

**Sea Duck Joint Venture
Annual Project Summary
FY 2017 – (October 1, 2016 to Sept 30, 2017)**

Project Title: Migration patterns, habitat use, and harvest characteristics of long-tailed ducks wintering on Lake Michigan.

Principal Investigator(s):

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Partners: USFWS, SDJV; Long Point Waterfowl; Environment Canada; Wisconsin Waterfowl Association; Delta Waterfowl; Wisconsin Waterfowl Hunters' Conference; Bill Cook Chapter and Wisconsin State Division of the IWLA; Illinois Federation for Outdoor Resources.

Project Description:

This project is expected to address information needs concerning population delineation, migration, and ecology of long-tailed ducks (LTDU) wintering in the Great Lakes. Long-tailed ducks marked on the Atlantic Coast and eastern Great Lakes regions have shown very little use of western Great Lakes, however there is a sizable LTDU population that winters on Lake Michigan. We proposed to capture and radio-mark 20 adult female LTDUs during November 2015 through April 2017, in anticipation of obtaining data from ≥ 12 adult females for one entire year. Over-water mist netting and night-lighting techniques were employed to obtain the sample of birds for this project.

Objective:

The goal of the project is to determine temporal and spatial patterns of migration, breeding ground affiliations, and fidelity to wintering areas of long-tailed ducks wintering on Lake Michigan. Specific objectives are to:

1. Radio-mark an adequate number (estimated at 20) of adult female LTDUs wintering on Lake Michigan with Platform Transmitter Terminals (PTTs) to ensure that an effective sample of ≥ 12 survive and provide location data for at least one full year. Deploy additional transmitters, if necessary, to obtain a minimum of 12 PTTs that collect data for a minimum of one year.
2. Characterize movements and habitat use of radio-marked LTDUs.
3. Additional components of the study include evaluations of food habits and harvest characteristics of LTDUs wintering on Lake Michigan.

Preliminary Results:

Capture

We conducted capture from 27 October -25 November 2016 (18 night-lighting attempts), 18-22 February 2017 (4 night lighting attempts), 11-24 March 2017 (5 night-lighting attempts), and 2 May 2017 (1 night lighting attempt). Forty-five LTDUs were captured during these efforts, consisting of 17 after second year (ASY) males, one second year (SY) male, 13 hatch year (HY) males, two ASY females, two SY females, and 10 HY females. Several capture opportunities of HY and male LTDUs were passed, as they were not the target sex or age class, and/or ASY females were being targeted in the flock but not captured. Of the captured birds, two ASY females, four ASY males, one SY male, and one HY male were implanted with satellite transmitters.

Capture success during FY 2017 (average capture rate of 1.61 LTDUs per night over 28 capture nights) fell slightly below that experienced during our spring 2015 pilot work (average capture rate of 2.00 LTDUs per night over 7 capture nights), but well above that experienced in FY 2016 (average capture rate of 0.36 LTDUs per night over 19 nights). We attribute this increase in success from FY 2016 to FY 2017 to the following reasons: (1) the use of aerial infrared thermal imagery at night (utilized in fall 2016) to locate large concentrations of LTDUs; (2) radio-marking a subsample (n=5) of males, termed “Judas” birds, with transmitters programmed to transmit at noon and midnight, providing detailed information on movements throughout Lake Michigan; (3) increased time near the study site, allowing quick access when weather conditions were conducive for capture; and (4) increased knowledge gained from conducting hunter harvest surveys from 1 November to 4 December 2016. Aerial infrared thermal imagery has been the most useful tool for increasing capture of LTDUs on Lake Michigan. Capture efficiency increased from an average of 0.67 LTDUs per night (33 capture nights), to an average of 2.10 LTDUs per night (21 capture nights) when capture crews were directed by an aerial crew collecting thermal imagery.

Migration and movements of LTDUs radio marked on Lake Michigan

Satellite transmitters were implanted in ten LTDUs that were captured on Lake Michigan during March, April, October, November 2016 and March 2017 (Table 1). Of the ten deployed transmitters, five were programmed to provide migration information (duty cycle=2 hrs on:72hrs off), while the other five were programmed as “Judas” birds (duty cycle=2 hrs on:10hrs off). As of 1 August 2017, PTT-ID 158804 was transmitting regularly, PTT-ID 158806 was transmitting intermittently, PTT-IDs 146129 and 158806-1 were confirmed mortalities, and PTT-IDs 146126, 146127, 146128, 146131, 146132, and 158807 had lost transmissions due to transmitter failure, battery depletion, or unconfirmed/unknown mortality. Six birds (PTT-IDs 146126, 146128, 146131, 146132, 158804, 158806) provided location information for greater than 60 days. Three female LTDUs (PTT-IDs 146126, 158804, 158806; Table 2) have provided information on spring migration chronology and breeding ground affiliations. An SY female, PTT-ID 146126 radio marked in April 2016, has provided location information for a full migration cycle (Figure 1), while two ASY females, PTT-IDs 158804 and 158806 radio marked in November 2016, have only provided spring migration chronology and breeding ground affiliations (Figures 2 and 3, respectively). Three “Judas” LTDUs (PTT-IDs 146128, 146131, 146132) provided detailed location and movement information while on Lake Michigan (Figure 4), but only provided two spring migration locations; PTT-ID 146131 utilized Hudson Bay between Marcopeet Islands and Sleeper Islands and PTT-ID 146132 utilized James Bay southwest of Akimiski Island.

Data from radio-marked LTDUs, particularly “Judas” birds, have provided insight into the daily movements and seasonal patterns of LTDUs on Lake Michigan. Long-tailed ducks appear to move away from the shoreline at night (Figure 5), and those movements can vary in distance on any given night (Figure 6). Additionally, LTDUs tended to move from the northern end to the southern end of Lake Michigan as winter progressed, and then back to the northern end and Green Bay in spring, before departing for the breeding grounds (Figure 7). This pattern is consistent with findings from aerial surveys conducted on Lake Michigan.

Food Habits

A total of 57 LTDU carcasses were donated by hunters for food habits analysis in November and December 2016. Ten of 57 (18%) had visible food items present in the esophagus when the esophagus was removed. Esophageal contents will be examined for food items, and items determined to the lowest possible taxonomic level in fall 2017. Prey species present in the esophagus will be compared to prey items determined using Next Generation Sequencing (NGS) techniques, from swab samples collected from the esophagus, small intestine, and cloaca. Results from food habits analyses (both esophageal and NGS) are anticipated in fall 2017.

Hunter Harvest

A systematic, in person, hunter survey was conducted from Seagull Marina, in Two Rivers, WI from 1 November to 4 December 2016. The survey was conducted from 08:00 to 14:00, for 21 days of the 60-day hunting season. Hunters were present on 15 (71%) survey days, and a 100% response rate was received on the 119 attempted surveys. Twelve groups were missed due to high traffic or not falling within the survey time frame. From the survey, there were a total of 361 hunters accounting for a total harvest of 1,422 waterfowl. Of that total, 1,383 (97%) were LTDUs and 31 (2%) were scoter species (24 white-winged scoters and seven black scoters). Hunters reported that 173 total birds were not recovered, accounting for a wounding loss [birds wounded and unable to retrieve / (birds wounded and unable to retrieve + birds killed and retrieved)] of 10.8%. Sex composition of harvested LTDUs was 848 (61%) males and 535 (39%) females. However, hunters admitted difficulty in identifying the difference among juvenile males, juvenile females, and adult females and grouped them together in the female category, inflating the number of harvested females. From the survey we found that hunters spent approximately four hours hunting and averaged 3.83 LTDUs per hunter per day. This harvest rate is higher than those reported for all ducks throughout the state of Wisconsin, as reported through the Harvest Information Program (HIP) data, which was estimated at 1.31 and 1.16 ducks per hunter per day for 2014 and 2015 respectively.

Project Status:

During the 2016/17 capture period, we were successful at capturing and deploying transmitters in five males, to act as “Judas” birds, along with two adult females and one adult male to document migration corridors and breeding ground affiliations. Information collected from radio marked individuals, with transmitters lasting for ≥ 60 days, has provided information on the movements of LTDUs on Lake Michigan and information regarding breeding ground affiliations, as well as migration timing and corridors.

Funding from FY 2016/17 has been carried over to support a capture effort in 2017/18. It is anticipated that 12 transmitters will be available and we plan to deploy them in adult females during this effort. We feel that the 2016/17 capture effort was much improved from the 2015/16 effort, and hope to build on those successes and gained knowledge for the 2017/18 field season. Additional funding sources (i.e., grants and scholarships) will also be sought to supplement project funds.

We plan to capture and radio-mark 12 adult female LTDUs during October 2017 through April 2018. Prey items comparison for esophageal and NGS data should be complete by November 2017. Hunter harvest data will continue to be analyzed and possibly collected during the 2017 season. A final thesis by Luke Fara, on the migration of three ASY females, movement patterns of “Judas” birds on Lake Michigan, and food item comparison is anticipated by May 2018.

Project Funding Sources (US\$).

USGS	Other U.S. federal contributions	SIU	Grants or Scholarships – Received From	In kind field assistance (volunteer #'s and total hours)
\$69,382	\$52,224 SDJV	\$15,000	\$1,000 - Wisconsin Waterfowl Hunters' Conference \$3,000 - Wisconsin Division of the IWLA \$1,000 – Illinois Federation for Outdoor Resources \$200 – Lakeshore Chapter of Wisconsin Waterfowl Association	18 Volunteers totaling 273 hours

Table 1. Long-tailed ducks radio-marked on Lake Michigan in March, April, October, November 2016 and March 2017.

PTT ¹ -ID	Sex	Age ²	Capture location	Capture date	Duty cycle	Transmission duration (days)	Comments
158806-1	Female	ASY	Two Rivers, WI	11-Mar-16	2 hrs on: 72 hrs off	4	Mortality signal 15-Mar-16; PTT recovered 17-Mar-16
146126	Female	SY	Seul Choix Point, MI	28-Apr-16	2 hrs on: 72 hrs off	188	Last transmission 2-Nov-16; possible PTT failure
146127	Male	ASY	Two Rivers, WI	29-Oct-16	2 hrs on: 10 hrs off	17	Last transmission 15-Nov-16; possible PTT failure
146128	Male	ASY	Two Rivers, WI	29-Oct-16	2 hrs on: 10 hrs off	184	Last transmission 1-May-17; battery likely depleted
146129	Male	HY	Two Rivers, WI	29-Oct-16	2 hrs on: 10 hrs off	13	Mortality signal 11-Nov-16; remains found; PTT not recovered
146131	Male	SY	Two Rivers, WI	29-Oct-16	2 hrs on: 10 hrs off	213	Last transmission 30-May-17; battery likely depleted
146132	Male	ASY	Two Rivers, WI	4-Nov-16	2 hrs on: 10 hrs off	219	Last transmission 11-June-17; battery likely depleted
158804	Female	ASY	Two Rivers, WI	4-Nov-16	2 hrs on: 72 hrs off	270+	Transmitting regularly
158806	Female	ASY	Two Rivers, WI	21-Nov-16	2 hrs on: 72 hrs off	225+	Intermittent transmissions; last transmission 4-Jul-17
158807	Male	ASY	Two Rivers, WI	16-Mar-17	2 hrs on: 72 hrs off	1	Last transmission 17-Mar-17; possible transmitter failure

¹ PTT Platform Transmitter Terminal (satellite transmitter).

² HY Hatch Year, SY Second Year, and ASY After Second Year; determined by bursal measurement (females), presence of sheathed penis (males), and/or plumage characteristics.

Table 2. Sequential dates and locations for long-tailed ducks implanted with PTTs, which have provided migration information.

PTT-ID	Wintering	Spring staging areas	Breeding	Fall staging areas	Following year wintering areas
146126	29 Apr 16 - 15 May 16 (Lake Michigan [29 Apr-15 May 16])	18 May 16 - 09 Jun 16 (James Bay [18 May-21 May 16]; Hudson Bay [24 May-09 Jun 16])	12 Jun 16 - 01 Sep 16 (~60 km south southwest of Karrak Lake, Nunavut, Canada)	04 Sep 16 - 18 Oct 16 (Queen Maud Gulf [04 Sep-07 Sep 16]; Storis Passage [10 Sep-13 Sep 16]; Victoria Strait [17 Sept 16]; James Ross Strait [20 Sep-29 Sep 16]; Hudson Bay [02 Oct-05 Oct 16]; James Bay [08 Oct-18 Oct 16])	27 Oct 16 - 02 Nov 16 (Lake Michigan [27 Oct-02 Nov 16]; <i>transmission lost</i>)
158804	05 Nov 16 - 18 May 17 (Lake Michigan [05 Nov 16-18 May 17])	21 May 17 - 30 May 17 (Ontario [21 May 17]; Hudson Bay [24 May-30 May 17])	02 Jun 17 - 16 Jul 17 (~175 km north northwest of Baker Lake, Nunavut, Canada)	25 Jul 17 - 01 Aug 17 (Adalaide Peninsula, Nunavut, Canada [25 Jul-01 Aug 17])	
158806	22 Nov 16 - 15 May 17 (Lake Michigan [22 Nov 16]; Green Bay [23 Nov-06 Dec 16]; Lake Michigan [09 Dec 16-15 May 17])	24 May 17 (Ontario [24 May 17])	27 Jun 17 - 04 Jul 17 (~35 km south of Yathkyed Lake, Nunavut, Canada)		

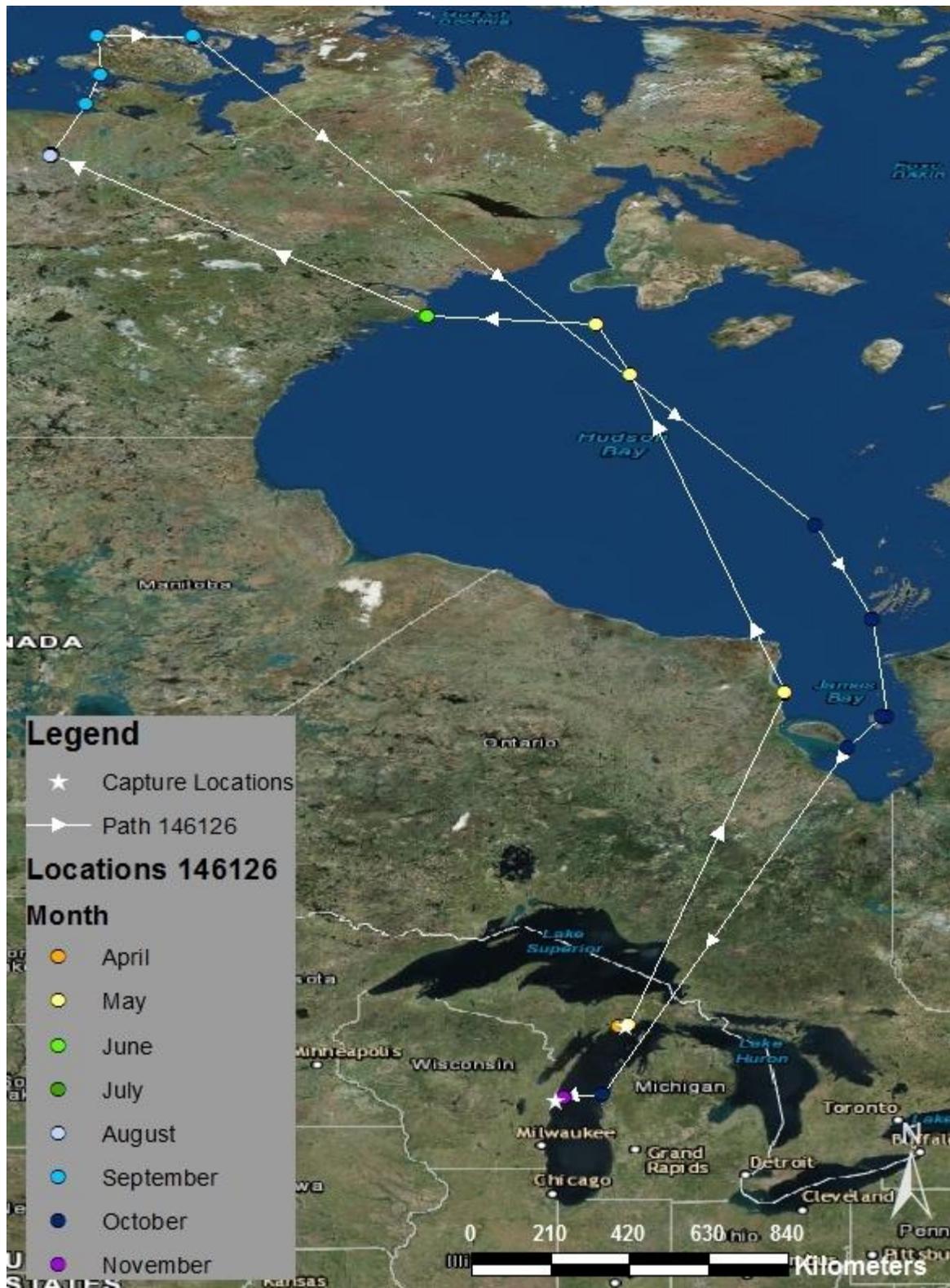


Figure 1. Complete migratory route of a second year female long-tailed duck (PTT ID 146126) radio-marked in April 2016. All locations have an Argos precision index location class greater than or equal to one ($LC \geq 1$).

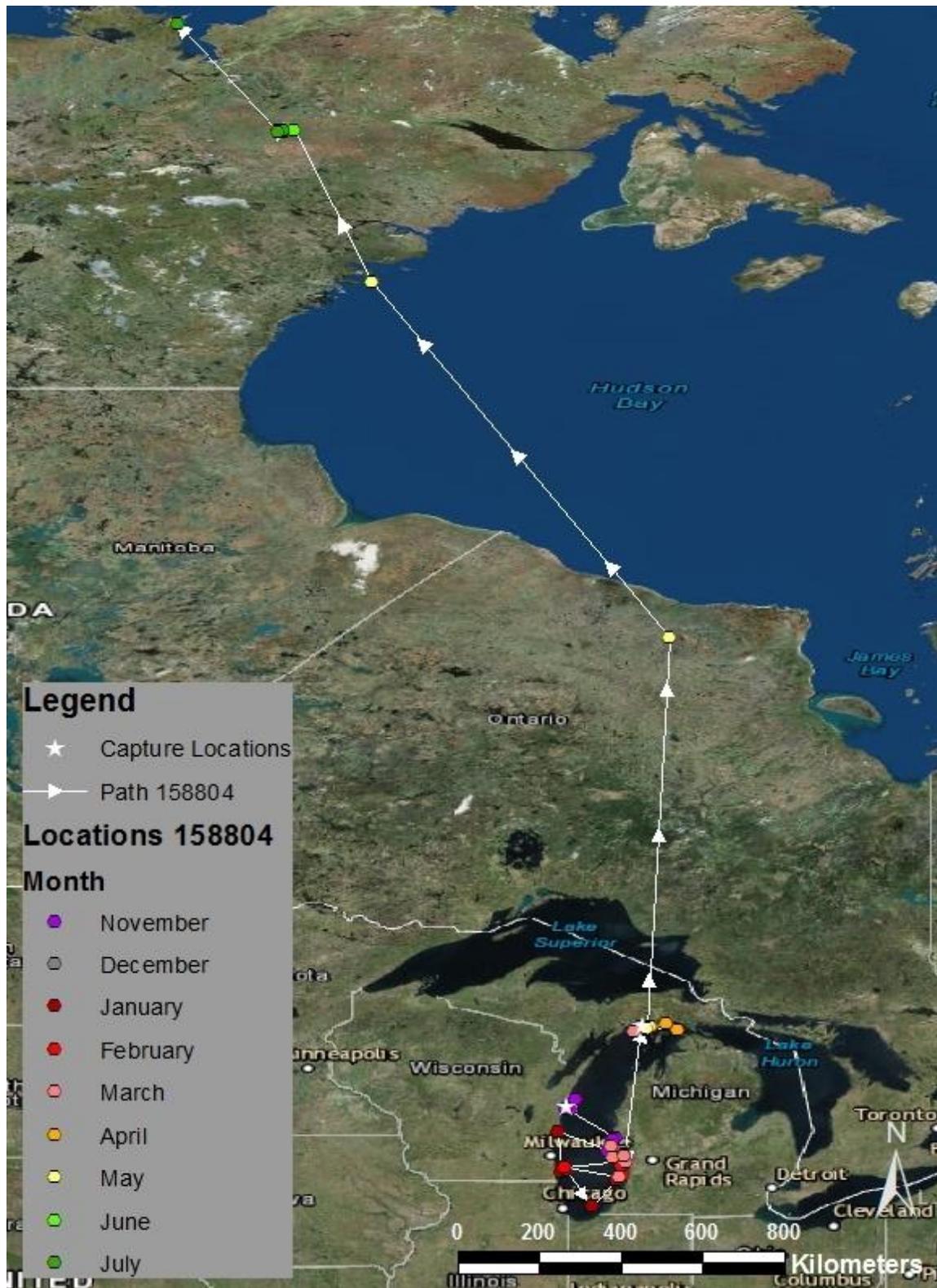


Figure 2. Winter movements and spring migratory route of an after second year female long-tailed duck (PTT ID 158804) radio-marked in November 2016. All locations have an Argos precision index location class greater than or equal to one ($LC \geq 1$).



Figure 3. Winter movements and spring migratory route of an after second year female long-tailed duck (PTT ID 158806) radio-marked in November 2016 (intermittent transmissions since March 2017). All locations have an Argos precision index location class greater than or equal to one ($LC \geq 1$).

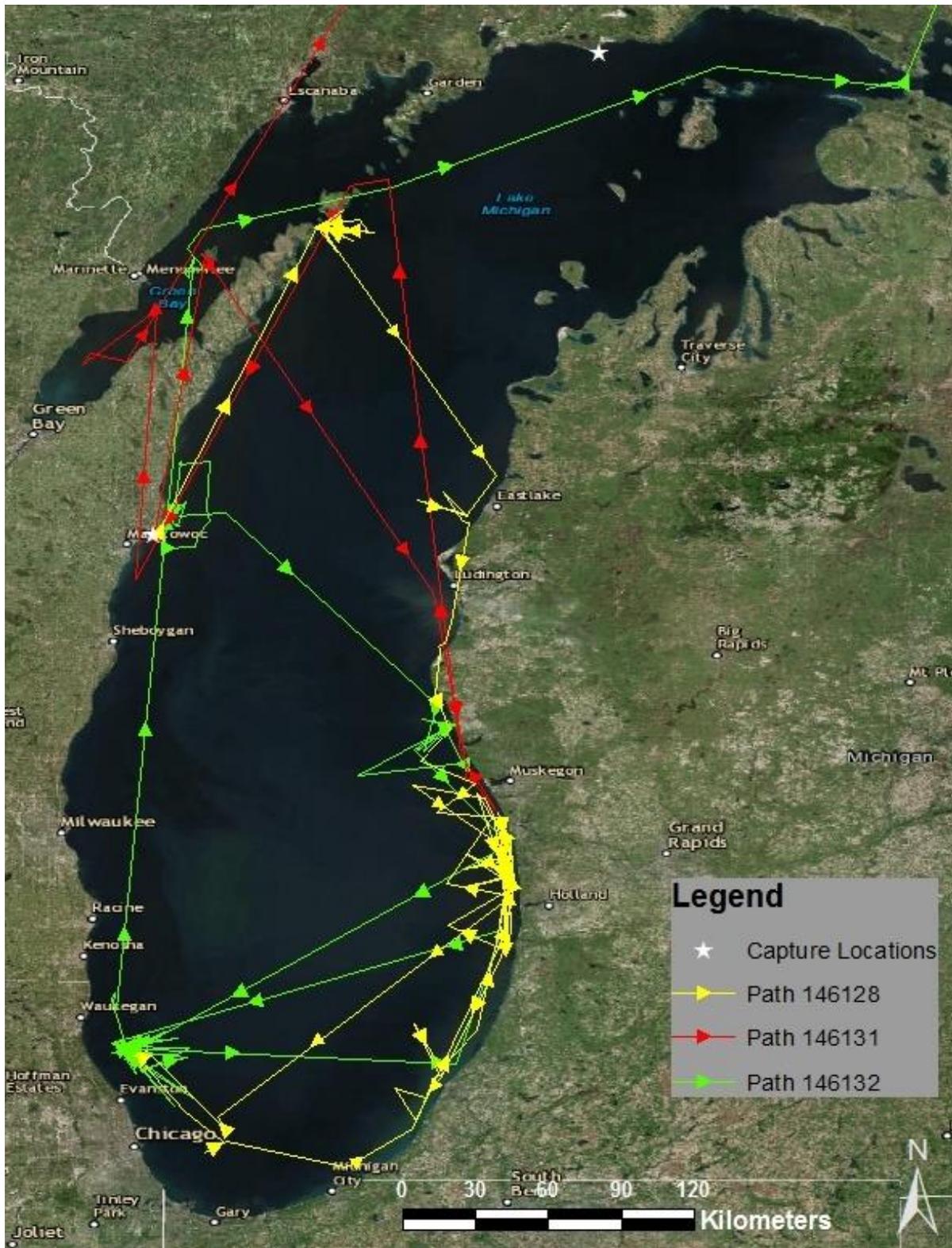


Figure 4. Map of movements for three “Judas” long-tailed ducks on Lake Michigan, from 29 October 2016 through 11 May 2017. All locations have an Argos precision index location class greater than or equal to one ($LC \geq 1$).

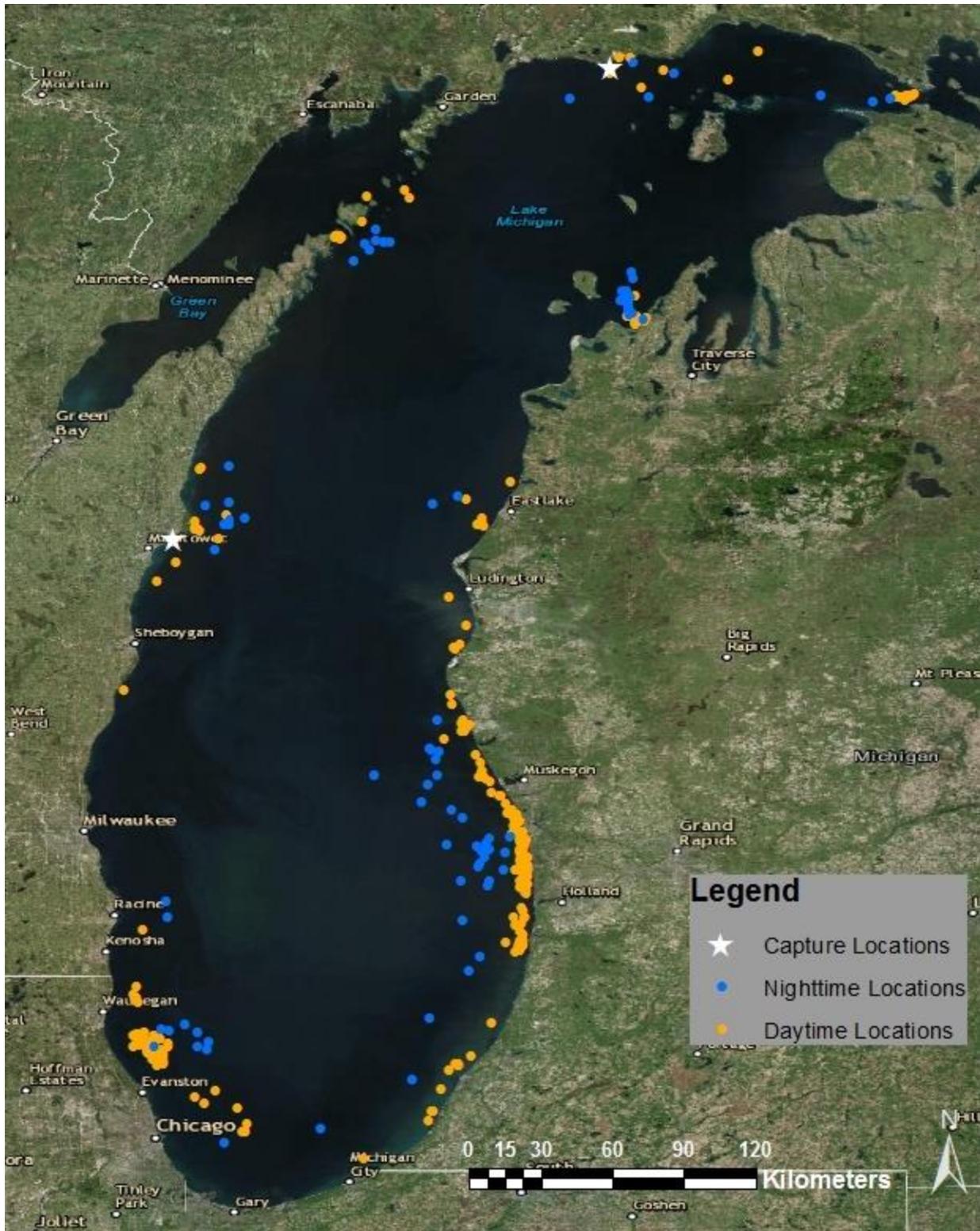


Figure 5. Map of the daytime and nighttime locations of three “Judas” birds (males), one second year female, and two after second year female long-tailed ducks radio-marked on Lake Michigan. All locations have an Argos precision index location class greater than or equal to one ($LC \geq 1$).

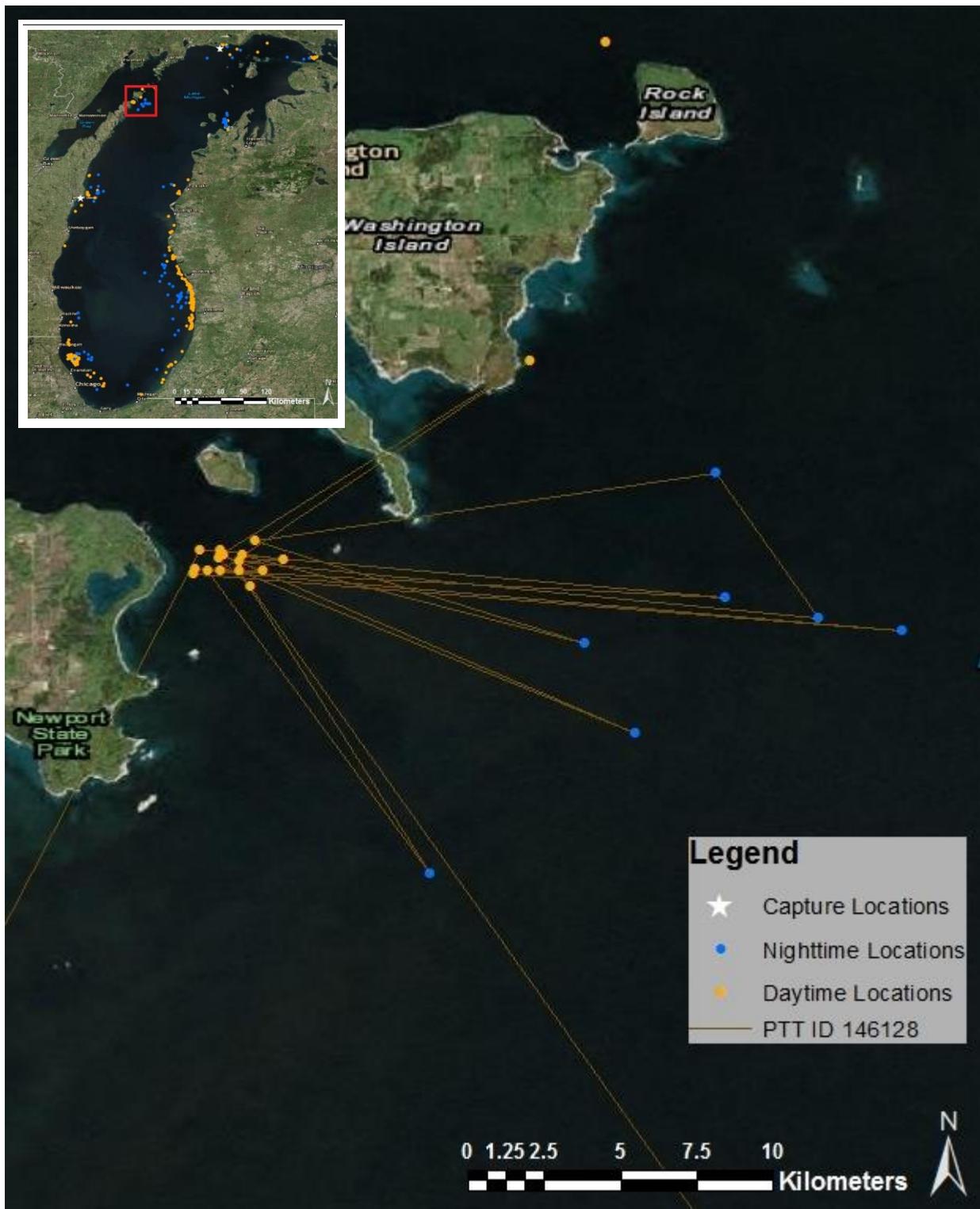


Figure 6. Map of diel movements for an after second year male long-tailed duck (PTT ID 146128), from 1-18 November 2016. All locations have an Argos precision index location class greater than or equal to one ($LC \geq 1$).

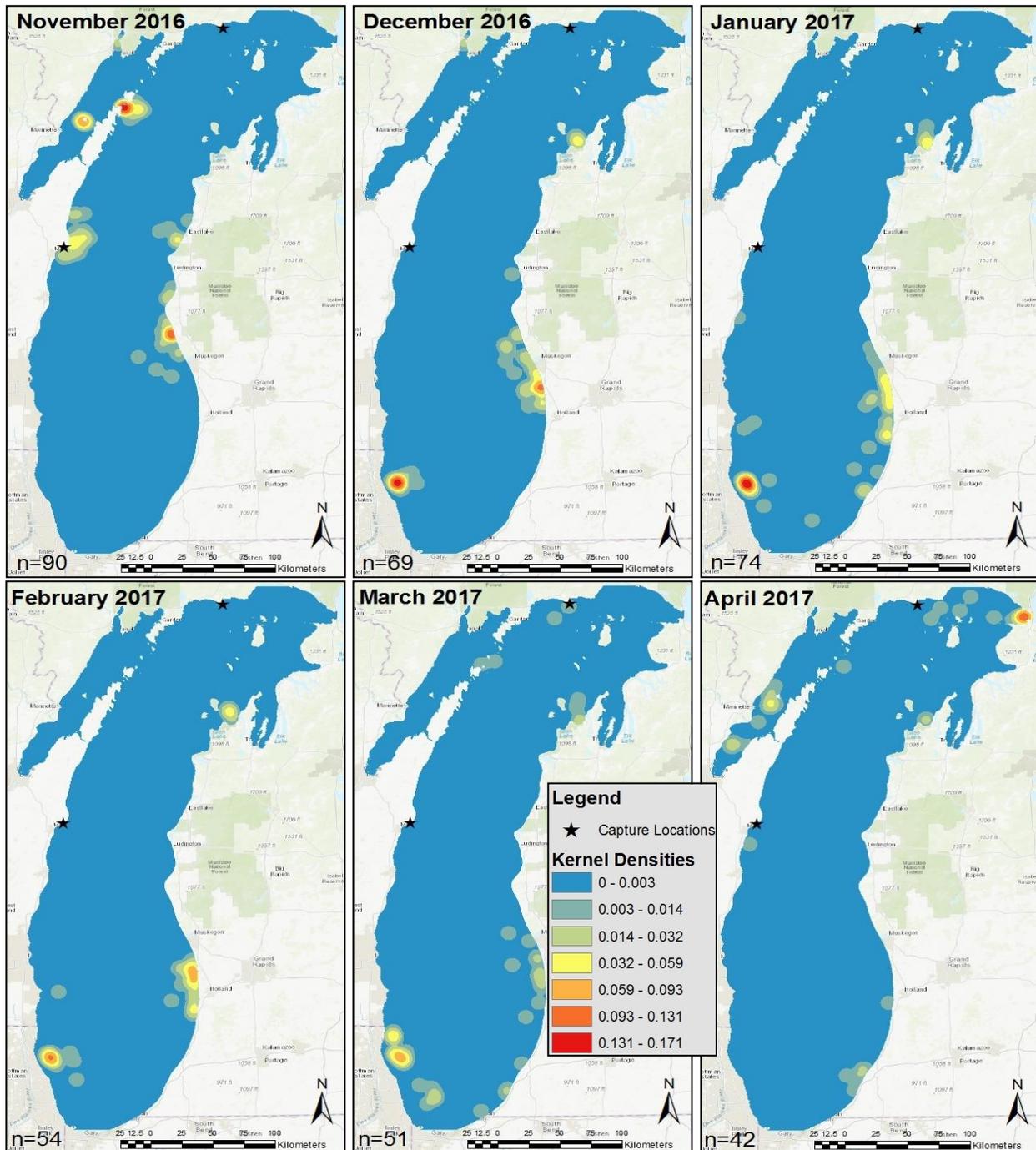


Figure 7. Monthly kernel density maps of long-tailed ducks radio-marked on Lake Michigan. All locations have an Argos precision index location class greater than or equal to one ($LC \geq 1$); locations used per month are indicated in the lower left corner.