Common Loons (*Gavia immer*) Wintering off the Louisiana Coast Tracked to Saskatchewan during the Breeding Season

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Abstract.—Common Loon (*Gavia immer*) migration pathways have been previously identified using resightings, band recoveries, and satellite tracking with platform terminal transmitters, but there remains much to be learned. No band recoveries or resightings of Common Loons from Louisiana have been documented to date, and it is unclear where Common Loons from this region migrate and breed. On 29 March 2011, as part of a pilot study, we implanted two platform terminal transmitters in Common Loons wintering off the Louisiana coast. Both individuals migrated to Saskatchewan, Canada. Previous research using satellite telemetry on migrating Common Loons in the western USA states (Nevada and Montana) showed they migrated to Saskatchewan, but wintered at Lake Mead, Nevada, the Gulf of California and the Pacific Ocean. Our findings are of interest as Common Loons from the same breeding area in Saskatchewan overwinter in different regions of North America. *Received 15 February 2013, accepted 24 May 2013.*

Key words.—Common Loon, Deepwater Horizon oil spill, *Gavia immer*, Gulf of Mexico, migration, satellite transmitter, wintering loons.

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The Common Loon (*Gavia immer*) is a long-lived (> 25 years) bird with a broad geographical distribution in North America: across Canada, Alaska and the northern contiguous states of the USA. They breed in freshwater lakes and winter on the Pacific and Atlantic Coasts, including the Gulf of California and Gulf of Mexico. This species typically occupies inshore waters, but may range up to 100 km offshore across the continental shelf (Lee 1987; Haney 1990; Kenow *et al.* 2002). Currently, no subspecies are recognized despite broad variation in multiple morphological characteristics (Evers *et al.* 2010). Geographic variation is smoothly clinal with interior breeding populations in the upper Great Lakes and central Canada being the smallest, and size increasing to the east and west from there (Rand 1947; Anderson *et al.* 1970; Storer 1988; Evers *et al.* 2010). Connectivity between breeding and wintering areas has been fairly well established (Kenow *et al.* 2002, 2009; Evers *et al.* 2010), but one area that has no banding recovery data is Louisiana. The state supports a moderate population of wintering Common Loons (Evers 2007), and it became important to know where they summer/breed in response to the potential environmental impacts of the Deepwater Horizon Oil Spill. The objective of our pilot study was to link the wintering and breeding locations of Common Loons from coastal Louisiana.

Methods

Wintering Common Loons were captured on 29 March 2011 in Adams Bay, Louisiana (29° 22' 48.0" N, 89° 43' 8.4" W) using night-lighting techniques (Evers 1993). A specially trained wildlife veterinarian surgically implanted 60-g satellite platform transmitter terminals (PTTs) with percutaneous antennas into the coelomic cavities following the procedure detailed in Mulcahy and Esler (1999). The condition and health of each bird were evaluated by physical examination before a decision was made to implant the transmitter. The surgeries were conducted in a climate-controlled room under sterile conditions and completed in < 1 hr. After surgery, each loon was given a subcutaneous injection of a sterile electrolyte solution, held in a net-bottomed container, and observed for 4-5 hr to make sure they had fully recovered (demonstrating control of head and neck and an ability to assume an alert posture). Birds were released at the site of capture 8 hr later. Prior to release, each loon was banded with a U.S. Geological Survey aluminum band and a unique combination of colored leg-bands, weighed, and measured (leg, bill, and wing). Surgical techniques, as well as care and handling of loons, were done in compliance with the Animal Welfare Act (United States Department of Agriculture 2013).

The transmitters were programmed with an 8-hr-on and 16-hr-off duty cycle. Data were transferred to and location estimates were acquired using Argos (Argos

2011). We only used location classes 3, 2, and 1 that represented positional accuracies of < 250 m, 250-500 m, and 500-1500 m, respectively, for spring and summer. Beginning in September, however, the signals weakened so we used location classes 0, A, and B, which have a wider error.

RESULTS

We caught two loons on 29 March 2011: one male (3,900 g) and one female (3,000 g). The spring and fall migration routes of both birds, including temporal and stopover locations, are listed in Tables 1 and 2, respectively. Both individuals migrated to Saskatchewan. The male took a more direct route than the female, covering 3,840 km in 36 days (11 April-17 May), while the female flew northeast to Chesapeake Bay, Maryland, before orienting northwest, covering 4,538 km in 36 days (7 May-12 June) (Fig. 1). The male's northward migration consisted of a series of 2-day flights (11-12 April, 21-22 April, 8-9 May) followed by a period of several days (Range = 4-15) in which the bird did not fly (Table 2). Each 2-day migration movement was > 950 km. In each case, the flight on the first day was considerably longer than the second day flight (in temporal sequence: 725 km and 234 km; 782 km and 214 km; and 909 km and 176 km). The male stopped at the following water bodies: 1) J. Percy Priest Reservoir, Tennessee (surface area = 57 km^2); 2) Lake Michigan (surface area = 57,750 km^2); and 3) Lake St. Martin, Manitoba (surface area = 345 km^2). The male remained at an unnamed lake in Saskatchewan for approximately 3 months (mid-May-mid August; Table 1), suggesting it was at least paired and may have bred. The timing and route of its fall migration was uncertain because its PTT signal went undetected from 9 August-9 November (the signal was detected again on 10 November, at which point the loon was already over eastern Penn-

Figure 1. Migratory routes from PTT transmitters deployed in Common Loons captured at Flathead Lake, Montana (1999; Confederated Salish and Kootenai Tribes 2008), and the Louisiana Coast (2011).

Table 1. Spring and fall migration routes with location and flight distance estimates between locations for a male Common Loon caught in Adams Bay, Louisiana, on 29 March 2011.

Date	Location	Distance (km)	Length of Stay (days)
29 Mar	Adams Bay, Louisiana	0	12 [a]
11 Apr	Pine Lake, Tennessee	725	1
12 Apr	J. Percy Priest Reservoir, Tennessee	234	9
21 Apr	Lake Pewaukee, Wisconsin	782	1
22 Apr	Lake Michigan (Green Bay), Wisconsin	214	15
8 May	Lake Winnipeg, Manitoba	909	1
9 May	Lake St. Martin, Manitoba	176	4
13 May	Cedar Lake, Manitoba	192	2
15 May	Big Sandy Lake, Manitoba	544	1
16 May	McDowell Lake, Manitoba	22	1
17 May	Unnamed lake, Saskatchewan (58° 2' 3.06" N, 104° 6' 32.35" W)	42	1
	Total Northward Migration:	3,840 km	36 days
17 May-7 Jul	Unnamed lake, Saskatchewan (58° 2' 3.06" N, 104° 6' 32.35" W)	Possibly breeding?	
7 Jul-8 Aug	Lost signal, no transmissions	?	
8 Aug	Unnamed lake, Saskatchewan (58° 7' 5.71" N, 104° 5' 24.22" W)	9	
8 Aug-10 Nov[b]	Lost signal, no transmissions	?	
?-10 Nov[b]	Philadelphia, Pennsylvania	2,900+	
10 Nov[b]	Pensacola Beach, Florida	1,516	
11 Nov[b]	Horn Island, Mississippi	144	
12 Nov[b]	Bayou Biloxi, Louisiana	123	
14 Nov[b]	Adams Bay, Louisiana	51	
	Total Southward Migration:	4,734 km	? days

[a]Not included in the total number of migration days for this individual since northward migration had not yet begun.
[b]Total fall migration route and timing are uncertain because the PTT signal was too weak to decode position data from August through early November; even when the bird reached a lower latitude, Argos was barely able to decode the positions again as the bird's transmitter battery continued to weaken.

sylvania). The bird was tracked over the next several days; on 14 November, it returned to its capture location in Adams Bay (Table 1; Fig. 1). The transmitter ceased transmission in March 2012 for unknown reasons.

Whereas the male departed 2 weeks after PTT implantation, the female remained in the Gulf of Mexico for a total of 5 weeks (departed on 7 May). Unlike the male that flew due north, the female flew northeast toward the Atlantic Coast (Table 2; Fig. 1). Her 2-day movement, reaching the upper Chesapeake Bay, Maryland, was 34.3% longer than any 2-day flight for the male (1,457 km vs. 1,085 km). The female had only one long stopover (> 7 days) compared to the male, which had two. The female reached her final destination on 12 June at Churchill Lake, Saskatchewan, after covering 4,538 km.

Compared to spring migration (36 days), the fall migration was protracted, lasting approximately 2-2.5 months. The female had two long stopover visits. The first one lasted nearly a month at Lake Ontario and the second one was just over a month in Chesapeake Bay. She retraced her spring migration route and returned on 17 November to Adams Bay (where she was captured and released 7.5 months previously). The transmitter ceased transmission in March 2012 for unknown reasons.

DISCUSSION

Our satellite data show that at least some Common Loons wintering in coastal Louisiana also summer in Saskatchewan. This is of interest for a number of reasons. Prior

Table 2. Spring and fall migration routes with location and flight distance estimates between locations for a female Common Loon caught in Adams Bay, Louisiana, on 29 March 2011.

Date	Location	Distance (km)	Length of Stay (days)
29 Mar-16 Apr	Adams Bay, Louisiana	0	18[a]
16 Apr	Offshore, Alabama	80	20[a]
7 May	Buckhorn Reservoir, North Carolina	1,126	1
8 May	Patuxent River, Maryland	331	10
18 May	Lake Erie (east end)	531	3
21 May	Lake Huron (eastern end)	256	1
22 May-2 Jun	Short flights northwest	360	11
2 Jun	Lake Winnipeg (south end), Manitoba	995	1
3 Jun	Lake Winnipeg (central area), Manitoba	187	1
4 Jun	Cedar Lake, Manitoba	126	4
8 Jun	Cumberland Lake, Saskatchewan	205	4
12 Jun	Churchill Lake, Saskatchewan (56° 9' 12.24" N, 108° 14' 39.84" W)	341	
	Total Northward Migration:	4,538 km	36 days
13-28 Jun	Churchill Lake, Saskatchewan (56° 9' 12.24" N, 108° 14' 39.84" W)		
29 Jun-12 Aug	Series of unnamed lakes	southeast	
13 Aug-1 Sep	Cedar Lake, Manitoba	693	8
2 Sep	Lake Superior	1,019	2
4 Sep	Lake Huron	454	3
7 Sep	Lake Ontario	476	25
2 Oct	Patuxent River, Maryland	685	5
7 Oct	Chesapeake Bay, Maryland	34	33
11 Nov	New Hanover, North Carolina	449	2
12 Nov	Ogeechee River Delta, Georgia	425	1
13 Nov	Offshore, Destin, Florida	624	2
15 Nov	Off Chandeleur Island, Louisiana	227	1
16 Nov	Bayou Biloxi, Louisiana	60	1
17 Nov	Adams Bay, Louisiana	65	
	Total Southward Migration:	5,211 km	126 days

[a]Not included in the total number of migration days for this individual since northward migration had not yet begun.

to this pilot study, it was shown that Common Loons in Saskatchewan overwinter on the Pacific Ocean, Gulf of California, and Lake Mead, Nevada (Yates *et al.* 1999; Confederated Salish and Kootenai Tribes 2008). These new data show that some loons from the same breeding area winter in different ocean basins of North America, and raise the question whether these birds are part of the same breeding population. Currently, the American Ornithologists' Union does not recognize any subspecies of Common Loons. Furthermore, we do not know if they exhibit assortative mating. An incomplete genetic profile of Common Loons across North America indicates small, but potentially significant genetic differences between eastern and central/western populations of North America (McMillan *et al.* 2004). However, it is unknown at this time whether unique alleles exist among populations.

Common Loons are diurnal migrants, and adults typically migrate before subadults. Flights may include thousands of irregularly spaced individuals or migrants may fly in small groups (McIntyre 1975; Winter and Morlan 1977; Kelling 1996). It is unknown what portion of loon migration is under genetic control and how much is socially facilitated. It appears some juveniles born in

Saskatchewan migrate southeast and others migrate southwest. Also, it is unclear why the male in this pilot study took a more direct and shorter route (40%) than the female to the Chesapeake Bay, especially given that loons have one of the highest wing-loading ratios of any breeding bird in North America (2.45 g/m^2) (Poole 1938; McIntyre 1988). Common Loons exhibit high site fidelity and take several years to reach reproductive maturity. The earliest known breeder was a 4-year old (Evers 2001; W. Piper, pers. commun.). The great majority of loon chicks are not observed on or near their natal lake until their third summer (60%; W. Piper and M. Meyer, pers. commun.). Thus, subadults use other waterbodies during this interval. We have a few summer observations of second and third year loons along the Atlantic Coast (P. Spitzer, pers. commun.) and the Great Lakes (Gostomski and Evers 1998). Loons are infrequently observed during the summer in the Gulf of Mexico, and it appears most individuals have moved out by early to mid-April (Kratter 2009). The ages of loons for this study were unknown. It is possible the male and female spent their second summers on Lake Michigan and the Chesapeake Bay, respectively, areas they may have visited during their first fall migration, which may have led to their distinct migration patterns.

Lastly, because loons from the same area potentially interbreed, but winter in different ocean basins, this at least opens the possibility and concern about the spread and transmission of avian diseases from one basin to the other (Tracey *et al.* 2004; Hill *et al.* 2012).

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