

APPENDIX 1

Detailed descriptions of southbound migration routes

'THGU1' first headed south to the northwest Boothia Peninsula, where it spent 7 d around Cape Maguire before travelling west through the Queen Maud Gulf. It then took a rapid southwest route across the Northwest Territories, crossing Great Bear Lake and into northern interior British Columbia, travelling 1134 km over 2 d. THGU1 then travelled to Prince of Wales Island, Alaska, where it stayed for 6 d before moving south to northwest Vancouver Island, spending 5 d nearshore before coming to the first distinct overwinter destination at Ucluelet Inlet on Vancouver Island, British Columbia.

'THGU2' first spent 10 d c.150 km south of the breeding colony around Sophia Inlet on the southwest coast of Devon Island, Nunavut. It then took a westward bearing to the southeast coast of Melville Island, then travelled southwest across the Amundsen Gulf. THGU2 then crossed the Northwest Territories to northern interior British Columbia, travelling 1253 km in 1 d. It then traveled 444 km over one more day before arriving near Kitimat, British Columbia. After spending 4 d in this area, it traveled west 258 km to its first and only overwinter destination around Lyell Island in the Haida Gwaii, British Columbia.

'THGU3' migrated south to Prince of Wales Island, Nunavut, where it spent 4 d on the south coast before heading southwest across the Northwest Territories, travelling 1616 km in two days. After 1 d near the border intersection of the Yukon, Northwest Territories and British Columbia, THGU3 then traveled 633 km due west to the Pacific coast, then turned north to arrive 2 d later to its first overwinter destination around Sitka, Alaska.

'THGU4' first traveled south to the northeast coast of Prince of Wales Island, Nunavut, spending 2 d before traveling across Victoria Island to the north coast of Nunavut. It then crossed Great Bear Lake in the Northwest Territories en route through southern Yukon to arrive on the Pacific coast at Admiralty Island, Alaska. After 2 d, it moved into the northern end of Hecate Strait, British Columbia, making relatively large daily movements between daily locations (10-140 km/d) for 11 d before arriving to its first overwinter destination in the same area as THGU2, around Lyell Island in the Haida Gwaii, British Columbia.

APPENDIX 2

Detailed descriptions of overwinter movement patterns

THGU1 began the overwinter period with 35 d on the southwest coast of Vancouver Island, British Columbia around Nitinat Lake (Fig. 2). It then moved southbound over 3 d to Gold Beach, Oregon, and farther south again to the area around Crescent City, California, for 11 d. After another 5 d nearshore, THGU1 moved farther south to spend 52 d in the area around San Francisco and Monterey Bay, California (Fig. 2).

THGU4 was tracked for the entire duration of the overwinter period, lasting 254 d between arrival at the first overwinter destination and departure on northbound migration. THGU4 began the overwinter period in the same region as THGU2, around Lyell Island, Haida Gwaii, British Columbia (Fig. 2). After 22 d, THGU4 moved south across Queen Charlotte Sound and through the Strait of Georgia, through Sidney on Vancouver Island and farther south to arrive in Dabob Bay near Brinnon, Washington. This route was 820 km total, travelled over 7 d. THGU4 then spent 135 d (November to March) within an 11 km radius in Dabob Bay (Fig. 2). Thus, in the first 4 mo of the overwinter period, THGU4 exhibited extensive southward movements after initial arrival in northwest British Columbia, before moving south to arrive at an overwinter destination where it would remain locally within a highly constrained area for four months.

Similarly, THGU3 remained within a 2.87° latitudinal range for the first 5 mo of the overwinter period, making extensive movements within southeast Alaska. The device then began transmitting from the same location for a period of 20 d; after being manually located, the device was found on the east coast of Chichagof Island, Alaska in March 2017. This bird was subsequently photographed in September 2018 on Middleton Island,

Alaska, without a harness.

THGU4 exhibited extensive overwinter movements following the 4 mo stay in Dabob Bay, Washington. It travelled 325 km northwest in 2 d to the central west coast of Vancouver Island for 18 d around Hesquiat Harbour and Esperanza Inlet. It then traveled 843 km due north in 1 d to Prince of Wales Island, Alaska, and onward further north to spend 16 d in Sitka Sound (Fig. 2). It then returned to the north coast of Prince of Wales Island for 22 d before again heading north to spend 20 d moving between various inlets around Haines, Alaska. THGU4 then departed on northbound migration on 12 June 12 2017 (see Appendix 3 for further details).

THGU1 was also tracked through what was likely representative of the near entirety of the overwinter period. After the first 4 mo, THGU1 moved further eastward and inland from the San Francisco, California area where it travelled extensively over 101 d between various landfills, agricultural fields, state recreation areas, and water reservoirs (Fig. 2). It then travelled northbound covering 1223 km over 10 d to arrive on the east coast of Vancouver Island. Here it stayed for 30 d, until the end of April, remaining mostly around Hornby Island in the Strait of Georgia (Fig. 2). THGU1 then traveled further north through Bella Bella for 2 d and further on to the Skeena River Estuary in northwest British Columbia for 19 d. It then traveled northwest to Prince of Wales Island for 8 d before heading 876 km farther north over 2 d to then spend 37 d in the coastal areas of southeast Alaska between the estuaries of Alsek and Bering River. The device then stopped transmitting on 5 June 2017.

APPENDIX 3

Northbound migration and fidelity to migration routes

The transmitter on THGU4 continued to function for an additional annual cycle, revealing a return trip to the Canadian Arctic Archipelago but not to the breeding colony at St. Helena Island. The bird departed on northbound migration in mid-June, first heading northeast 751 km in 1 d to central interior Northwest Territories, then north 387 km in 1 d to Great Bear Lake, where it had passed through on southbound migration the previous autumn. It remained around Great Bear Lake on this northward migration for 4 d before it then continued north across the Coronation Gulf and across central Victoria Island to the west coast of Somerset Island before arriving to the east coast of Prince of Wales Island, Nunavut on 29 June 2017 (over 3 w later than this same bird was captured and equipped as a breeding adult on St. Helena Island the previous June). THGU4 then spent 38 d on Prescott Island until travelling 274 km north to the east coast of Cornwallis Island for 4 d, before returning back to an area southwest of the colony on Devon Island on 17 August 2017 (Fig. 1). THGU4 spent 21 d in this area before departing southbound again on 4 September 2017, within 5 d of its southbound migration departure the previous year.

The southbound migratory route taken by THGU4 in 2017 varied markedly from that taken in 2016 (Fig. 1). It first returned south to Prescott Island for one day before turning west-southwest to cross northern Victoria Island, then west to cross the Beaufort Sea over 4 d to arrive on the north coast of the Yukon. Moving northwest up the Yukon/Alaska coast, THGU4 then spent 5 d on the northeast coast of Alaska before travelling 542 km over 2 d to central Alaska. Here it stopped for 6 d on the Yukon River before travelling southwest 846 km over 2 d to Bristol Bay, Alaska for a 3-d stop. THGU4 then continued to travel south down the coast of Alaska, stopping for 6 d south of Kayak

Island, and 3 d in the Chatham Strait, passing Prince of Wales Island and continuing south through the Hecate Strait and the Strait of Georgia. It stopped for 9 d around Victoria, British Columbia and the outer Strait of Juan de Fuca before returning to Dabob Bay, Washington, on 17 October 2017. In 2016, THGU4 arrived at this same region just 14 d earlier and stayed through to March. In 2017, THGU4 remained in the Dabob Bay area again for at least 93 d until its device ceased transmissions on 17 January 2018.