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Whimbrel tracked with satellite transmitter on migratory flight across North America

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Two disjunct breeding populations of Whimbrel *Numenius phaeopus* have been described in the western hemisphere (American Ornithologists' Union 1983). The western population breeds in portions of Alaska and across the Yukon and Northwest Territories of Canada while the eastern population breeds west and south of Hudson Bay (Skeel & Mallory 1996). Most of what we believe we know about the migratory pathways of these populations has been pieced together from circumstantial evidence gleaned from decades of field observations (Skeel & Mallory 1996, Taverner 1942). The populations have been thought to have separate migratory routes with little mixing where the western and eastern populations were confined to the Pacific and Atlantic Coasts, respectively. Here we present evidence of a transcontinental migration route that brings portions of the two Whimbrel populations into contact during spring migration.

We captured 26 Whimbrels between 30 April and 20 May 2008 within the barrier island-lagoon system of the lower Delmarva Peninsula in Virginia (37°39'S, 75°87'W). Birds were captured using rocket nets set on known loafing or roosting sites in cordgrass *Spartina alterniflora* marshes.

We fitted birds with Incoloy® tarsal bands on the right leg and yellow color bands over alpha-numeric green flags on the left leg. All birds captured were in adult plumage and varied in mass between 360 and 645 g ($X \pm S.E. = 480 \pm 14.6$). One Whimbrel captured on 20 May was fitted with a satellite transmitter or PTT (Platform Transmitter Terminal). The PTT used in this study was a 9.5 g, solar-powered unit produced by Microwave Telemetry Inc (Columbia, MD). We glued the transmitter to a larger square of neoprene to give it elevation above the body and to prevent the bird from preening feathers over the solar panels. We attached the transmitter using a modification of the leg-loop harness (Rappole & Tipton 1991, Sanzenbacher *et al.* 2000). Instead of elastic cord, we used Teflon® ribbon (Bally Ribbon Mills, Bally, PA) that was fastened with brass rivets (Fig. 1).

The bird was located using satellites of the National Oceanic and Atmospheric Administration and the European Organization for the Exploitation of Meteorological Satellites with onboard tracking equipment operated by Collecte Localisation Satellites (CLS America, Inc., Largo, MD) (Collecte Localisation Satellites 2008, Fancy *et al.* 1988). The



Fig. 1. Platform Transmitter Terminal (PTT) attachment on a Whimbrel that was captured along the lower Delmarva Peninsula in Virginia on 20 May 2008. Note neoprene base, Teflon® harness, and brass rivet used for PTT attachment and PTT position on synsacrum.

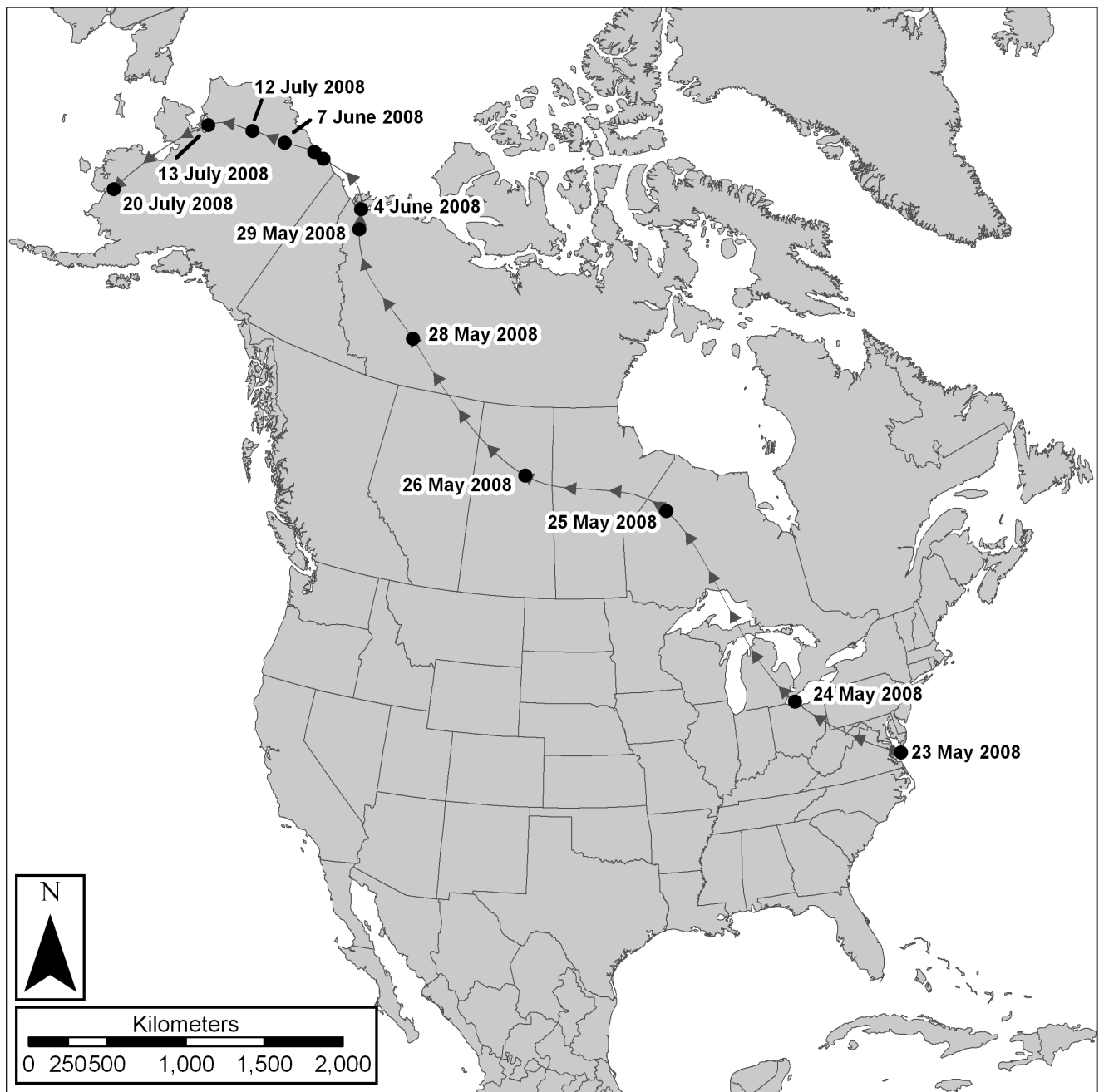


Fig. 2. Transcontinental migration route of a Whimbrel tagged in the lower Delmarva Peninsula in Virginia on 20 May 2008 that moved to the north slope of Alaska by 7 June 2008.

transmitter was programmed to operate with a duty cycle of 24 h off and 5 h on. Locations in latitude and longitude decimal degrees, date, time, location error, activity sensor data, and other data were received from CLS America within 24 hr of satellite contact with the PTT. Locations were estimated by the ARGOS system (www.argos-system.org). The system estimates location using a Doppler shift in signal frequency, and calculates a probability distribution within which the estimate lies. The standard deviation of this distribution gives an estimate of the location accuracy and assigns it to a “location class” (LC): LC3 = <150 m, LC2 = 150–350 m, LC1 = 350–1000 m, LC0 > 1000 m, LCA, B, and Z = no location accuracy. We received 10–15 locations per reporting period and plotted the highest quality of these (LC = 1–3) using ArcGIS 9.2 (Environmental Systems Research Institute Inc., Redlands, CA) for analysis.

The Whimbrel left Virginia on 23 May 2008, flew northwest, skirted around the foothills of the Rocky Mountains to the Beaufort Sea, around the Brooks Range and on to the north slope of Alaska (Fig. 2). We believe that the first leg of this migration between the Virginia and the upper MacKenzie River was completed without refueling. The bird flew 5,057 km in no more than 143 hr and 24 min resulting in an average flight speed of 35.3 km/h. This is likely an underestimate of the flight speed since 8 AM was the last location reported on the day the bird left the study area. Birds typically depart from this site in the late afternoon as has been reported for Whimbrel within other staging areas (e.g. Piersma *et al.* 1990). Similarly, we do not know the exact time of arrival on the MacKenzie River. Given the average flight speed attained, there would have been little opportunity to refuel during this leg of the migration.

After arriving on the MacKenzie River, the bird appeared to have staged for a short period and then moved to breeding grounds (Fig. 2). For 5 days between 29 May and 4 June the bird stayed within a 30 km² area along the MacKenzie River. After this period, the bird moved down river to the Beaufort Sea, turned west along the coast and reached the Colville watershed in Alaska on 7 June. Locations were tightly grouped in an area less than 4 km² for 35 days between 7 June and 11 July. On 12 July, the bird left the watershed and had reached the village of Noorvik near the western coast of Alaska by 13 July. The bird moved south along the coast and had reached the Kuskokwim River by 19 July.

Documentation of this flight suggests that a portion of the western population may undergo an elliptical migration route and overlap with the eastern population along the south Atlantic Coast of North America. For most of western North America, the Rocky Mountains and Brooks Range to the north form a tremendous barrier for birds migrating along the Pacific Coast. After leaving the East Coast, the bird tracked here oriented north-west past the Great Lakes, west until reaching these mountains and then flew over lower elevation lands along their eastern margin. This migration pathway may help to explain how Whimbrel arrive in the portion of the breeding distribution for the western population that lies within the MacKenzie Watershed east of this barrier.

Our study area along the lower Delmarva Peninsula in Virginia has been believed to represent a terminal staging area for Whimbrel along the Atlantic Coast. Bird numbers increase dramatically from mid-April through mid-May (Watts and Truitt, unpubl. data) before departing overland to the Northwest. It has been assumed that all of the Whimbrel staging here were from the Hudson Bay breeding population and peak surveys have been used, in part, to estimate the size of this population. Our findings presented here suggest that

both Virginia and the MacKenzie River may play important roles as staging areas for a portion of the western breeding population. These findings also suggest that the use of peak surveys from this or other sites along the Atlantic Coast may overestimate the size of the Hudson Bay population. Work is needed to separate the relative importance of the Atlantic region to both of these breeding populations.

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