PART II
Photographic record
South region helicopter survey photos 1-12 March 2012

All photographs presented in the five appendices of Part II were taken by Christine Cuyler, and from the left front side of helicopter, which maintained an altitude of ca. 40 m. Distances (m) to caribou, if given, are approximate and estimated from 0-line.

Compass headings given: North (N), South (S), East (E) and West (W).
Appendices 11, 12, 13 and 14 – all photographs were resized to 200KB.
Appendix 15, all photographs presented are unaltered and original size, >6MB.
See Figures 4 to 7 for transect line locations.

All photographs and more are available at full size (>6MB) on the Greenland Institute of Natural Resources server:
F:/40-59/PaFu/42/Landpattedyr/24 Aerial Survey/2012 South/Photo DATA_South Survey 2012

Figure 18. Group of 24 Ameralik caribou on the sea ice among islands at the mouth Sermilik Fjord on the north side, view S, 12 March 2012.
Appendix 11

Ameralik transect line snow conditions & topography

Ameralik South Region: HIGH-density stratum, transects (not all) in order flown

**Figure 19.** Line 45 flying A to B, ca. 35 caribou (not visible) were foraging near lakeshore, view E, 8 March 2012.

**Figure 20.** Line 45 flying A to B, three (3) caribou centre photo, view NE, 8 March 2012.
Ameralik South Region: HI-density stratum, transects (not all) in order flown

Figure 21. Line 44 flying B to A, view SW, 8 March 2012.

Figure 22. Line 44 flying B to A, windswept rocky terrain, two (2) caribou ½-way right of centre photo, view SW, 8 March 2012.
Ameralik South Region: HI-density stratum, transects (not all) in order flown

Figure 23. Line 43 flying A to B, sunny south-facing rocky slopes where caribou have been foraging extensively, view N, 8 March 2012.

Figure 24. Line 43 flying A to B, sunny south-facing rocky slopes where caribou have been foraging extensively, view NE, 8 March 2012. Backgrounds like these reduce caribou sightability, specifically when the caribou are stationary.
Ameralik South Region: HI-density stratum, transects (not all) in order flown

Figure 25. Line 46 flying A to B, snow cover is minimal, view to NE, 8 March 2012.

Figure 26. Line 46 flying A to B, snow cover is minimal, view to NE, 8 March 2012.
Ameralik South Region: HI-density stratum, transects (not all) in order flown

Figure 27. Line 47, near start B-point, flying B to A, landscape windswept, view S, 8 March 2012.

Figure 28. Line 47, flying B to A, four (4) caribou on steep rocky slope just below centre in dark shadow, view NW, 8 March 2012.
Ameralik South Region: HI-density stratum, transects (not all) in order flown

Figure 29. Line 48, just north of the glacial tongue, three (3) caribou low right of centre, flying B to A, view S, 8 March 2012.

Figure 30. Line 48, at end A-point, shrubs along the river, flying B to A, view S, 8 March 2012.
Ameralik South Region: HI-density stratum, transects (not all) in order flown

**Figure 31.** Line 60, first valley used by many caribou, flying A to B, view E, 9 March 2012.

**Figure 32.** Line 60, second valley also used by many caribou, flying A to B, view E, 9 March 2012.
Figure 33. Line 59, one caribou left of centre and tracks, 40 m altitude can be too high when terrain slopes sharply away from the 0-line, flying B to A, view S, 9 March 2012.

Figure 34. Line 59 flying B to A, view SW, 9 March 2012.
Ameralik South Region: HI-density stratum, transects (not all) in order flown

**Figure 35.** Line 58, rugged topography of the 0-line ahead, flying A to B, view NE, 9 March 2012.

**Figure 36.** Line 58, Gyr falcon sited along this slope, flying A to B, view NE, 9 March 2012.
Ameralik South Region: HI-density stratum, transects (not all) in order flown

Figure 37. Line 57, top near start B-point windswept rocks, middle 1 caribou & feeding craters, bottom near end A-point, flying B to A, view W on 0-line, 9 March 2012.
Ameralik South Region: HI-density stratum, transects (not all) in order flown

Figure 38. Line 52, looking at start B-point from Isfjord, flying B to A, view W, 9 March 2012.

Figure 39. Line 52, big valley midway with skidoo track (one of many), flying B to A, view SSW, 9 March 2012.
Ameralik South Region: HI-density stratum, transects (not all) in order flown

Figure 40. Line 51, top rugged, descending into big valley, 14 caribou foraging in dark willows right of centre, flying B to A, views W on 0-line, 9 March 2012.
Ameralik South Region: HI-density stratum, transects (not all) in order flown

Figure 41. Line 50, plenty of bare ground/rock showing, flying A to B, view NE, 9 March 2012.

Figure 42. Line 50, rocks’ colour resembles caribou pelage, flying A to B, view NE, 9 March 2012.
Ameralik South Region: HI-density stratum, transects (not all) in order flown

Figure 43. Line 56, the 0-line is beside the glacier tongue, flying A to B, view ESE, 9 March 2012.

Figure 44. Line 56, poor snow cover and rocky terrain, flying A to B, view NE, 9 March 2012.
Ameralik South Region: HI-density stratum, transects (not all) in order flown

Figure 45. Line 55 flying A to B, view NE, 9 March 2012.

Figure 46. Line 55, caribou tracks & foraging on this slope, mother with calf in upper right quadrant centre, flying A to B, view E on 0-line, 9 March 2012.
Ameralik South Region: HI-density stratum, transects (not all) in order flown

Figure 47. Line 54, near start B-point little snow many rocks, flying B to A, view SW, 9 March 2012.

Figure 48. Line 54 flying B to A, view SSW, 9 March 2012.
Figure 49. Line 49, Austmannadalen valley’s slopes drop away sharply from 0-line making sighting the many caribou among the willows difficult, flying B to A, view SW, 9 March 2012.

Figure 50. Line 49 Austmannadalen’s south-facing slopes and valley bottom were well foraged by caribou, six caribou just up from centre, flying B to A, view backwards SE, 9 March 2012.
Ameralik South Region: LOW-density, transects (not all) in order flown

Figure 51. Line 37 near B-point, views first N and then E on 0-line, 3 March 2012. Beyond beyond B-point the high density stratum began.
Ameralik South Region: LOW-density, transects (not all) in order flown

Figure 52. Line 34, view along 0-line looking E, 3 March 2012. Above the snow poor valley just E of B-point and south of east end of the Kangerdluarssungûp tasersuap lake; Below the uplands close to A-point.
Ameralik South Region: LOW-density, transects (not all) in order flown

Figure 53. Line 42 flying B to A, rocky terrain has little snow cover, view W, 8 March 2012.

Figure 54. Line 42 flying B to A, view SW, 8 March 2012.
Ameralik South Region: LOW-density, transects (not all) in order flown

Figure 55. Line 41 flying B to A, on the windswept rocks three (3) caribou are standing, view W, 8 March 2012.

Figure 56. Line 41 flying B to A, cow & calf standing up & right of centre, view SW, 8 March 2012.
Ameralik South Region: LOW-density, transects (not all) in order flown

**Figure 57.** Line 40 flying B to A, view WSW, 8 March 2012.

**Figure 58.** Line 40 flying B to A, view SW, 8 March 2012.
Ameralik South Region: LOW-density, transects (not all) in order flown

Figure 59. Line 62, approaching start A-point on the jagged mountain peak on the right, flying A to B, view E, 12 March 2012.

Figure 60. Line 62 flying A to B, view ENE, 12 March 2012.
Ameralik South Region: LOW-density, transects (not all) in order flown

Figure 61. Line 39 flying B to A, view NW across the 0-line, 12 March 2012.

Figure 62. Line 39 flying B to A, view W along 0-line, 12 March 2012.
Ameralik South Region: LOW-density, transects (not all) in order flown

Figure 63. Line 38 flying B to A, windswept rocky highlands gave way to windswept coast, views W along 0-line, 12 March 2012.
Appendix 12
Qeqertarsuatsiaat (QEQ) transect line snow conditions &
topography
QEQ South Region: HIGH-density stratum, transects (not all) in order flown

Figure 64. Line 13, view N from the line as approach B-end point, 2 March 2012.

Figure 65. Line 13 near B-end, view NNE, 2 March 2012.
Figure 66. Contrasting conditions between B-ends of lines 13 & 14, view NNW to line 14, which runs on the far side and almost parallel to the lake, 2 March 2012.

Figure 67. Line 16 flying B to A, view W, 2 March 2012.
QEQ South Region: HIGH-density stratum, transects (not all) in order flown

**Figure 68.** Line 16 flying B to A, view SW, 2 March 2012.

**Figure 69.** Line 19 flying B to A, taken at start B-point, view W, 7 March 2012.
South Region: HIGH-density stratum, transects (not all) in order flown

Figure 70. Line 19 flying B to A, view SW, 7 March 2012.

Figure 71. Line 18 at start A-point, flying A to B, view E, 7 March 2012. High angled slopes as depicted here, confound estimating distances to the caribou, specifically for observer(s) on the down-slope side where the terrain rapidly falls away.
QEQ South Region: HIGH-density stratum, transects (not all) in order flown

Figure 72. Line 18 flying A to B, view NE, 7 March 2012.

Figure 73. Line 17 start B-point, flying B to A, view WSW, 7 March 2012.
QEQ South Region: HIGH-density stratum, transects (not all) in order flown

Figure 74. Line 17 flying B to A, approaching A-point, view WSW, 7 March 2012.

Figure 75. Line 28 just after start B-point, flying B to A, view W, 7 March 2012. Gorge in background was steep sided and deep. Maintaining the 40m altitude above ground requires skillful piloting of the helicopter, specifically when ambient wind direction and velocity can change abruptly.
QEQ South Region: HIGH-density stratum, transects (not all) in order flown

Figure 76. Line 28 flying B to A, view NW down and out the gorge to fjord, 7 March 2012.

Figure 77. Line 28 flying B to A, approaching A-point, view SW, 7 March 2012.
QEQ South Region: HIGH-density stratum, transects (not all) in order flown

Figure 78. Line 7 flying B to A, rocky outcrops were typical, view WSW, 7 March 2012.

Figure 79. Line 3 near start A-point, flying A to B, view SE, 7 March 2012.
QEQ South Region: HIGH-density stratum, transects (not all) in order flown

Figure 80. Line 3, large and small boulders scattered everywhere were typical for much of this transect line, and reduced caribou sightability, flying A to B, view ESE, 7 March 2012.

Figure 81. Line 2, start at B-point, flying B to A, view NW, 7 March 2012.
QEQ South Region: HIGH-density stratum, transects (not all) in order flown

Figure 82. Line 2 at A-point end, view S across the ‘flats’, 7 March 2012.

Figure 83. Line 1, just east of B-point end, view N across the ‘flats’ from the Frederikshåb Isblink, 7 March 2012.
Figure 84. Line 10, flying B to A, at start B-point, view SW, 7 March 2012. Terrain drops sharply away from the 0-line on left side of helicopter.

Figure 85. Line 10 flying B to A, view SW, 7 March 2012.
Figure 86. Line 22, solar glare as flying B to A, close to start B-point, view SW, 7 March 2012.

Figure 87. Line 22, solar glare as flying B to A, close to end A-point, view SW, 7 March 2012.
Line 24 flying A to B, close to the start A-point, view NE, 7 March 2012.

There were many feeding craters ca. 14 caribou (not visible) foraging along these south-facing rocky ridges that have little snow cover.
QEQ South Region: HIGH-density stratum, transects (not all) in order flown

Figure 90. Line 24 flying A to B, top view NE, bottom view SE, 7 March 2012. Large glacial erratics (boulders) above, and rugged terrain below, reduce caribou sightability.
Figure 91. Line 27 flying B to A, top view W, mid and bottom views SW, 7 March 2012. Sun-in-eyes required polarized sunglasses & plus dark shadows reduced caribou sightability.
Figure 92. Line 32 flying B to A, views to SW, 8 March 2012.
QEQ South Region: HIGH-density stratum, transects (not all) in order flown

**Figure 93.** Line 31 flying B to A, view directly W on 0-line, 8 March 2012.

**Figure 94.** Line 31 flying B to A, two (2) caribou on near ridge centre photo, view S, 8 March 2012.
Figure 95. Line 29 just after start A-point, flying A to B, 9 caribou centre, view N, 8 March 2012.

Figure 96. Line 29, flying A to B, view E, 8 March 2012.
Figure 97. Line 30, flying A to B, view E along 0-line, 8 March 2012.

Figure 98. Line 30, flying A to B, view S from 0-line, 8 caribou and tracks, 8 March 2012.
QEQ South region: LOW-density stratum, transects (not all) in order flown

Figure 99. Line 4 flying B to A, view WNW, 7 March 2012.

Figure 100. Line 4 flying B to A, view WNW, 7 March 2012.
QEQ South region: LOW-density stratum, transects (not all) in order flown.

Figure 101. Line 5 flying A to B, view SE, 7 March 2012.

Figure 102. Line 5, approaching end –point, flying A to B, view SE, 7 March 2012.
QEQ South region: LOW-density stratum, transects (not all) in order flown

Figure 103. Line 6 flying B to A, view WNW, 7 March 2012.

Figure 104. Line 6, flying B to A, nearing end A-point, 2 caribou feeding on steep slope (right of centre photo), view WNW, 7 March 2012.
Appendix 13

Preferred foraging was on south-facing slopes or on flats and valley bottoms. Mountainside slope angle reflects actual, because camera was held horizontal.

![Caribou feeding craters in snow, 1-12 March 2016.](image)

Figure 105. Caribou feeding craters in the snow on south-facing slopes in the Ameralik LOW-density stratum along eastern portion of line 37, 3 March.
Figure 106. Caribou feeding craters in the snow on south-facing slopes in the Ameralik LOW-density stratum along eastern portion of line 37, 3 March. In top photo, three caribou can be seen at the bottom centre.
Caribou feeding craters: Ameralik LOW-density stratum

Figure 107. Caribou feeding craters in the snow on south-facing slopes in the Ameralik LOW-density stratum along eastern portion of line 37, 3 March.
Caribou feeding craters: Ameralik HIGH-density stratum

Figure xx. Line 44, caribou feeding craters, Ameralik HIGH density stratum, 8 March.

Figure 108. Line 43, caribou feeding craters along rocky slope of lake shore, Ameralik HIGH density stratum, 8 March.
Caribou feeding craters: Ameralik HIGH-density stratum

Figure 109. Line 42, caribou feeding craters over entire slope, four (4) caribou right of centre, Ameralik HIGH density stratum, 8 March.

Figure 110. Line 48, caribou feeding craters, Ameralik HIGH density stratum, 8 March.
Caribou feeding craters: Ameralik HIGH-density stratum

**Figure 111.** Nunatarsuaq, line 60, caribou feeding craters over entire sunny slope, five (5) caribou centre, six (6) caribou upper left but still in sunlight, Ameralik HIGH density stratum, 9 March.

**Figure 112.** Nunatarsuaq, line 60, caribou feeding craters throughout rocky rough terrain, Ameralik HIGH density stratum, 9 March.
Caribou feeding craters: Ameralik HIGH-density stratum

Figure 113. Nunatarsuaq, line 60, mother with calf centre, feeding over entire rocky area, Ameralik HIGH density stratum, 9 March.

Figure 114. Nunatarsuaq, line 60, caribou feeding craters over most of valley bottom and south facing slopes, Ameralik HIGH density stratum, 9 March.
Caribou feeding craters: Ameralik HIGH-density stratum

**Figure 115.** Nunatarsuaq, line 60, caribou feeding craters over entire slope, two (2) caribou, one up left of centre, the other just above flat snow in lower right quadrant, Ameralik HIGH density stratum, 9 March.

**Figure 116.** Nunatarsuaq, line 60, foraging spots cover entire slope, four (4)caribou in a line, 2 at centre, then 1 left and 1 right of centre, Ameralik HIGH density stratum, 9 March.
Caribou feeding craters: Ameralik HIGH-density stratum

Figure 117. Nunatarsuaq, line 59, caribou feeding craters spread out over valley, four (4) caribou bottom right, Ameralik HIGH density stratum, 9 March.

Figure 118. Nunatarsuaq, line 58, caribou feeding craters spread out over valley, Ameralik HIGH density stratum, 9 March.
Caribou feeding craters: Ameralik HIGH-density stratum

Figure 119. Nunatarsuaq, line 58, caribou feeding craters spread across steep slope, Ameralik HIGH density stratum, 9 March.

Figure 120. Nunatarsuaq, line 58, caribou feeding craters spread across rocky slope, seven (7) caribou centre (4 cows + 3 calves), Ameralik HIGH density stratum, 9 March.
Caribou feeding craters: Ameralik HIGH-density stratum

Figure 121. Nunatarsuaq, line 58 at eastern end, mother with calf, centre, have foraged over much of this slope, Ameralik HIGH density stratum, 9 March.

Figure 122. Nunatarsuaq, line 57, four (4) caribou, lower right of centre, have foraged valley bottom, Ameralik HIGH density stratum, 9 March.
Caribou feeding craters: Ameralik HIGH-density stratum

Figure 123. Line 51, caribou have foraged much of this steep slope, Ameralik HIGH density stratum, 9 March.

Figure 124. Line 51, caribou feeding craters and foraging around rocks, Ameralik HIGH density stratum, 9 March.
Caribou feeding craters: Aneralik HIGH-density stratum

Figure 125. Line 50, caribou have foraged much of this steep slope, Aneralik HIGH-density stratum, 9 March.

Figure 126. Line 50, caribou in rocky slope right of centre, Aneralik HIGH density stratum, 9 March.
Caribou feeding craters: Ameralik HIGH-density stratum

Figure 127. Line 50, caribou have foraged much of this steep slope, Ameralik HIGH density stratum, 9 March.

Figure 128. Line 50, caribou have foraged much of this steep slope, Ameralik HIGH density stratum, 9 March.
Caribou feeding craters: Ameralik HIGH-density stratum

**Figure 129.** Line 50, caribou have foraged much of this rocky slope, Ameralik HIGH density stratum, 9 March.

**Figure 130.** Austmannadalen valley bottom and slopes, line 49, shrubs are abundant and the caribou forage extensively among them. Six (6) caribou appear centre photo, Ameralik HIGH density stratum, 9 March.
Caribou feeding craters: Qeqertarsuatsiaat

**Figure 131.** Line 4, caribou feeding craters on very steep slopes with six caribou left of helicopter shadow centre photo, QEQ Low density stratum, 7 March.

**Figure 132.** Line 30, caribou feeding craters, very steep slopes, QEQ High density stratum, 7 March.
Appendix 14
Sun in one’s eyes & fog/icing of helicopter windows 2012
Despite polarized sunglasses solar glare could reduce caribou sightability, as did window fog/icing.

Figure 133. Solar glare looking into the Naujat Kuat south of line 37B-point, view S, 3 March.

Figure 134. Sun in one’s eyes on line 2 below Grædefjord, view S, 7 March.
Sun in one’s eyes & window fog/icing reduce caribou sightability

Figure 135. Despite our best efforts window fog was fast forming and could obscure vision and reduce caribou sightability. There are two caribou just left of centre in this foggy photo. One is visible, the other less so.

Figure 136. The combination of dark shadows and window icing could reduce caribou sightability. There are three caribou in the shadow centre photo. If not detected now, once behind the iced window they would not likely be seen.
Sun in one’s eyes & window fog/icing reduce caribou sightability

**Figure 137.** A clear example of window icing obscuring observer viewing of the terrain.

**Figure 138.** Window icing with markings where recently removed. There are three caribou at little to the right of centre photo entering the last small snow patch under the top of the hill in the foreground, 8 March.
Appendix 15
How difficult is it to spot caribou?
Small group size (median 3) combined with transect conditions and topography make caribou sightability typically poor. Further, not all flee the helicopter but remain stationary. All photographs are original size, ≥ 6MB.

Figure 139. Dark shadows can make caribou difficult to detect, above are two caribou in lower left on line 6, and below are six at centre photo on line 27, 7 March.
How difficult to spot a caribou?

Figure 140. Caribou are difficult to see in dark shadowed areas despite snow cover, above on line 47 are four caribou approaching top of ridge ahead, below on line 48 are two caribou centre photo, one standing, one lying, 8 March.
How difficult to spot a caribou?

Figure 141. At the edge between dark shadows and sunlight spotting caribou can be difficult. This was on line 46. Above are two caribou at centre photo, below are two caribou at left low centre just in front of the shadow, 8 March.
How difficult to spot a caribou?

**Figure 142.** Willows backgrounds on line 45 make group of 13 caribou and another pair invisible (upper centre and left upper centre respectively) although both were well within 500 m of the helicopter, 8 March.

**Figure 143.** The ‘Salt & Pepper’ background in the valley on line 45 renders 12 caribou (centre right) and another group of three (centre photo) invisible, although they are <1 km of the helicopter, 8 March.
How difficult to spot a caribou?

Figure 144. Even bright sunshine is of little help for spotting the three groups of caribou in this rocky terrain on line 24. There are eight just to the right and below centre. Three are below the 2nd rocky outcrop above and somewhat to the right. The final three are beyond that outcrop on the snow and to the right again. All groups were within 500 m of the helicopter and relatively stationary, 7 March.

Figure 145. Rocky terrain on line 30 hides two groups. Six caribou are at low centre, and another 11 are far right of centre, 8 March.
How difficult to spot a caribou?

Figure 146. The topography of the region is rough. Caribou present on the transect lines must be detected early before they disappear from sight. On line 27 a group of three caribou are vanishing over the rocky ridge at right of centre photo, 7 March.

Figure 147. Again on line 27, the rocky terrain hides one caribou among the rocks ca. ½ way right of centre, 7 March. It is standing still and looking over its shoulder at the helicopter.
How difficult to spot a caribou?

Figure 148. Single caribou that stand without moving are not easily detected, whether in mountainous terrain line 22 above, or on flats line 45 below, 7-8 March. Both these caribou are almost centre photo.
How difficult to spot a caribou?

Figure 149. Conditions like these promote observer fatigue and lack of concentration. There are two caribou in each photo, 8 March. Both images are from line 44. In photo above, they are just over centre. In the photo below, they are slightly left of centre.
How difficult to spot a caribou?

\textbf{Figure 150}. Conditions like these on line 60 make detecting caribou difficult. In the above photos, there are five (5) caribou a smidgen left of centre among rocks, below is a cow with calf. They are also a smidgen left of centre near the big boulder, 9 March.
How difficult to spot a caribou?

**Figure 151.** This rocky slope on line 60 has been well foraged. There are two (2) caribou, one just above centre and the other, which remained stationary as we flew past, is in lower right just above ‘flat’ relatively untouched snow, 9 March.

**Figure 152.** This is a well foraged rocky slope on line 60. There are four (4) caribou strung out in a line mid-photo, two are at centre, one is ahead to the right and one lags behind to left, 9 March.
How difficult to spot a caribou?

**Figure 153.** There are four (4) caribou centre photo among the rocks at the top of the slope they had been foraging, line 59, 9 March.

**Figure 154.** Seven (7) caribou are just below the top of the ridge ½-way right of centre, 9 March.
How difficult to spot a caribou?

**Figure 155.** Sun in one’s eyes makes sighting the 11 caribou difficult, line 52, 9 March. The 11 caribou are in a line on the hill just a smidgen right of centre photo.

**Figure 156.** Sun in one’s eyes makes it difficult to sight the 2 caribou, mother & calf, which had foraged this rocky slope and were up in the dark shadow under the flare, line 54, 9 March.
How difficult to spot a caribou?

Figure 157. Austmannadalen, even sparse willows hide the two (2) caribou well, a smidgen up and right of centre. These remained stationary as we flew past, line 49, 9 March.

Figure 158. Austmannadalen willows hide the two (2) caribou well, a cow with calf ½-way to left of centre. These remained stationary as we flew past, line 49, 9 March.