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SHORT COMMUNICATION

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the cumulative percent distributions of female and male captures (termed D_m). We express female-first migration as negative values, and male-first migration as positive values. D_m can be interpreted as the expected number of days by which the capture of a randomly-selected male precedes that of a randomly-selected female. The likelihood that the value of D_m occurred by chance can be estimated by comparing the estimated value of D_m with a null distribution (i.e. that expected if the order of arrival were random with respect to gender). The null distribution is generated by randomly assigning a gender to each successive capture in proportion to each gender's representation in the data set, computing D_m, and repeating 1000 times (Morbey 2000). We expected female-first migration, and therefore report the proportion of the null distribution lying below (i.e. females further ahead) the measured value of D_m—effectively a one-tailed test that more extreme values could arise by chance.

This procedure is inadequate to test the hypothesis that males are significantly advanced when, as we unexpectedly observed, they preceded females. In these cases the proportion of the null distribution lying below the measured value of D_m is large and may approach 1.00, but this does not mean that the difference is random. To better and more conservatively test whether males ever significantly preceded females, we took the inverse (i.e. 1 minus the probability), and doubled it to make a two-tailed test. The estimates of D_m and the associated one-tailed probability levels are summarized in Table 1.

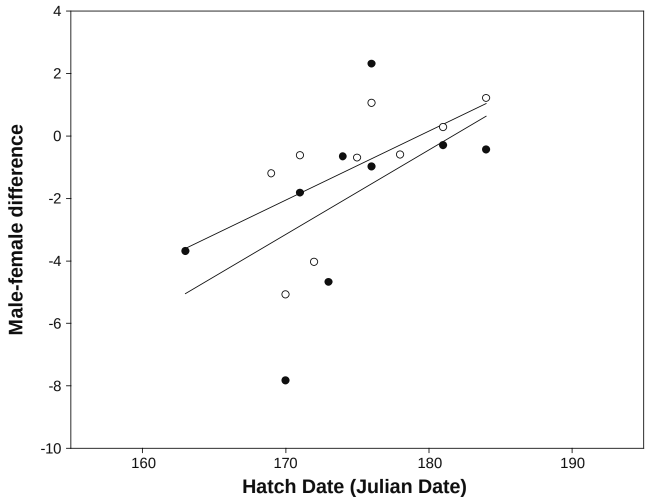
Table 1 The table shows hatch (Julian date) from the data of Bowman et al. (2001), sample size, D_m (male–female timing difference) and the one-tailed probability level that D_m arose by chance[a]

Year	Hatch	Adults			Juveniles		
		N	D_m	*P*	*N*	D_m	*P*
1978		118	−2.11	0.167	372	-2.43	0.037
1979		487	−0.12	0.585	699	0.53	0.759
1980		1,221	1.5	1.00	626	−0.87	0.076
1981		310	2.62	1.00	524	−0.79	0.106
1982	181	762	−0.3	0.284	1734	0.28	0.853
1983		686	−0.93	0.038	1,297	−1.79	0.002
1985	184	217	−0.44	0.324	88	1.21	0.843
1989	175				57	−0.70	0.103
1990	176	103	−0.98	0.265	129	1.05	0.836
1992	178				38	−0.60	0.443
1993	172				138	−4.04	0.004
1994	169				93	−1.20	0.137
1995	170	34	−7.83	0.009	142	−5.08	. 0.001
1996	171	113	−1.82	0.112	415	−0.62	0.183
1997	163	124	−3.69	0.001	238	−3.18	0.013
1998	173	38	−4.68	0.015	97	0.89	0.708
1999	176	23	2.31	0.895	55	−3.08	0.040
2000	174	199	−0.66	0.24	154	−0.13	0.432

[a]Procedure described in the text. No data were collected in 1984, 1986–1988, or 1991

Hatch timing

In 1982 and 1985–2000, intensive nest surveys were conducted in coastal areas of the Yukon-Kuskokwim Delta in western Alaska (Bowman et al. 2001), at the heart of the breeding range of western sandpipers. We used the data



4
2
0
-2
-4
-6
-8
-10
160
170
180
190
Male-female difference
Hatch Date (Julian Date)

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