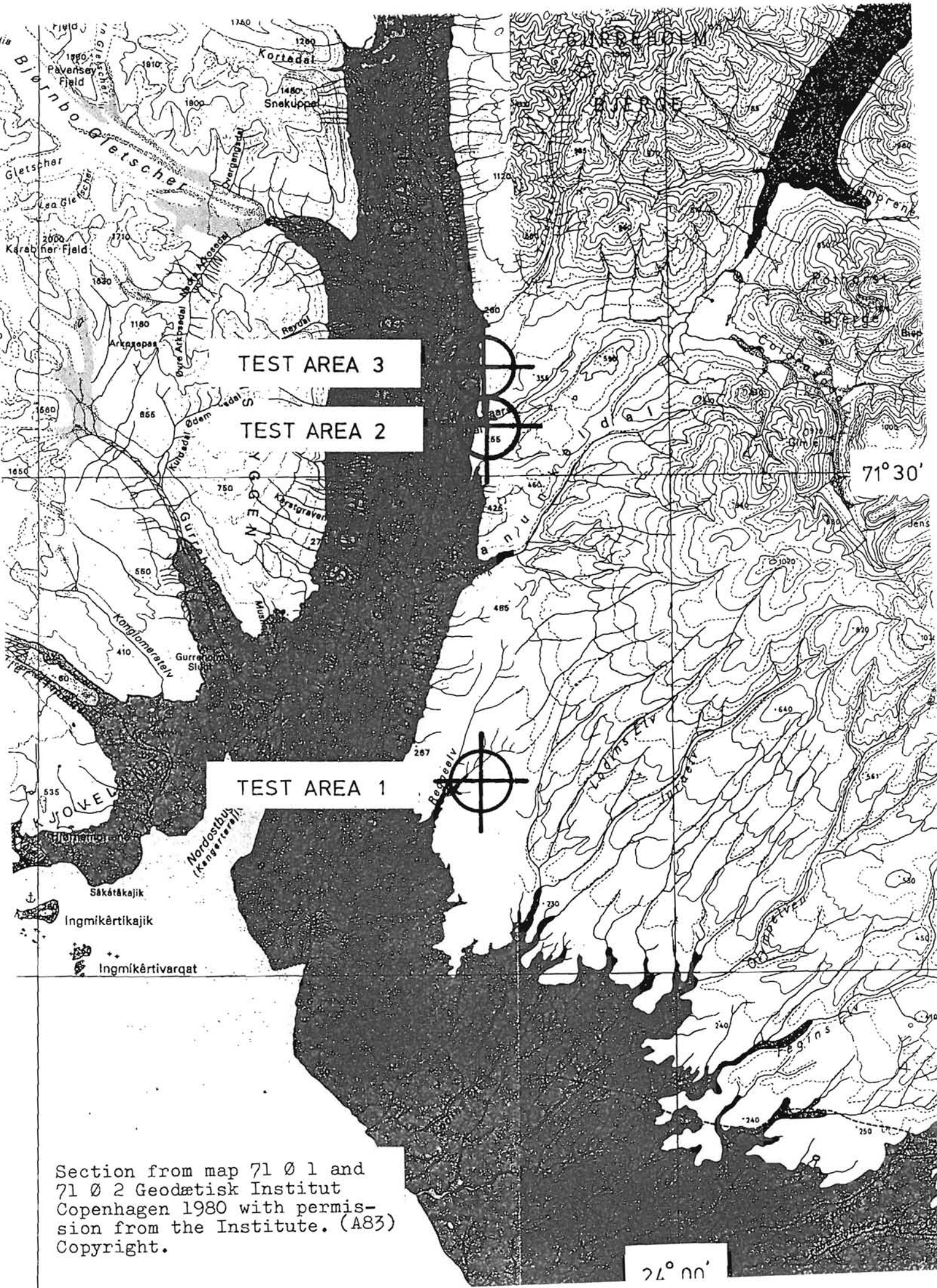
In August 1982 and 1983 tests were conducted of the sensitivity to traffic of fens with respect to thickness and compactness of the peat layer.

A test of the impact on terrain and vegetation by driving with an ATV (all terrain vehicle) one, five and ten passes was conducted in August 1982 in a fen with a well-developed peat layer at Major Paars Dal, in the same fen a Honda ATC (all terrain cycle) was tested in August 1983. Furthermore the impact of the ATC was tested in an extremely wet fen with a noncompact and poorly developed peat layer. This test was set up for one, five and ten passes in a fen near Mesters Vig and took place in late August 1983.

The ATV used in the fen at Major Paars Dal had a total weight about 2500 kilograms resulting in ground pressures of approximately 86 grams per square centimeter.

The ATC used in the fen at Major Paars Dal was a Honda ATC 200E (155 kg dry weight).

The ATC used in the fen near Mesters Vig was a Honda ATC 110 (110 kg dry weight).



TEST AREA 3

TEST AREA 2

TEST AREA 1

Section from map 71 Ø 1 and 71 Ø 2 Geodætisk Institut Copenhagen 1980 with permission from the Institute. (A83) Copyright.

27° 00'

THE ATC TEST AREA AT MESTERS VIG





The ATC test in the fen at Major Paars Dal

The fen used for the ATC test at Major Paars Dal is situated 2 km north of Major Paars Dal in the NW. part of Jameson Land. The terrain where the test is performed is on a west facing slope 100 m above sea level.

The fen at Major Paars Dal is dominated by *Eriophorum scheuchzeri* and *Carex saxatilis* with a total phanerogam cover (visual estimate) of 10%. Mosses constitute 90% cover. The fen is very rich in species, and the species composition indicates that the soil is rich in nutrients.

Accompanying species are *Juncus biglumis*, *Juncus triglumis*, *Juncus castaneus*, *Carex atrofusca*, *Carex microglochin*, *Carex marina*, *Carex rariflora*, *Carex parallela*, *Triglochin palustre*, *Polygonum viviparum*, and *Salix arctica*. On the drier tussocks the vegetation consists of *Vaccinium uliginosum*, *Euphrasia frigida*, *Pedicularis flammea*, *Pinguicula vulgaris*, *Tofieldia pusilla*, *Dryas octopetala*, *Carex capillaris* and *Arctostaphylos alpina*.

The ATC test in the fen at Major Paars Dal

The test program for the ATC was the same as was used for the ATV test in August 1982. One, five and ten passes were made along marked lines on sloping and level terrain. The area was inspected two days after the driving and damage on the terrain and vegetation was recorded.

Track from one pass



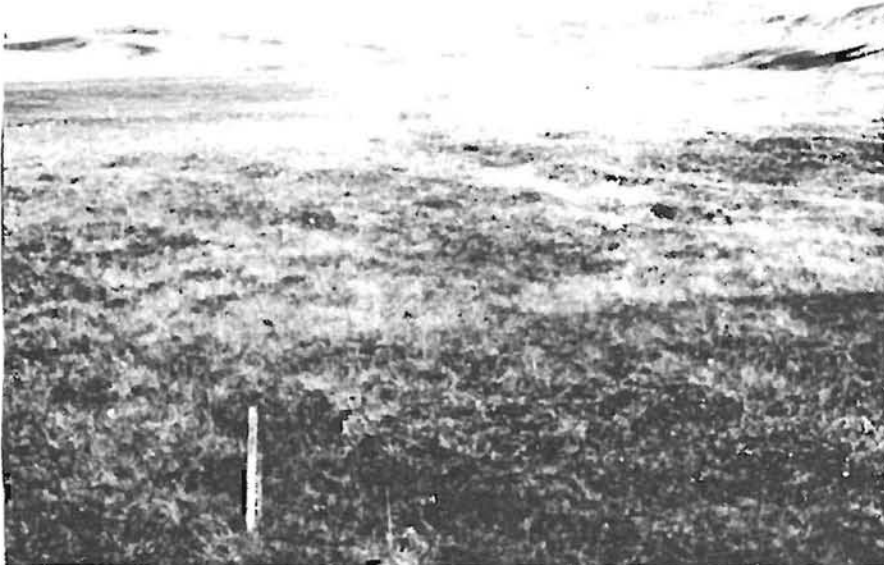
Track from one pass with the ATC on sloping terrain in the Major Paars Dal fen is dimly seen. August 15, 1983.

Photo 83-089-13

The track from one pass is only distinct in areas on very wet ground. Here leaves and inflorescences of *Eriophorum scheuchzeri* and *Carex saxatilis* are bent to the ground. Otherwise the track can only be recognized by bent inflorescences of *E. scheuchzeri*. (Photo 83-089-13).

Track from five passes

The track from five passes can be seen in its full extension as a depression in the vegetation (Photo 83-089-14). Leaves and inflorescences of sedges and grasses are bent, but obviously not broken. In a few places where the track passes puddles, silty mud has been teared up.



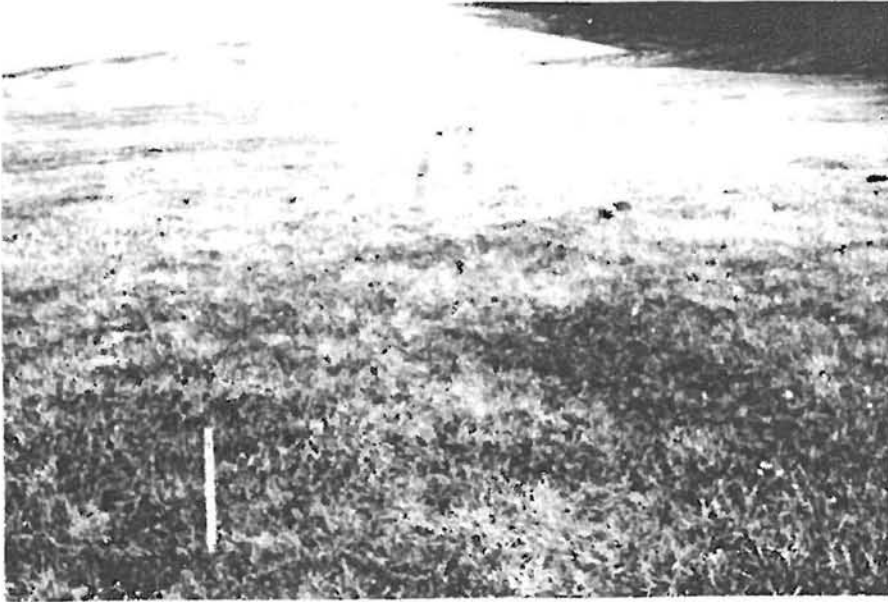
Track from five passes on level terrain in the Major Paars Dal fen. August 15, 1983.

Photo 83-089-14

Track from ten passes

The track from ten passes appears distinctly in its full extension as three parallel depressions in the vegetation on both level and sloping terrain. (Photo 83-089-12, 83-089-10). The impact of the front wheel is less distinct as from the rear wheels. The tracks from the rear wheels are a few centimeters deep. In these depressions the vegetation is depressed. There is a marked difference in the dry tussocks. In contrast to the vegetation in depressions, the vegetation on the tussocks raised again shortly after the passing. The imprint from the tires is seen in the wet, open soil.





Track from ten passes on level terrain in the Major Paars Dal fen. August 15, 1983.

Photo 83-089-12



Track from ten passes on sloping terrain is seen. The two outermost depressions is from the rear wheels, and the depression seen in the middle is from the front wheel of the ATC. August 15, 1983.

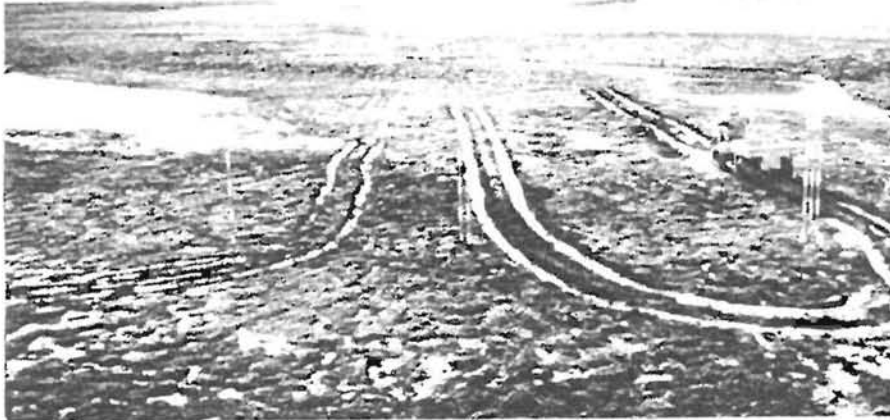
Photo 83-089-10

The ATC test in the fen at Mesters Vig

Approx. 1 km NW. of the W. end of the airstrip, Mesters Vig the impact on the vegetation and the terrain caused by one, five and ten passes was studied. (Photo 83-082-36, 83-078-11).

The Mesters Vig fen is an extremely wet fen dominated by mosses, *Carex stans* and *Salix arctica*. The moss cover consists mainly of the species

*Calliergon sarmentosum*, *Drepanocladus revolvens*, *Campylium stellatum*, *Scorpidium turgescens* and *Philonotis tomentella*. Also the phanerogams *Polygonum viviparum*, *Equisetum arvense* and *E. variegatum* were recorded.



The ATC test driving programme at Mesters Vig during conduction. From the left tracks from one, five and ten passes is seen. August 31, 1983.

Photo 83-082-36

The mosses covers 100% and the total cover of the phanerogames is 30%, (visual estimate).



General view of the fen at Mesters Vig immediately after the test driving was completed . August 31., 1983.

Photo 83-078-11

On August 31 the moss tussocks in the lower part of the fen were on average 5 cm above the water level.

Between the tussocks puddles are regularly seen. However, the terrain is gently sloping on the last 5 meters at the NW. end of the track. On this slightly raised terrain puddles are not seen and the peat layer here seems to be much more compact.

There is a weak westwards water movement at the test site in the fen.

#### Tracks from one pass

The general effect on the terrain and vegetation in the test track caused by one pass is two 5-10 cm deep waterfilled depressions corresponding to the rear wheels of the ATC. A depression of 1-2 cm has appeared from the front wheel (Photo 83-082-30). The effect varies greatly with the heterogeneous compactness in the peat layer of the fen. On small tussocks and on the gently sloping area in the NW. end of the track, where the peat is more compact, the depth of the depressions in the track is considerably smaller than in the rest of the track. Here the depressions in the track from the rear wheels vary from 1 - 5 cm.

The rear wheels destroyed vegetation completely in most of the track due to tearing up the knobby tires. In the track caused by the front wheel, the vegetation is generally intact, though slightly compressed. (Photo 83-082-34).



Track from one pass is seen towards NW. Between the two tracks from the rear wheels a slight depression from the front wheel is dimly seen. August 31., 1983.

Photo 83-082-30

The vegetation on the tussocks in the fen and on the gently raised area at the last 5 meters in the NW end of the track, has been much more resistant to the passing. Here the vegetation is still rooted and the moss cover has only sporadically been torn up.





Track from one pass by the ATC is seen. The depth of the track varies from 5 - 10 cm August 31., 1983.

Photo 83-082-34

#### Tracks from five passes

The general damaging effect on the terrain and vegetation in the test track from five passes is considerably increased in comparison with the track from one pass. (Photo 83-082-34). The tracks from the rear wheels of the ATC vary in depth from 10 to 16 cm (Photo 83-082-35). Where the track is crossing tussocks and along the previous mentioned last 5 meters in the NW end of the track, it is less deep due to the greater compactness of the peat. In the NW. end of the track, the depressions range from 1 to 5 cm in depth.

The depressions from the front wheel were generally from 2 to 4 cm deep.



Track from five passes is seen towards NW. in the Mestersvig fen. August 31, 1983

Photo 83-082-31

The vegetation in the tracks from the rear wheels has generally been totally destroyed due to spinning of the wheels. In addition a considerable amount of silty mud has been hurled up on the sides of the track.

In the track from the front wheel the vegetation is compressed, but generally intact.

Where the tracks from the rear wheels cross the tussocks or cross the slightly rising terrain (along the last 5 meters in the NW. end of the line), the vegetation seems rather undamaged although obviously it has been compressed. A minor part of the moss cover has been torn up here.



Track from five passes is seen. The depth of the track varies from 10-16 cm. August 31, 1983.

Photo 83-082-35

#### Tracks from ten passes

Here the damaging effect on the terrain and vegetation was usually two 10 - 18 cm deep tracks from the rear wheels of the ATC. (Photo 83-082-32). The depression from the passing of the front wheels was 3 - 5 cm.

Where the track is crossing tussocks and along the last 5 meters in the NW. end of the test route depressions vary from 1 - 7 cm.



Track from ten passes is seen towards NW. Where the water is no longer seen in the track the terrain is gently rising. August 31, 1983.

Photo 83-082-32

The vegetation has been completely torn up in the tracks from the rear wheels. The amount of mud hurled up on the sides of the track is several times greater than seen in the track from five passes (Photo 83-082-33).



Track from ten passes is seen. The depth of the track varies from 10-18 cm. August 31, 1983.

Photo 83-082-33



## DISCUSSION

It appears from the investigations of the test drivings in the two different types of fens that the deleterious effect on the terrain and vegetation is dependent on the thickness and compactness of the peat layer.

The damaging effect from driving in the fens is caused by compression of the peat layer and spinning of wheels which tears up the vegetation. These damages will probably lead to development of water channels which could serve as drainage channels. A change in the water level would affect the ecology in the fens severely.

The damaging effect on vegetation and soil in the fen at Mesters Vig is highly severe. Here the track from only one pass appears as two 5 - 10 centimeter deep water filled depressions where the vegetation has been torn up. Where the ATC has passed ten times, the track is 10 - 18 centimeter deep. Here the vegetation and a considerable amount of mud has been hurled up.

Presumably these damages have a long-term effect on the vegetation. However, investigations in the coming years are necessary to evaluate the extent of these damages.

The damaging effect on vegetation and soil in the fen at Major Paars Dal is much less severe than in the Mesters Vig fen. Here the track from one pass is only distinct on very wet ground. Where the ATC has passed ten times, the track appears distinctly in its full length. The track from the rear wheels is generally a few centimeters deep. Here the vegetation is depressed.

The reason for this differential effect on the vegetation and soil in fens must be ascribed to differences in the structure of the fens. The fen in Major Paars Dal is characterized by a thick layer of peat. The total peat layer constitutes about half a meter, and this organic layer protects the underlying soil.

As the fens on Jameson Land belong to the most important vegetation types in relation to grazing by muskoxen and geese it is of great importance to avoid any damaging impact on this vegetation type.

The fen at Mesters Vig belongs to one of the most distributed fen types in Jameson Land. This fen type has a non-coherent layer of peat.

Major Paars type of fen has a rather limited occurrence in Jameson Land.

