Longevity records show that Upland Sandpipers are long-lived birds

Brett K. Sandercock[1*] & Greg Kramos[2]

[1]*Department of Terrestrial Ecology, Norwegian Institute for Nature Research, P.O. Box 5685 Torgarden, Trondheim NO-7485, Norway. brett.sandercock@nina.no*
[2]*Partners for Fish & Wildlife Program, U.S. Fish & Wildlife Service, 2609 Anderson Manhattan, KS 66502, USA*

Keywords: *Bartramia longicauda,* Flint Hills, natal philopatry, survival, tallgrass prairie

Manuscript format: Short Communication for *Wader Study*

The life-history traits of migratory waders are characterized by low reproductive rates, delayed maturity, and high survivorship (Myers *et al.* 1987, Sandercock 2003), which leads to low rates of maximum population growth. Due to their suite of life-history traits, many populations of migratory waders have been negatively impacted by environmental change, habitat loss, harvest, and other perturbations. Conservation planning has been assisted by improved estimates of survival for wader populations (Méndez *et al.* 2018), but basic data are still lacking for many poorly studied species (Vickery *et al.* 2010, Pearce-Higgins *et al.* 2017). One indication that sandpipers and other scolopacid waders might have high annual survival is that records of maximum longevity are often quite high. Scolopacid waders with estimates of maximum longevity over 10 years in the Western Hemisphere include: 12-13+ years for Sanderling (*Calidris alba*, Boates and McNeil 1984) and Wandering Tattlers (*Tringa incana*, Gill *et al.* 2010), 14+ years for Dunlin (*C. alpina*, Warnock and Gill 1996) and Short-billed Dowitchers (*Limnodromus griseus*, BBL 2019), 16+ years for Whimbrel (*Numenius phaeopus*, Klima *et al.* 2013), Ruddy Turnstones (*Arenaria interpres*, BBL 2019), Least Sandpipers (*Calidris minutilla*, Miller *et al.* 1988), and Semipalmated Sandpipers (*C. pusilla*, Gratto-Trevor & Vacek 2001), 19 years for Red Knots (*rufa* subspecies of *C. canutus*, Baker *et al.* 2013), 23+ years for Bristle-thighed Curlews (*N. tahitiensis*, Marks 1992), and 25-29+ years for Marbled Godwits (*Limosa fedoa*, Colwell *et al.* 1995, Gratto-Trevor 2000).

Here, we report on new longevity records for the Upland Sandpiper (*Bartramia longicauda*). Upland Sandpipers are long-distance migrants that use temperate grasslands throughout their migratory range (Blanco & López-Lanús 2008, Sandercock *et al.* 2015, Grosselet *et al*. 2019). Survival rates are poorly known for the species because past field studies have ringed mainly flightless young (Garber *et al.* 1997, Houston *et al.* 1999), or have ringed adults for relatively short periods of 2-4 years (Jackson 2003, Mong & Sandercock 2007, Alfaro *et al.* 2018). In the 74-year period from 1923 to 1996, a total of 1,484 sandpipers were ringed across all North America, which resulted in 11 dead recoveries (0.7%, Houston *et al.* 1999). Based on this sample of birds, the previous longevity record for Upland Sandpipers was 8 years, 11 months, and 17 days for a bird that was ringed as a hatchling at JFK airport in New York on 12 June 1981 and recovered as a collision mortality at the same site on 28 May 1990 (Garber *et al.* 1997).

We conducted a population study of Upland Sandpipers for nine years (2001 to 2009) at Konza Prairie Biological Station, Kansas (39.100°N, 96.608°W). The goals of our field study at the natural preserve were to investigate the mating system and parental care, space use and habitat selection, and population demography (Mong & Sandercock 2007, Casey *et al.* 2011, Sandercock *et al.* 2015). We captured and ringed a total of 824 birds during 2001-2008, including 318 young caught at the nest as hatchlings or as mobile chicks, and 506 adults that were captured at night during the pre-laying period with spotlights and a dipnet, or at the nest during incubation with mist nets. Young were marked with a single aluminum ring with a unique number (Bird Banding Lab, U.S. Geological Survey), and a single colour ring as a batch mark for the year of ringing. Adults were marked with an aluminum ring and an individual combination of three colour rings. Sex was unknown when birds were ringed, and we collected a small blood sample and sexed birds using molecular primers based on introns of the CHD gene (Casey *et al.* 2011). We recaptured and resighted sandpipers during the following field seasons of 2002-2009, plus an opportunistic encounter in 2019.

Our new longevity record comes from a live observation of an Upland Sandpiper that was originally captured and ringed as hatchling on 24 May 2006 at Konza Prairie. The bird was ringed with an aluminum ring on the upper right leg with the unique ring number of 1573-30043 and a light green ring on the upper left leg, and it was sexed as a male from a blood sample. The bird was not encountered during the last three years of our field work during 2007-2009. On 21 June 2019, the same bird was photographed by G. Kramos while perched on a fence post along the edge of a private pasture south of Konza Prairie. High quality images from several different postures allowed the bird to be individually identified from a legible ring number (Fig. 1). The colour ring had been lost. Our record is noteworthy for two reasons. First, the exact age of this bird was 13 years and 29 days, which is a new longevity record for Upland Sandpipers. Second, the resighting location was only 1.73 km southeast of the nest site where the bird was originally ringed as a hatchling. GPS and satellite tracking have shown that Upland Sandpipers breeding in Kansas have an average round-trip migration distance of ca. 18,500 km (Hill *et al.* 2019). In a 13-year lifespan, the total distance potentially travelled by this individual bird would be comparable to flying around the Earth five times.

We compared our new longevity record to estimates based on 824 Upland Sandpipers that were captured and resighted during our 9-year field study at Konza Prairie (Table 1). We expected our estimates of longevity to be biased low because we recorded fewer encounters of unique individuals at the start and end of our study (2001: n = 58 birds, 2008-2009: n = 34 to 69 birds) than during the core years of the project (2002-2007: n = 132 to 200 birds per year). Negative bias was also expected because the estimates were left-censored for any adults captured at the start of the project, but also right-censored when systematic monitoring was discontinued after 2009. Nevertheless, a total of 13 sandpipers ringed as hatchlings (4.1%, n = 318) were encountered again after their natal year. Longevity records for known age birds were up to 6 years for one male and up to 5 years for females (Table 2). A total of 93 adult males (35.0%, n = 266) and 70 adult females (29.2%, n = 240) were encountered after their first year of ringing. Longevity records among adults were up to 7-8+ years for males and 5-6+ years for females. Longevity records among the oldest birds were consistently higher for males than females (Table 2), suggesting that annual survival, breeding site fidelity, or encounter rates may be higher among males.

Our estimate of maximum longevity of 13 years from the opportunistic encounter in 2019 was almost twice as high as our estimates of 8+ years based on our systematic monitoring during the population study in 2001-2009. However, at least six males were observed for a block of up to 7 or 8 years during the 9-year study period, and it seems likely that the duration of our project was effectively too short to estimate maximum longevity for Upland Sandpipers. Another problem was that relatively few adults were encountered after the year of ringing (29 to 35%, Table 1), and losses could have been due to low survival, dispersal, or imperfect detection (Sandercock 2003). For example, at least one adult captured at Konza Prairie was a transient migrant *en route* to a northern breeding site in South Dakota (Hill *et al.* 2019). Our return rates of young after their natal year were quite low (4.1%), but comparable to reports for other scolopacid waders (median of 4.8%, n = 22 estimates for 13 spp., Thompson *et al.* 1994). Overall, our combined data indicate that at least 13 Upland Sandpipers ringed as hatchlings showed strong natal philopatry and returned to their natal area as breeding adults. Our findings are consistent with past records of dead recoveries for Upland Sandpipers during the breeding season (May-Jul) where the natal dispersal distances were relatively short (range= 0-95 km, n = 5 birds, Houston *et al.* 1999).

Longevity records are interesting as an index of lifespan of birds living in the wild under natural conditions, and annual survival rates must be relatively high for individual birds to survive >10 years (Baylis *et al*. 2014). Compilations of survival rates for waders have not included longevity records because estimates tend to be higher for species or regions with greater ringing and recovery effort (Sandercock 2003, Méndez *et al.* 2018). Our new longevity record of 13 years for Upland Sandpipers is comparable to other scolopacid waders in North America, but maximum longevity could be higher still since our estimate was based on a relatively small sample of ringed birds over a limited time period. Estimates of demographic rates of Upland Sandpipers are relevant to ongoing conservation efforts in the tallgrass prairie ecosystem. In 2016, the Flint Hills ecoregion of eastern Kansas was designated as a 'Landscape of Hemispheric Importance' by the Western Hemisphere Shorebird Reserve Network (WHSRN), based on high counts of migrating Buff-breasted Sandpipers (*C. subruficollis*) and American Golden-Plovers (*Pluvialis dominica*, Penner *et al.* 2015), as well as high counts and positive population trends for breeding Upland Sandpipers. The results of our 9-year population study complement count-based assessments by demonstrating that Upland Sandpipers have healthy demographic performance in the Flint Hills ecoregion. Nest success may be low in managed rangelands (Bowen & Kruse 1993, Garvey *et al.* 2013, Sandercock *et al.* 2015), but seasonal survival of sandpipers can be high during the breeding period (Mong and Sandercock 2007). Our new findings in this report demonstrate that individual birds can also be long-lived with strong site fidelity to native prairie habitats. In the future, conservation of tallgrass prairie in the Great Plains should play a key role in long-term management plans for Upland Sandpipers (Vickery *et al.* 2010).

We thank M. Alfaro, T.N. Johnson, R. Lohnes, J.E. Mendoza, T.W. Mong, K.J. Odom, K.M. Strum, and many field assistants for their contributions to the field work. A.E. Casey, C. Ganser, and S.M. Wisely conducted molecular sexing of the sandpipers. Staff at Konza Prairie Biological Station provided helpful logistical support. We thank L. Eberhart-Phillips and the reviewers for their comments on our manuscript. Financial support for our long-term population study included grants from the National Science Foundation for the Konza Prairie

LTER program (DEB-0218210) and an REU Site program (DBI-0243890, DBI-0552930), and the University Small Research Grant program at Kansas State University. All research activities were conducted under federal and state permits for wildlife research, and our field protocols were reviewed and approved by the Institutional Animal Care and Use Committee at Kansas State University.

Alfaro, M., B.K. Sandercock, L. Liguori & M. Arim. 2018. Body condition and feather molt of a migratory shorebird during the non-breeding season. *Journal of Avian Biology* 49: e01480.

Baker, A., P. Gonzalez, R. Morrison & B. Harrington. 2013. Red Knot (*Calidris canutus*), version 2.0. In: *The Birds of North America* (A. Poole, Ed). Cornell Lab of Ornithology, Ithaca, New York, USA.

Baylis, S.M., M. de Lisle & M.E. Hauber. 2014. Inferring maximum lifespan from maximum recorded longevity in the wild carries substantial risk of estimation bias. *Ecography* 37: 770-780.

Bird Banding Laboratory (BBL). 2019. *Longevity records of North American birds, version 2019.1*. Patuxent Wildlife Research Center, U.S. Geological Survey, Laurel, Maryland, USA. Accessed 12 August 2019 at: *https://www.pwrc.usgs.gov/BBL/longevity/Longevity_main.cfm*

Blanco, D.E. & B. López-Lanús. 2008. Non-breeding distribution and conservation of the Upland Sandpiper (*Bartramia longicauda*) in South America. *Ornitologia Neotropical* 19: 613-621.

Boates, J. & R. McNeil. 1984. Longevity record for the Sanderling. *Journal of Field Ornithology* 55: 485.

Bowen, B.S. & A.D. Kruse. 1993. Effects of grazing on nesting by Upland Sandpipers in southcentral North Dakota. *Journal of Wildlife Management* 57: 291-301.

Casey, A.E., B.K. Sandercock & S.M. Wisely. 2011. Genetic parentage and local population structure in the socially monogamous Upland Sandpiper. *Condor* 113: 119-128.

Colwell, M.A., R.H. Gerstenberg, O.E. Williams & M.G. Dodd. 1995. Four Marbled Godwits exceed the North American longevity record for scolopacids. *Journal of Field Ornithology* 66: 181-183.

Garber, S.D., S. Chevalier & J.R. Cohen. 1997. Twenty-eight year study of Upland Sandpiper breeding population in New York. *North American Bird Bander* 22: 109-113.

Garvey, M.E., E. Nol, D.W. Howerter & L.M. Armstrong. 2013. A spatial analysis of factors affecting nesting success of shorebirds in the Canadian Prairies. *Condor* 115: 58-66.

Gill Jr, R.E., P.S. Tomkovich, R. David, M. Dementyev & A. Dibben-Young. 2010. Longevity, movements, and site fidelity in Wandering Tattlers *Heteroscelus incanus*. *Wader Study Group Bulletin* 110: 187-189.

Gratto-Trevor, C.L. 2000. Marbled Godwit (*Limosa fedoa*), version 2.0. In: *The Birds of North America* (A.F. Poole & F.B. Gill, Eds). Cornell Lab of Ornithology, Ithaca, New York, USA.

Gratto-Trevor, C.L. & C.M. Vacek. 2001. Longevity record and annual adult survival of Semipalmated Sandpipers. *Wilson Bulletin* 113: 348-350.

Grosselet, M.O., G.J. Ruiz & F.M. Zuniga. 2019. First migratory route of an Upland Sandpiper tracked with satellite transmitter during fall migration. *Wader Study* 126: 125-128.

Hill, J.M., B.K. Sandercock & R.B. Renfrew. 2019. Migration patterns of Upland Sandpipers in the Western Hemisphere. *Frontiers in Ecology and Evolution* 7:art426.

Houston, C.S., S.C. Drury & G. Holroyd. 1999. Upland Sandpiper banding in North

America. *North American Bird Bander* 24: 1-2.
Jackson, C.R. 2003. *Breeding ecology of prairie nesting shorebirds: relationships with habitat, land use and predators*. Master of Science, University of Saskatchewan, Saskatoon, Saskatchewan, Canada.
Klima, J., K. Ballantyne, J. Perz, A.S. Johnson, J.A. Jackson, J.-F. Lamarre & L. McKinnon. 2013. North American longevity records for American Golden-Plover *Pluvialis dominica* and Whimbrel *Numenius phaeopus* from Churchill, Manitoba, Canada. *Wader Study Group Bulletin* 120: 134-135.
Marks, J.S. 1992. Longevity record for the Bristle-thighed Curlew - an extension. *Journal of Field Ornithology* 63: 309-310.
Méndez, V., J.A. Alves, J.A. Gill & T.G. Gunnarsson. 2018. Patterns and processes in shorebird survival rates: a global review. *Ibis* 160: 723-741.
Miller, E.H. & R. McNeil. 1988. Longevity record for the Least Sandpiper - a revision. *Journal of Field Ornithology* 59: 403-404.
Mong, T.W. & B.K. Sandercock. 2007. Optimizing radio retention and minimizing radio impacts in a field study of Upland Sandpipers. *Journal of Wildlife Management* 71: 971-980.
Myers, J., R. Morrison, P. Antas, B. Harrington, T. Lovejoy, M. Sallaberry, S. Senner & A. Tarak. 1987. Conservation strategy for migratory species. *American Scientist* 75: 19-26.
Pearce-Higgins, J.W., D.J. Brown, D.J.T. Douglas, J.A. Alves, M. Bellio... Y.I. Yerkuil. 2017. A global threats overview for Numeniini populations: synthesising expert knowledge for a group of declining migratory birds. *Bird Conservation International* 27: 6-34.
Penner, R., B. Andres, J. Lyons & E. Young. 2015. Spring surveys (2011–2014) for American Golden-Plovers (*Pluvialis dominica*), Upland Sandpipers (*Bartramia longicauda*), and Buff-breasted Sandpipers (*Calidris subruficollis*) in the Flint Hills. *Kansas Ornithological Society Bulletin* 66: 37-52.
Sandercock, B.K. 2003. Estimation of survival rates for wader populations: a review of mark-recapture methods. *Wader Study Group Bulletin* 100: 163-174.
Sandercock, B.K., M. Alfaro-Barrios, A.E. Casey, T.N. Johnson, T.W. Mong, K.J. Odom, K.M. Strum & V.L. Winder. 2015. Effects of grazing and prescribed fire on resource selection and nest survival of Upland Sandpipers in an experimental landscape. *Landscape Ecology* 30: 325-337.
Thompson, P.S., D. Baines, J.C. Coulson & G. Longrigg. 1994. Age at first breeding, philopatry and breeding site-fidelity in the Lapwing *Vanellus vanellus*. *Ibis* 136: 474-484.
Vickery, P.D., D.E. Blanco & B. López-Lanús. 2010. *Conservation Plan for the Upland Sandpiper (Bartramia longicauda)*, version 1.1. Manomet Center for Conservation Sciences, Manomet, Massachusetts, USA.
Warnock, N. & R. Gill. 1996. Dunlin (*Calidris alpina*), version 2.0. In: *The Birds of North America* (A.F. Poole and F.B. Gill, Eds). Cornell Lab of Ornithology, Ithaca, New York, USA.

Table 1. Longevity of Upland Sandpipers ringed as hatchlings, adult males or adult females at Konza Prairie Biological Station, Kansas, 2001-2008.

Age (years)	Hatchlings		Age (years)	Adult males		Adult females	
0	305	95.9%	---	---	---	---	---
1	3	0.9%	1+	173	65.0%	170	70.8%
2	2	0.6%	2+	32	12.0%	25	10.4%
3	2	0.6%	3+	20	7.5%	25	10.4%
4	1	0.3%	4+	17	6.4%	13	5.4%
5	2	0.6%	5+	9	3.4%	4	1.7%
6	2	0.6%	6+	9	3.4%	3	1.3%
…	…	…	7+	4	1.5%	---	---
(13)	(1)	(0.3%)	8+	2	0.8%	---	---
Total	318		Total	266		240	

Table 2. Longevity records for Upland Sandpipers ringed as hatchlings, adult males, or adult females at Konza Prairie Biological Station, Kansas, 2001-2008.

Ring	Age	Sex	First capture	Date	Last record	Date	Age (yr)
30043	H	M	Ringed at nest	24.05.2006	Resight	21.06.2019	13
28457	H	U	Ringed at nest	09.06.2002	Resight	19.06.2008	6
28656	H	M	Ringed at nest	16.06.2003	Resight	11.05.2009	6
28329	H	F	Ringed at nest	30.05.2001	Recapture	20.06.2006	5
28745	H	F	Ringed at nest	25.05.2004	Resight	16.05.2009	5
28415	A	M	Ringed at nest	21.05.2002	Resight	11.05.2009	8+
28419	A	M	Caught at night	23.05.2002	Resight	04.05.2009	8+
28565	A	M	Caught at night	13.05.2003	Resight	11.06.2009	7+
28582	A	M	Ringed at nest	26.05.2003	Resight	23.06.2009	7+
28361	A	F	Caught at night	23.04.2002	Resight	08.06.2007	6+
28365	A	F	Caught at night	25.04.2002	Recapture	28.05.2007	6+
28376	A	F	Caught at night	01.05.2002	Recapture	10.05.2007	6+
28592	A	F	Ringed at nest	30.05.2003	Resight	29.06.2007	5+

Fig. 1. A new longevity record of 13 years and 29 days for an Upland Sandpiper. The sandpiper was ringed as a hatchling on 24 May 2006, and photographed on 21 June 2019 near Konza Prairie Biological Station, Kansas (photos: Greg Kramos). The individual identity was confirmed from a sequence of photographs of the ring number (1573-30043). The bird had been previously sexed as a male and was resighted 1.73 km from the original natal nest site.