

**BODY CONDITION OF PACIFIC BLACK BRANT (*BRANTA BERNICLA NIGRICANS*): USING THE ABDOMINAL PROFILE INDEX (API) AS A MEASURE OF FAT ACCUMULATION DURING SPRING MIGRATION IN BRITISH COLUMBIA.**

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**Abstract:** Each spring, roughly 25% of the Pacific Flyway Brant Population (*Branta bernicla nigricans*) stages in the Strait of Georgia, British Columbia. From 1999 to 2004, we used the abdominal profile index (API) as a surrogate of body condition to measure fat accumulation. Mean API scores differed significantly across years for the two most important staging sites in B.C. In the Parksville-Qualicum area, scores were relatively high in 1999 and 2000 and did not differ but scores were significantly lower in each of the following four years (2001-2004 inclusive). On the Fraser River delta, scores in 2001 were significantly lower than in 2000. The lower API scores in the years 2001-2004 could be due to a reduction in food resources or to an increase in disturbance rates.

Each spring, Pacific Herring (*Clupea pallasii*) spawn in the Strait and one of the largest, traditional spawning events occurs near the Parksville-Qualicum area. Brant forage intensively on the eggs when present. However, a preliminary examination of the spawn data suggests that the relationship between spawn biomass and mean API scores is weak or non-existent.

Disturbance rates to Brant in the Strait are among the highest recorded globally for Arctic geese, with the largest single source of disturbance being Bald Eagles (*Haliaeetus leucocephalus*). Eagle numbers have been increasing at 8% per year and both eagle and human disturbance rates have increased over the period 1999-2004.

To manage spring staging Brant in B.C., we need a better understanding of the relationships between: 1) staging variables of individual body condition, timing of migration and length of stay, 2) staging variables and food (eelgrass abundance, herring spawn) availability and rates/sources of disturbance, and finally 3) staging variables and fitness (annual survival and reproductive rates).

## EFFECTS OF VARIABLE CROWBERRY PRODUCTION ON AUTUMN-STAGING CACKLING GEESE

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**Abstract:** We examined the effects of spatial and temporal variation in berry yield of crowberry (*Empetrum nigrum*) on autumn-staging cackling geese (*Branta hutchinsii*) on the Izembek National Wildlife Refuge, Alaska. We measured pre-staging berry abundance at 53-66 randomly located 50 x 50 m plots from 1999-2002. We revisited plots after geese had been on the refuge for approximately six weeks and measured berry offtake and goose fecal densities. Annual pre-staging berry yield ranged from 12 berries/m<sup>2</sup> (SE 3.3) to 205 berries/m<sup>2</sup> (SE 15.6). Berry abundance varied spatially and fecal densities of geese were highest in areas where berry production was also high. Based on relationships between goose fecal density and berry removal, geese consumed up to 45% of the berry crop in years of good berry production. We collected 183 cackling geese over three years and contrasted daily rates of lipid deposition between years of good and poor berry production.

## **BODY COMPOSITION DYNAMICS IN PACIFIC BLACK BRANT, *BRANTA BERNICLA NIGRICANS*, WINTERING IN ALASKA AND BAJA CALIFORNIA.**

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**Abstract:** Understanding energetic costs associated with migration distance and wintering location is vital in predicting how birds will respond to changing environmental conditions including, global climate change and habitat destruction. We compared carcass, skin, and pectoralis muscle composition for Brant collected concurrently during fall, winter and spring of 2002-2003 in Alaska and Baja California, Mexico. We measured lipid, protein and ash in body tissues to assess the effects of two divergent wintering strategies: 1) to remain in an unstable and harsh environment or 2) to migrate long distances to a stable and mild environment. Body protein increased over winter for Brant in Alaska and remained stable for birds in Baja California. Protein in the pectoralis muscle and skin remained stable at both sites. Body lipids decreased over winter for Alaskan birds and increased for Mexican birds. Changes in body lipid reflected those of pectoralis muscle, skin, and carcass. The increase in lipid likely fuels long distance migration for Brant wintering in Mexico. Increases in protein may reflect reproductive readiness of Brant wintering in Alaska. The differential deposition of nutrients reflects the magnitude and timing of energetic costs associated with winter location.

## MIGRATORY BEHAVIOUR OF EASTERN CANADIAN HIGH ARCTIC LIGHT-BELLIED BRENT GEESE TRACKED USING SATELLITE TELEMETRY

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**Abstract:** Almost the entire breeding population of East Canadian High Arctic Light-bellied Brent Geese *Branta bernicla hrota* winter in Ireland, migrating through Greenland and Iceland. This species remains one of the least studied Western Palaearctic species. Given its conservation importance and relatively small and vulnerable population, a number of flyway initiatives have been undertaken to secure the species' conservation. These include the development on a Single Species Action Plan under the African-Eurasian Waterbird Agreement (AEWA) and an accompanying research programme aimed at developing our understanding of the species in wintering, staging and breeding areas. Here we report on the migration of nine Eastern Canadian High Arctic Light-bellied Brent Geese *Branta bernicla hrota*, tracked in 2002 and 2004 using satellite telemetry. Transmitters were attached in Icelandic spring staging areas and the migration followed to Canadian breeding grounds; the autumn migration to Iceland was followed in 3 birds and 2 on the return to Irish wintering grounds. This paper reports on the migratory routes, use of staging sites and migration phenology of tracked individuals during autumn and spring migrations. The telemetry study has provided important information underpinning the flyway-wide conservation of the species, including the identification of important staging areas. The project also had a enormous impact in raising public awareness about the species and wider wetland/waterfowl conservation.

## SNOW GEESE WINTERING IN SOUTHWEST LOUISIANA USE TWO DISTINCT HABITATS – IS THERE EVIDENCE FOR SEPARATE POPULATIONS?

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**Abstract:** Lesser snow geese wintering in southwest Louisiana historically were only found in coastal marshes, but began inhabiting rice-prairies after the 1940s. Snow geese collected in coastal marshes have larger bills and larger bodies than do snow geese in rice-prairies; thus, individuals in the two habitats possibly are separate populations (Alisauskas 1998). An alternative hypothesis states that snow geese sample and select foraging habitats in relation to their body size (Alisauskas 1998). We tested these hypotheses by neck-banding snow geese in both habitats, and constructing *a priori* models representing both hypotheses in MARK. Candidate models had fixed movement probabilities ( $\Psi$ ). We also built intermediate models ( $\Psi$ : 0.4; 0.5; 0.6), wherein non-movement and movement between the 2 habitats had roughly equal probabilities. We used Akaike's Information Criterion ( $\Delta\text{QAIC}_c$ ) to test our models against an unconstrained (global) model. The intermediate model  $\Psi=0.4$  fit better to our movement data ( $\Delta\text{QAIC}_c=9.4$ ) than did 3 models for habitat selection ( $\Psi\geq 0.9$ ) and 3 models for separate populations ( $\Psi\leq 0.1$ ), which had  $\Delta\text{QAIC}_c > 125$  and  $\Delta\text{QAIC}_c > 39$ , respectively. Our results suggest that snow geese in southwest Louisiana comprise one population, and indicate that habitat sampling is common and body size seemingly represents differential competitive abilities.

## POPULATION STRUCTURE AND MIGRATION CHRONOLOGY OF WINTERING BRANT BLACK

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**Abstract:** Understanding population structure at wintering and staging areas is important for effective management of Pacific Black Brant (*Branta bernicla nigricans*). We used resightings of brant marked in summer at widely separated breeding areas to examine breeding population and age distribution of brant during winter and spring migration. Study sites were spread across the entire nonbreeding range of brant, Alaska to Baja California. Brant that wintered in the north (Oregon to Alaska) were more likely to originate from northern breeding areas (low and high Arctic Canada), whereas wintering birds in the south (Mexico) were more likely to be from southern breeding areas (Western Alaska and Chukotka Peninsula, Russia). Winter distribution of juveniles was also disproportionate among areas. For example, in Mexico, a larger proportion of juveniles were found in the north where habitat conditions are more favorable. During spring migration from Mexico, brant that nested in southern breeding areas were the first to move north, reflecting the earlier nesting phenology of these birds. The slight geographic and temporal variation in distribution of the breeding populations should be considered when managing this species.

## **ESTIMATING VOLUMES OF BLACK BRANT (*BRANTA BERNICLA NIGRICANS*) DURING SPRING MIGRATION USING LONG-TERM DATASETS.**

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**Abstract:** Differences in migration timing and stopover duration among individuals may complicate the estimate of a sub-population's size as it transits a critical staging area. Yet, such estimates are essential since the importance of staging habitats is often measured by the volume of birds using such sites. Estimating volume requires incorporation of estimates of arrival and stopover duration with a time series of abundance assessments for the staging site. Using Program MARK, transition probabilities can be generated conditional upon the arrival time and stopover duration for these transiting populations. These probabilities can then be incorporated with abundance assessments in models designed to estimate volumes and their associated uncertainties.

The Parksville-Qualicum (PQ) area on the East Coast of Vancouver Island, British Columbia, hosts a large annual spring northern migration of Black Brant (*Branta bernicla nigricans*). Here we have used abundance and leg-band observation data collected over 16 years in the PQ area each spring from 1989-2004. Our volume estimates provide a clearer understanding of the importance of this staging area to the Pacific Flyway Brant Population. Researchers and managers will be able to identify trends in the number of Brant using this site to aid in conservation planning for this rapidly changing landscape.

## WINTER DISTRIBUTION OF GREATER WHITE-FRONTED GEESE IN THE INTERIOR HIGHLANDS OF MEXICO

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**Abstract:** Declining abundance of greater white-fronted geese (*Anser albifrons*) that nest in Northwest and Interior Alaska prompted a study of their winter status and ecology in the Interior Highlands of Mexico where many winter. During 5 winters (1998-2002), we surveyed 156 wetland areas in 8 states of the Interior Highlands from the International border at Chihuahua southward  $\geq 1,400$  km into the states of Jalisco and Michoacan. All wetlands were surveyed one or more times by air and/or ground. Combining various surveys, we recorded white-fronts at 75 wetland areas in 6 states: Chihuahua (19), Durango (14), Zacatecas (31), San Luis Potosi (6), Aguascalientes (1), and Jalisco (4). Only 24 of the 75 areas have been included in traditional Fish and Wildlife Service January aerial waterfowl surveys. During our most extensive survey (Dec 1999), we recorded >27,700 white-fronts at 55 areas in 5 states distributed as follows: Chihuahua-35%, Durango-37%, Zacatecas-21%, San Luis Potosi-5%, and Jalisco-2%. Only 12 areas held >1,000 white-fronts during 1 or more surveys with largest flocks found at Laguna de Santiaguillo, Durango (5,500), Laguna Tejanero (4,975) and Laguna de Babicora (2,250), Chihuahua. Wintering geese from the Pacific Population predominated in northern Chihuahua, whereas western Mid-continent Population geese were mainly found further south in the Highlands. Neck collar observations and band recoveries that we collected revealed >90% originated from Northwest and Interior Alaska.