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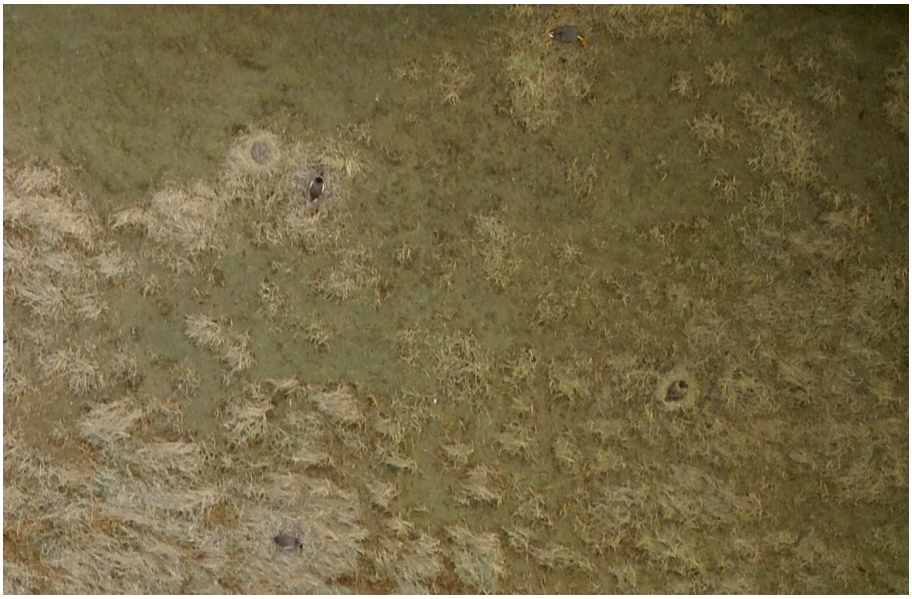
Preliminary Results

AERIAL SURVEYS OF BRANT COLONIES ON YUKON DELTA NWR IN 2006



R. Michael Anthony
Alaska Science Center
USGS – Biological Science Office
1011 East Tudor Road
Anchorage, Alaska 99503

Aerial surveys at four black brant colonies on the Yukon-Kuskokwim Delta--Kokechik Bay (KB), Tutakoke River (TR), Kigigak Island (KI), Baird Peninsula (BP), and Baird Inlet Island (BI) were conducted on 11-12 June. This year two vertically mounted Kodak SLR digital still cameras replaced the single digital camera used in 2004 and 2005. Using two cameras allowed collecting more photographs per transect, reducing the time required to sample the colonies. Image-stabilizing lenses were used on the cameras to reduce the degradation of image quality by vibration and forward motion of the aircraft. The cameras were set to the maximum shutter speed possible with an aperture of f2.8, 105-mm focal length, and focused to infinity. This focal length produced images about 42 x 28 m (12 mm/pixel resolution), which covered a

smaller area than in 2005, but yielded higher quality images. A serial cable connected the camera to a GPS receiver, which recorded the latitude-longitude in the image files. The cameras, which has a photo sensor equivalent to the area of 35 mm film, sampled non-overlapping 0.12-hectare quadrats (vs 0.19-hectare in 2005) through holes in the floor of a Cessna-206 aircraft. With the exception of the additional camera and better lenses, 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 2003-2005. 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 separate GPS receiver was interfaced with each 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 heavy clouds, which provided mostly favorable lighting conditions at KI, BI, and BP, but poorer lighting conditions and variable image quality at KB and TR. Transects were spaced at 150-350 m intervals depending on the size of the colony. We flew at 122 m AGL. Flight speed was 137-162 km/hr over all colonies. KB, TR, KI, BI, and BP required 3:6 (hours:minutes), 1:18, 0:54, 2:24 and 0:53, respectively, from start of first transect to end of last transect. Additional time was required at KB and BI due to waiting for lighting conditions to improve at KB and technical problems at BI, requiring us to interrupt filming and land the aircraft. 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 ArcMap geographical

information system. Total area in each colony was determined with the GIS planimeter function used to outline 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 20 sub-areas that were each approximately equivalent to 2.2 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. 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 and motorized vehicle tracks were counted at KB. No measure of human activity was attempted at BI this year because a USFWS field crew was working there. All image files with nests of brant, cackling Canada geese, emperor geese, white-fronted geese, and eiders were saved on compact disk. A new observer was employed to count nests.

Total nests for all colonies combined was similar to 2005 (Table 1). Because of the much later start at collecting imagery, about 63% of the photographs from TR had been viewed at the time that this report was delivered; estimates from all other colonies are based on complete

counts. At KB human activity was reduced and numbers of nests increased. Before this year, boot tracks were observed in 30 images in 2001 and 34, 160, 166, and 120 in 2002-2005, respectively. This year, no boot tracks were counted. Snow machine tracks in mud were seen in 3 images and only old ATV tracks were seen in 2 images. There were no signs of nest predation or flooding at KB in the area searched for ground-truthing photographs. Based on a partial analysis of the photos from TR, numbers of nests was up from 2005. At TR where fox predation was heavy locally in 2005, nineteen arctic foxes were removed in April. Observations of foxes by resident field crews and nest predation was reduced from 2005. At KI eight foxes were trapped, as in 2005. Estimated number of nests was about 17% lower than in 2005 at KI. To a lesser extent, BI also had fewer nests. BP had fewer than half the number nests than when last surveyed in 2004. The trend in the annual mean of estimates continues to be negative (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 1992 to 2006.

COLONY	ANNUAL ESTIMATE (S.E.)													
	1992	1993	1994	1995	1997 [2]	1998 [2]	1999 [1]	2000	2001 [2]	2002 [2]	2003 [2]	2004 [2]	2005 [2]	2006 [2]
TR	4,600 [2] (202)	4,937 [2] (190)	4,807 [1] (400)	5,596 [2] (297)	4,588 (554)	3,448 (292)	4,100 (96)	7,437 [2] (584)	1,212 (73)	4,524 (314)	1,622 (79)	2,704 (153)	2,977 (205)	3,714 [4] (286)
KB	6,134 [2] (295)	4,667 [1] (577)	6,978 [2] (196)	7,573 [2] (351)	9,144 (1092)	5,655 (471)	4,072 (74)	8,021 [2] (866)	3,677 (215)	4,634 (362)	655 (52)	1.996 (116)	3,985 (177)	5,280 (341)
BI	3,258 [1] (347)	4,156 [1] (357)	4,461 [1] (454)	4,720 [1] (474)	1,944 (242)	2,747 (264)	1,777 (80)	4,088 [1] (324)	3,604 (198)	3,052 (199)	3,202 (135)	2,759 (160)	4,093 (256)	3,628 (262)
KI	3,440 [1] (154)	1,727 [2] (90)	2,260 [2] (92)	---	4,776 (595)	3,105 (238)	3,962 (402)	4,286 [1] (647)	1,721 (107)	4,380 (255)	2,474 (118)	3,284 (208)	4,728 (213)	3,920 (240)
BP	2,157 [1] (151)	614 [1] (77)	2,441 [1] (142)	2,591 [1] (184)	2,259 (282)	1,431 (169)	448 (81)	1,962 [1] (142)	421 (36)	2,708 (147)	547 (46)	1,687 (76)	---	793 (61)
TOTAL	19,589	16,101	20,947	22,740 [3]	22,711	16,386	14,359	25,749	10,635	19,298	8,500	12,430	17,470 [3]	17,335

[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.

[4] 2006 Tutakoke River estimate based on 63% of the images analyzed.

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 2006.