Dunlin, Arctic

Class: Aves
Order: Charadriiformes

Calidris alpina arcticola

Note: This assessment refers to this subspecies only.

Review Status: Peer-reviewed **Version Date:** 18 March 2019

Conservation Status

NatureServe:	*Agency:*		
G Rank: G5	ADF&G: Species of Greatest Conservation Need	IUCN: Least Concern	Audubon AK: Red
S Rank: S4B,S4N	USFWS: Bird of Conservation Concern	BLM: Sensitive	

Final Rank

Conservation category: **II. Red**

high status and either high biological vulnerability or high action need

Category	Range	Score
Status	-20 to 20	16
Biological	-50 to 50	-16
Action	-40 to 40	-16

Higher numerical scores denote greater concern

Status

- variables measure the trend in a taxon's population status or distribution. Higher status scores denote taxa with known declining trends. Status scores range from -20 (increasing) to 20 (decreasing).

Score

Population Trend in Alaska (-10 to 10) 10

Has declined significantly in recent decades (Andres et al. 2012a; ASG 2019). C. alpina arcticola has much lower adult survival rates than other sympatrically breeding Arctic shorebirds (Weiser et al. 2018c).

Distribution Trend in Alaska (-10 to 10) 6

Unknown, but suspected to be decreasing given population declines (R. Lanctot, USFWS, pers. comm.).

Status Total: 16

Biological

- variables measure aspects of a taxon's distribution, abundance and life history. Higher biological scores suggest greater vulnerability to extirpation. Biological scores range from -50 (least vulnerable) to 50 (most vulnerable).

Score

Population Size in Alaska (-10 to 10) -10

Population size in Alaska is estimated at 500,000 (Andres et al. 2012a).

Range Size in Alaska (-10 to 10) -8

Found along Alaska's northern coast from the Canadian boundary to the Lisburne Peninsula (Warnock and Gill 1996; Johnson et al. 2007a). Range limits are unknown, especially in western Alaska where its range overlaps with that of C. a. pacifica (Warnock and Gill 1996). However, recent geolocator work revealed that birds breeding near Kotzebue belonged to pacifica subspecies (B. Lagassé and R. Lanctot, unpubl. data); it is assumed that the dividing line between the two species is therefore north of Kotzebue (R. Lanctot, USFWS, pers. comm.). Overwinters in Japan, China, South Korea, and North Korea (Fernández et al. 2010; B. Lagassé and R. Lanctot, unpubl. data). Minimum range size in Alaska is ~107,678 sq. km and no greater than 400,000 sq. km, based on range map from ACCS (2017a).

Population Concentration in Alaska (-10 to 10) 2

Aggregates in large numbers during fall migration e.g. at Pogik Bay, Kasegaluk Lagoon, and the Colville River Delta (Fernández et al. 2010; Smith et al. 2012a). The Dunlin Conservation Plan lists 10 sites in Alaska where >7,000 arcticola Dunlins have been observed during fall migration (Fernández et al. 2010). Distribution is more dispersed during the breeding season, though Dunlins occur at high densities in the Teshekpuk Lake Special Area (Andres et al. 2012b; Smith et al. 2012a), by Prudhoe Bay (Troy 1996), and near Utqiaġvik (Saalfeld and Lanctot 2015).

Reproductive Potential in Alaska

Age of First Reproduction (-5 to 5) -3

Most birds breed when they are two years old (Warnock and Gill 1996).

Number of Young (-5 to 5) 1

Typically lay one 4-egg clutch per year (Warnock and Gill 1996). Weiser et al. (2018b) reported an average clutch size of 3.96 +/- 0.22 eggs (n=480). Can lay a replacement clutch if the first one fails, though survival rates for replacement clutches tend to be much lower than for initial clutches (Holmes 1966a; Hill 2012; Gates et al. 2013a).

Ecological Specialization in Alaska

Dietary (-5 to 5) 1

Few data are available. During breeding, feeds mainly on terrestrial insects, especially adult and larval crane flies (Family: Tipulidae) and larval chironomid flies (Holmes 1966b; Doll et al. 2015). Insect diversity is limited in the Arctic and while the Dunlin respond to changes in prey availability, they also exhibit consistent dietary preferences for tipulid larvae (Holmes 1966b). Foraging data from staging grounds in Alaska are unavailable. C. a. pacifica feeds primarily on the clam Macoma expansa, as well as on the blue mussel Mytilus edulis and on amphipods (Warnock and Gill 1996; Doll et al. 2015).

Habitat (-5 to 5) 1

Breeds in coastal graminoid tundra habitats (Holmes 1966b; Warnock and Gill 1996). Typically associated with wet or moist moisture regimes (Holmes 1966b; Warnock and Gill 1996; Cunningham et al. 2016), though nests are often placed on drier or upland sites (Holmes 1966b; Liebezeit et al. 2011; Cunningham et al. 2016). Post-breeding, found on intertidal habitats such as mudflats, estuaries, and bays (Kessel 1989; Warnock and Gill 1996; MacDonald and Wachtel 2000; R. Lanctot, unpubl. data). On migration and wintering grounds outside of Alaska, found mainly on tidal flats, but also use aquaculture ponds (Choi et al. 2014).

Biological Total: -16

Action - variables measure current state of knowledge or extent of conservation efforts directed toward a given taxon. Higher action scores denote greater information needs due of lack of knowledge or conservation action. Action scores range from -40 (lower needs) to 40 (greater needs). **Score**

Management Plans and Regulations in Alaska (-10 to 10) -10

Protected under the Migratory Bird Treaty Act (MBTA 1918). In Alaska, open to subsistence harvest and egg gathering, but only during certain times of the year (AMBCC 2018).

Knowledge of Distribution and Habitat in Alaska (-10 to 10) -10

Distribution and habitat associations are known from multi-species surveys and habitat studies on the Arctic Coastal Plain (e.g. Brown et al. 2007; Johnson et al. 2007a; Naves et al. 2008; Liebezeit et al. 2011; Andres et al. 2012b; Saalfeld et al. 2013b; Cunningham et al. 2016). Some knowledge of migration routes and staging sites from count surveys (Gill and Handel 1990; MacDonald and Wachtel 2000; Fernández et al. 2010), sightings of banded individuals (Gill et al. 2013), and transmitter data (Taylor et al. 2011; Doll et al. 2015; R. Lanctot, unpubl. data). Results from DNA analyses revealed mixing between C. a. arcticola and other subspecies, suggesting that some individuals may not always arrive at breeding grounds in northern Alaska, but may instead stop in eastern Russia or western Alaska (Miller et al. 2015). It is unknown what proportion of dunlins staging on the YKD are C. a. arcticola versus C. a. pacifica individuals (Fernández et al. 2010).

Knowledge of Population Trends in Alaska (-10 to 10) 2

Population trends are inferred from 1. adult survival rates determined from the Arctic Shorebird Demographics Network (Weiser et al. 2018c) and 2. long-term counts of Dunlin in Asia (Amano et al. 2010). Data on demographic rates come from four study sites in Alaska that were monitored from 2011 to 2014 (with the exception of Utqiaġvik, which was monitored from 2010 to 2014; Weiser et al. 2018c). On their own, data from Alaska are not sufficient for detecting long-term (20-year) trends and we therefore rank this question as B- Data available but inadequate.

Knowledge of Factors Limiting Populations in Alaska (-10 to 10) 2

The destruction of intertidal habitats on wintering grounds in Asia may be a major factor contributing to ongoing population declines (Amano et al. 2010). Factors on breeding grounds do not appear to explain the Dunlin's low adult survival rates (Hill 2012; Saalfeld and Lanctot 2015; Weiser et al. 2018c). Additional research is needed on environmental contamination (Perkins et al. 2016; Saalfeld et al. 2016) and factors affecting reproductive success e.g. prey availability, female body condition, and mate availability (Jamieson 2012; Gates et al. 2013a).

Predation, prey availability, and inclement weather have been proposed as factors affecting nest survival. Predation has been documented as a main cause of nest failure in some studies (Holmes 1966a; Liebezeit et al. 2009; Gates et al. 2013a; but see Weiser et al. 2018b). Further research is needed to elucidate the relationship between predation rates and densities of alternative prey (Hill 2012; Saalfeld and Lanctot 2015; Pedersen et al. 2018). Nest survival rates may be influenced by insect (prey) abundance and chicks born earlier in the season might have higher survival rates because of the timing of peak insect abundance (Hill 2012). Cold, rainy weather may have an adverse effect on survival by decreasing prey availability and increasing thermoregulatory requirements (Holmes 1966b; Tulp and Schekkerman 2008; Hill 2012), though both Hill (2012) and Weiser et al. (2018b) found no relationship between temperature and nest survival rates. Early snowmelt has been linked to shorter incubation dates (Weiser et al. 2018b) and earlier nest initiation dates (Troy 1996; Saalfeld et al. 2013a), but the link to nest success and population growth is unclear (Hill 2012; Xu et al. 2015). Saalfeld and Lanctot (2015) found no relationship between snow cover and nest densities. Although there is no clear consensus about which factors limit this population, several studies have investigated factors affecting adult and nest survival and, in doing so, have greatly contributed to our understanding of Dunlin population ecology and provide a solid foundation for future research. We therefore rank this question as B- Factors potentially affecting this population are known.

Action Total: -16

Supplemental Information - variables do not receive numerical scores. Instead, they are used to sort taxa to answer specific biological or management questions.

Harvest: Not substantial

Seasonal Occurrence: Breeding
Taxonomic Significance: Subspecies
% Global Range in Alaska: >10%
% Global Population in Alaska: ≥75%
Peripheral: No

References

Alaska Center for Conservation Science (ACCS). 2017a. Wildlife Data Portal. University of Alaska Anchorage. Available online: http://aknhp.uaa.alaska.edu/apps/wildlife

Amano, T., T. Székely, K. Koyama, H. Amano, and W. J. Sutherland. 2010. A framework for monitoring the status of populations: An example from wader populations in the East Asian–Australasian flyway. Biological Conservation 143(9):2238–2247. DOI: 10.1016/j.biocon.2010.06.010

Andres, B. A., P. A. Smith, R. G. Morrison, C. L. Gratto-Trevor, S. C. Brown, and C. A. Friis. 2012a. Population estimates of North American shorebirds, 2012. Wader Study Group Bulletin 119(3):178-194.

Andres, B. A., J. A. Johnson, S. C. Brown, and R. B. Lanctot. 2012b. Shorebirds breed in unusually high densities in the Teshekpuk Lake Special Area, Alaska. Arctic 65(4):411–420. DOI: 10.14430/arctic4239

Alaska Shorebird Group (ASG). 2019. Alaska Shorebird Conservation Plan, Version III. Alaska Shorebird Group, Anchorage, AK, USA. Available online: https://www.fws.gov/alaska/mbsp/mbm/shorebirds/plans.htm

Brown, S., J. Bart, R. B. Lanctot, J. A. Johnson, S. Kendall, D. Payer, and J. Johnson. 2007. Shorebird abundance and distribution on the coastal plain of the Arctic National Wildlife Refuge. The Condor 109(1):1–14. DOI: 10.1650/0010-5422(2007)109[1:SAADOT]2.0.CO;2

Choi, C., X. Gan, N. Hua, Y. Wang, and Z. Ma. 2014. The habitat use and home range analysis of Dunlin (Calidris alpina) in Chongming Dongtan, China and their conservation implications. Wetlands 34(2):255–266. DOI: 10.1007/s13157-013-0450-9

Cunningham, J. A., D. C. Kesler, and R. B. Lanctot. 2016. Habitat and social factors influence nest-site selection in Arctic-breeding shorebirds. The Auk 133(3):364–377. DOI: 10.1642/AUK-15-196.1

Doll, A. C., R. B. Lanctot, C. A. Stricker, S. M. Yezerinac, and M. B. Wunder. 2015. Improved arrival-date estimates of Arctic-breeding dunlin (Calidris alpina arcticola). The Auk 132(2):408–421. DOI: 10.1642/AUK-14-227.1

Fernández, G., J. B. Buchanan, R. E. Gill, R. Lanctot, and N. Warnock. 2010. Conservation plan for dunlin with breeding populations in North America (Calidris alpina arcticola, C. a. pacifica, and C. a.hudsonia) Version 1.1. Manomet Center for Conservation Sciences, Manomet, MA, USA.

Gates, H. R., R. B. Lanctot, and A. N. Powell. 2013a. High renesting rates in Arctic-breeding dunlin (Calidris alpina): A clutch-removal experiment. The Auk 130(2):372–380.

Gates, H. R., S. Yezerinac, A. N. Powell, P. S. Tomkovich, O. P. Valchuk, and R. B. Lanctot. 2013b. Differentiation of subspecies and sexes of Beringian dunlins using morphometric measures. Journal of Field Ornithology 84(4):389–402. DOI: 10.1111/jofo.12038

Gill, R. E., Jr., and C. M. Handel. 1990. The importance of subarctic intertidal habitats to shorebirds: A study of the central Yukon-Kuskokwim Delta, Alaska. The Condor 92(3):709-725.

Gill Jr, R. E., C. M. Handel, and D. R. Ruthrauff. 2013. Intercontinental migratory connectivity and population structuring of Dunlins from western Alaska. The Condor 115(3):525-534.

Hill, B. L. 2012. Factors affecting survival of Arctic-breeding Dunlin (Calidris alpina arcticola) adults and chicks. MSc thesis, University of Alaska Fairbanks, AK, USA. Available online: http://hdl.handle.net/11122/8452

Holmes, R. T. 1966a. Breeding ecology and annual cycle adaptations of the red-backed sandpiper (Calidris alpina) in northern Alaska. The Condor 68(1):3–46. DOI: 10.2307/1365173

Holmes, R. T. 1966b. Feeding ecology of the red-backed sandpiper (Calidris alpina) in Arctic Alaska. Ecology 47(1):32–45. DOI: 10.2307/1935742

Jamieson, S. E. 2012. Body mass dynamics during incubation and duration of parental care in Pacific dunlins Calidris alpina pacifica: a test of the differential parental capacity hypothesis. Ibis 154:838–845.

Johnson, J. A., R. B. Lanctot, B. A. Andres, J. R. Bart, S. C. Brown. S. J. Kendall, and D. C. Payer. 2007a. Distribution of breeding shorebirds on the Arctic Coastal Plain of Alaska. Arctic 60(3):277-293. DOI: 10.14430/arctic220

Kessel, B. 1989. Birds of the Seward Peninsula, Alaska: Their biogeography, seasonality, and natural history. University of Alaska Press, Fairbanks, AK, USA.

Liebezeit, J. R., S. J. Kendall, S. Brown, C. B. Johnson, P. Martin, T. L. McDonald, ..., and S. Zack. 2009. Influence of human development and predators on nest survival of tundra birds, Arctic Coastal Plain, Alaska. Ecological Applications 19(6):1628–1644. DOI: 10.1890/08-1661.1

Liebezeit, J. R., G. C. White, and S. Zack. 2011. Breeding ecology of birds at Teshekpuk Lake: A key habitat site on the Arctic Coastal Plain of Alaska. Arctic 64(1):32–44. DOI: 10.14430/arctic4078

MacDonald, R., and J. Wachtel. 2000. Late summer occurrence of shorebirds on the southern Nushagak Peninsula, Alaska, 1999. Unpublished report, U.S. Fish and Wildlife Service, Togiak National Wildlife Refuge, Dillingham, AK, USA.

Migratory Bird Treaty Act (MBTA). 1918. U.S. Code Title 16 §§ 703-712 Migratory Bird Treaty Act.

Miller, M. P., S. M. Haig, T. D. Mullins, L. Ruan, B. Casler, A. Dondua, ..., and R. B. Lanctot. 2015. Intercontinental genetic structure and gene flow in dunlin (Calidris alpina), a potential vector of avian influenza. Evolutionary Applications 8(2):149–171. DOI: 10.1111/eva.12239

Naves, L. C. 2015. Alaska subsistence bird harvest, 2004-2014 data book. Special Publication No. 2015-05, Alaska Department of Fish and Game, Division of Subsistence, Anchorage, AK, USA.

Naves, L. C., R. B. Lanctot, A. R. Taylor, and N. P. Coutsoubos. 2008. How often do Arctic shorebirds lay replacement clutches? Wader Study Group Bulletin 115(1):2–9.

Pedersen, Å. Ø., J. Stien, P. B. Eidesen, R. A. Ims, J. U. Jepsen, A. Stien, I. Tombre, and E. Fuglei. 2018. High goose abundance reduces nest predation risk in a simple rodent-free high-Arctic ecosystem. Polar Biology 41(4):619–627. DOI: 10.1007/s00300-017-2223-z

Perkins, M., L. Ferguson, R. B. Lanctot, I. J. Stenhouse, S. Kendall, S. Brown, H. R. Gates, J. O. Hall, K. Regan, and D. C. Evers. 2016. Mercury exposure and risk in breeding and staging Alaskan shorebirds. The Condor 118(3):571–582. DOI: 10.1650/CONDOR-16-36.1

Saalfeld, S. T., and R. B. Lanctot. 2015. Conservative and opportunistic settlement strategies in Arctic-breeding shorebirds. The Auk 132(1):212–234. DOI: 10.1642/AUK-13-193.1

Saalfeld, S. T., B. L. Hill, and R. B. Lanctot. 2013a. Shorebird responses to construction and operation of a landfill on the Arctic Coastal Plain. The Condor 115(4):816–829. DOI: 10.1525/cond.2013.120169

Saalfeld, S. T., R. B. Lanctot, S. C. Brown, D. T. Saalfeld, J. A. Johnson, B. A. Andres, and J. R. Bart. 2013b. Predicting breeding shorebird distributions on the Arctic Coastal Plain of Alaska. Ecosphere 4(1):1–17. DOI: 10.1890/ES12-00292.1

Saalfeld, D. T., A. C. Matz, B. J. McCaffery, O. W. Johnson, P. Bruner, and R. B. Lanctot. 2016. Inorganic and organic contaminants in Alaskan shorebird eggs. Environmental Monitoring and Assessment 188(5):1–7. DOI: 10.1007/s10661-016-5270-y

Smith, M., N. Walker, C. Free, M. Kirchhoff, N. Warnock, ..., and I. Stenhouse. 2012c. Marine Important Bird Areas in Alaska: Identifying globally significant sites using colony and at-sea survey data. GIS data provided by E. Knight on 26 Feb 2018, Audubon Alaska, Anchorage, AK, USA.

Taylor, A. R., R. B. Lanctot, A. N. Powell, S. J. Kendall, and D. A. Nigro. 2011. Residence time and movements of postbreeding shorebirds on the northern coast of Alaska. The Condor 113(4):779–794. DOI: 10.1525/cond.2011.100083

Troy, D. M. 1996. Population dynamics of breeding shorebirds in Arctic Alaska. International Wader Studies 8:15–27.

Tulp, I., and H. Schekkermann. 2008. Has prey availability for Arctic birds advanced with climate change? Hindcasting the abundance of tundra arthropods using weather and seasonal variation. Arctic 61(1):48–60.

Warnock, N. D. and R. E. Gill. 1996. Dunlin (Calidris alpina), version 2.0. In Poole, A. F. and F. B. Gill, eds. The Birds of North America, Cornell Lab of Ornithology, Ithaca, NY, USA. DOI: 10.2173/bna.203

Weiser, E. L., S. C. Brown, R. B. Lanctot, H. R. Gates, K. F. Abraham, R. L. Bentzen, …, B. K. Sandercock. 2018b. Effects of environmental conditions on reproductive effort and nest success of Arctic-breeding shorebirds. Ibis 160(3):608–623. DOI: 10.1111/ibi.12571

Weiser, E. L., R. B. Lanctot, S. C. Brown, H. R. Gates, R. L. Bentzen, J. Bêty, ..., and B. K. Sandercock. 2018c. Environmental and ecological conditions at Arctic breeding sites have limited effects on true survival rates of adult shorebirds. The Auk 135(1):29–43. DOI: 10.1642/AUK-17-107.1

Xu, C., J. Barrett, D. B. Lank, and R. C. Ydenberg. 2015. Large and irregular population fluctuations in migratory Pacific (Calidris alpina pacifica) and Atlantic (C. a. hudsonica) dunlins are driven by density-dependence and climatic factors. Population Ecology 57(4):551–567. DOI: 10.1007/s10144-015-0502-5

Alaska Center for Conservation Science
Alaska Natural Heritage Program
University of Alaska Anchorage
Anchorage, AK