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AERIAL SURVEYS OF BRANT COLONIES ON YUKON DELTA NWR IN 2005



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Aerial surveys at four black brant colonies on the Yukon-Kuskokwim Delta--Kokechik Bay (KB), Tutakoke River (TR), Kigigak Island (KI), and Baird Inlet Island (BI) were conducted on 6-7 June. As in 2004, a vertically mounted Kodak SLR/c digital still camera replaced the dual digital video cameras used in earlier surveys. This camera, which has a photo sensor equivalent to the area of 35 mm film, sampled non-overlapping 0.19-hectare quadrats through a hole in the floor of a Cessna-206 aircraft. With the exception of the camera used, sampling protocol was similar to that of recent years and systematically spaced flight lines were established along the long axis of all colonies, as in 2003 and 2004. An external Global Positioning System (GPS) receiver was interfaced with a laptop computer via the serial ports to record the location of transects and the moving aircraft on the computer monitor. A second GPS receiver was

interfaced with the digital camera to record the latitude and longitude of each image. These data along with GPS altitude, time-date, and photographic information were stored internally with each image (see 2004 report for details). Surveys were conducted under high overcast to bright sun at all colonies, which provided mostly favorable lighting conditions. Transects were spaced at 150-350 m intervals depending on the size of the colony. We flew at 152 m AGL with the lens focal length set to 104 mm. This produced images about 53 m wide and 35 m high, which covered about 70 percent of the area photographed in 2004 and produced higher resolution images that were easier to interpret. Flight speed was 133-177 km/hr over all colonies. KB, TR, KI, and BI required 1:18 (hours:minutes), 1:08, 0:39, and 1:07, respectively, from start of first transect to end of last transect. Compared to 2004, additional time was required at KB and TR due to extremely turbulent flying conditions, requiring us to interrupt filming on the first day. Also, reduction of the area covered per image required collecting more images at all colonies to obtain the desired sampling effort. Ground-truthing searches were conducted at KB, KI, and TR.

GPS locations, which were stored with images created by the camera in exchangeable image file (Exif) format, were plotted on digitized topographic maps with MIPS (Map and Image Processing System) geographical information system. Total area in each colony was determined with the planimeter function in MIPS from GPS locations recorded during flight. Area sampled by each transect was computed based on altitude and the focal length of the lens used.

Image files were first converted from Kodak's proprietary format (.dcr) to a compressed format (.jpg) for viewing on a computer with a MATLAB image-processing program on a 43-cm monitor. Digitized images of known nests from previous years and nests from the current year were displayed as background on the computer monitor as a reference to image scale and

appearance of different postures of birds in the video images. Because the images recorded with the digital still camera (4500 x 3000 pixels) covered about 44 times the area of video images (640 x 480 pixels), the images were viewed in sub-areas that were approximately equivalent to 1.2 times that of a video image. This additional viewing area was judged to be better for interpreting image content and had the added advantage of reducing processing time. Transect number, image file name, sub-area being viewed, and observation codes were recorded automatically to file whenever an observer manually entered a two-digit observation code. In addition to recording observations of brant, cackling Canada geese, emperor geese, white-fronted geese, and eiders, boot tracks at BI and KB, as well as motorized vehicle tracks at KB, were noted. All image files with nests of brant, cackling Canada geese, emperor geese, white-fronted geese, and eiders were saved on compact disk. Processing time of imagery was less than in years that I used video cameras because, unlike videotape that required manual digitization, the images recorded by the digital still camera were converted to a viewable format automatically by the computer. As previously mentioned, the ability to view sub-areas larger than video images also contributed to less processing time. Other efficiencies in processing survey data resulted from the easily retrieved information stored in Exif format with each image (e.g., file name, time, latitude-longitude, altitude).

The nest estimate at KB this year increased compared to 2004 (Table 1), when excessive human activity occurred in the colony. Counts of ATV and boot tracks indicated a decrease in human activity in the brant colony. Before this year, boot tracks were observed in 30 images in 2001 and 34, 160, and 166 in 2002-2004, respectively. This year, 120 images with boot tracks were counted. Probably more importantly, ATV tracks were observed only 5 times this year in

sub-areas equivalent to video images compared to 88 in 2004. However, numbers at KB are still below the average of 6893 ± 902 nests from 1995-2000, which argues for further reduction in disturbance by humans at this colony. Also, contributing to lower numbers of nests at KB was the occurrence of flooding of nests within 300 m of the shoreline, as evidenced by displaced down and eggs seen during ground-truthing. Undisturbed nests were found among flooded ones indicating that flooding probably occurred early in nest initiation. Estimated number of nests at BI also was higher than last year, despite evidence of continued human activity in the colony. Boot prints were observed 122 times in images, compared to 176 observations of boot prints in equivalent areas in 2004, 70 in 2003, 138 in 2002, and 144 in 2001. Based on observations by resident biologists at TR, fox predation was heavy during nest initiation and early in incubation. As in recent years, most nests (55%) counted in images from TR were located between Tutakoke River and Kashunuk River even though this area is about 20% of the total area surveyed. KI, where eight foxes were trapped to reduce predation on eider nests, had the greatest number of nests among all colonies, as in 2004. The trend in the annual mean of estimates continues to be negative despite the improved success this year (Fig. 1).

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Table 1. Estimates from photographic aerial surveys of brant nests at five colonies--Tutakoke River (TR), Kokechik Bay (KB), Baird Island (BI), Kigigak Island (KI), and Baird Peninsula (BP)--on Yukon Delta National Wildlife Refuge from 1998 to 2005.

COLONY	ANNUAL ESTIMATE								S.E.							
	1998 ²	1999 ¹	2000	2001 ²	2002 ²	2003 ²	2004 ²	2005 ²	1998	1999	2000	2001	2002	2003	2004	2005
TR	3,448	4,100	7,437 ²	1,212	4,524	1,622	2,704	2,977	292	96	584	73	314	79	153	205
KB	5,655	4,072	8,021 ²	3,677	4,634	655	1,996	3,985	471	74	866	215	362	52	116	177
BI	2,747	1,777	4,088 ¹	3,604	3,052	3,202	2,759	4,093	264	80	324	198	199	135	160	256
KI	3,105	3,962	4,286 ¹	1,721	4,380	2,474	3,284	4,728	238	402	647	107	255	118	208	213
BP	1,431	448	1,962 ¹	421	2,708	547	1,687	---	169	81	142	36	147	46	76	---
TOTAL	16,386	14,359	25,749	10,635	19,298	8,500	12,430	17,470 ³								

¹ Estimates based on Lincoln-Petersen analysis of counts by two observers.

² Estimates based on correction factors from ground-truthed transects.

³ 2004 Baird Peninsula estimate included in total.

Figure 1. Linear trend of annual mean (yellow line) of estimates of numbers of nests from photographic surveys at five brant colonies--Tutakoke River (TR), Kokechik Bay (KB), Baird Island (BI), Kigigak Island (KI), and Baird Peninsula (BP)--on Yukon Delta National Wildlife Refuge from 1992 to 2005.

