

Supporting Materials

The migratory Mute Swan *Cygnus olor* population in East Asia

Table S1. Details of the five individual Mute Swans caught in summers 2016 and 2017 and fitted with solar-powered GPS/GSM telemetry devices. Age and sex as well as capture sites, date and attachment method are provided, together with body mass at capture (where known). Sex was determined based on the field identification. Ad = adult, juv = juvenile, M = male, F = female. * End date = date when the bird was last resighted in the field (by Nial Moores, in northern Kangwon, North Korea, pers. comms.); as the transmitter failed to provide GPS locations, data on the duration, total fixes and average number of fixes are not available. # End date = date when the bird was last resighted in the field (by a volunteer, in Inner Mongolia, China); as the transmitter failed to provide GPS locations, data on the duration, total fixes and average number of fixes are also not available.

Bird ID	Sex	Age	Weight (g)	Capture site	Device manufacture	Device weight (g)	Start date	End date	Duration (days)	Total no. fixes	Average no. fixes per day
MS001	F	Ad	10,940	Dalai Lake, Inner Mongolia	Druid	45	29/09/2016	10/05/2018	590	12,362	21
MS002	M	Juv	8,000	Buir Lake, Eastern Mongolia	KoEco	103	20/07/2017	22/10/2017	94	1,132	12
MS003	F	Ad	8,100	Buir Lake, Eastern Mongolia	KoEco	103	20/07/2017	04/11/2017*	–	–	–
MS004	M	Juv	8,600	Buir Lake, Eastern Mongolia	KoEco	103	20/07/2017	04/11/2017*	–	–	–
MS005	F	Ad	9,500	Buir Lake, Eastern Mongolia	KoEco	103	20/07/2017	20/10/2017#	–	–	–

Table S2. Records of Mute Swans during spring, summer, autumn and winter periods derived from the literature and unpublished data in China. The records are raw counts with details of observation location (if available) and approximate location.

Season	Province	Site	No. swans counted	Latitude	Longitude	Date	Reference
Spring	Shandong	Yellow River delta	122	37.83	119.04	07/03/2007	Hong Kong Bird Watching Society (2009)
	Shandong	Yellow River delta	23	37.83	119.04	01/03/2008	Hong Kong Bird Watching Society (2011)
	Shandong	Yellow River delta	35	37.83	119.04	01/03/2010	Hong Kong Bird Watching Society (2015)
	Shandong	Yellow River delta	70	37.83	119.04	01/03/2011	Hong Kong Bird Watching Society (2015)
	Shandong	Yellow River delta	115	37.83	119.04	14/03/2015	Yellow River Delta National Nature Reserve Administration (2015a)
	Hebei	Cangzhou	3	38.31	116.76	07/03/2007	Hong Kong Bird Watching Society (2009)
	Tianjin	Beidagang	12	38.83	117.46	19/03/2014	Wu & Su (2014)
	Tianjin	Beidagang	1	38.83	117.46	26/03/2016	Mo (2016)
	Tianjin	Beidagang	40	38.94	117.10	28/03/2017	Unpubl. data from Cao's counts at key sites in Tianjin in spring 2017
	Liaoning	Yalu River estuary	2	39.93	124.30	01/03/2008	Hong Kong Bird Watching Society (2011)
	Liaoning	Yalu River estuary	3	39.93	124.30	01/03/2009	Hong Kong Bird Watching Society (2011)
	Beijing	Wild Duck Lake	1	40.40	115.80	04/04/2008	Sun (2008)
	Inner Mongolia	Horqin Zuoyi Houqi	5	43.21	123.14	28/03/2015	Liu <i>et al.</i> (2015a)
	Jilin	Xianghai	15	45.05	122.29	09/04/2015	Li <i>et al.</i> (2015)
	Jilin	Xianghai	6	45.05	122.29	25/03/2016	Li <i>et al.</i> (2016)

Season	Province	Site	No. swans counted	Latitude	Longitude	Date	Reference
Summer	Tianjin	Beidagang	12	38.83	117.46	15/10/2014	Wu (2014a)
	Tianjin	Beidagang	4	38.83	117.46	18/04/2016	Liu <i>et al.</i> (2016)
	Inner Mongolia	Ulanu Lake	174	41.07	108.87	01/06/2004	Zhao <i>et al.</i> (2019)
	Inner Mongolia	Ulanu Lake	1,300	41.07	108.87	01/09/2004	Zhao <i>et al.</i> (2019)
	Inner Mongolia	Dalai Lake	56	48.34	117.49	22/05/2007	Zhao <i>et al.</i> (2009)
	Inner Mongolia	Dalai Lake	12	48.34	117.49	05/06/2007	Zhao <i>et al.</i> (2009)
	Inner Mongolia	Dalai Lake	12	48.34	117.49	10/07/2007	Zhao <i>et al.</i> (2009)
	Inner Mongolia	Dalai Lake	12	48.34	117.49	22/08/2007	Zhao <i>et al.</i> (2009)
	Inner Mongolia	Dalai Lake	79	48.34	117.49	28/04/2014	Dou (2014a)
	Inner Mongolia	Argun River	1	49.88	118.58	08/05/2014	Liu & Dou (2014)
	Inner Mongolia	Dalai Lake	3	48.34	117.49	24/09/2014	Su <i>et al.</i> (2014)
	Inner Mongolia	Dalai Lake	3	48.34	117.49	24/09/2014	Dou (2014b)
	Inner Mongolia	Tumuji	3	46.29	123.09	17/04/2016	Liu <i>et al.</i> (2016)
	Inner Mongolia	Dalai Lake	13	48.34	48.34	28/09/2016	Dou (2016)
	Inner Mongolia	Horqin Youyi Zhongqi	1	45.10	121.44	15/10/2014	Zhang (2014)
	Jilin	Xianghai	1	45.00	122.31	25/04/2019	Unpubl. data from Cao's counts at key sites in northeast China in spring 2019

Season	Province	Site	No. swans counted	Latitude	Longitude	Date	Reference
Autumn	Shandong	Yellow River delta	210	37.83	119.04	01/11/2009	Hong Kong Bird Watching Society (2011)
	Shandong	Yellow River delta	70	37.83	119.04	07/11/2007	Hong Kong Bird Watching Society (2009)
	Shandong	Yellow River delta	23	37.83	119.04	01/11/2010	Hong Kong Bird Watching Society (2015)
	Shandong	Yellow River delta	65	37.83	119.04	11/11/2011	Hong Kong Bird Watching Society (2015)
	Shandong	Yellow River delta	23	37.83	119.04	30/10/2014	Shan <i>et al.</i> (2014)
	Tianjin	Tianjin Coast	4	39.20	117.92	30/10/2006	Unpubl. data from Cao's counts at key sites along the Tianjin coasts in autumn 2006
	Tianjin	Beidagang	6	38.83	117.46	27/10/2014	Wu (2014b)
	Tianjin	Beidagang	5	38.83	117.46	07/11/2015	Mo <i>et al.</i> (2016b)
	Tianjin	Beidagang	1	38.83	117.46	17/10/2015	Liu <i>et al.</i> (2015b)
	Tianjin	Beidagang	3	38.83	117.46	31/10/2016	Mo <i>et al.</i> (2016a)
Winter	Shandong	Dingziwan	15	36.56	120.93	05/02/2007	Unpubl. data from Cao's non-breeding counts at key sites along the Yellow River estuary in 2017
	Shandong	Dingziwan	73	36.61	120.85	05/02/2007	Unpubl. data from Cao's non-breeding counts at key sites along the Yellow River estuary in 2017
	Shandong	Tian'e Lake, Dongying	13	37.36	118.78	13/02/2007	Unpubl. data from Cao's non-breeding counts at key sites along the Yellow River estuary in 2017
	Shandong	Yellow River Delta	79	37.83	119.04	07/01/2007	Hong Kong Bird Watching Society (2009)
	Shandong	Yellow River Delta	194	37.83	119.04	07/02/2007	Hong Kong Bird Watching Society (2009)
	Shandong	Yellow River Delta	88	37.83	119.04	07/12/2007	Hong Kong Bird Watching Society (2009)

Season	Province	Site	No. swans counted	Latitude	Longitude	Date	Reference
Winter	Shandong	Yellow River Delta	79	37.83	119.04	01/01/2008	Hong Kong Bird Watching Society (2011)
	Shandong	Yellow River Delta	65	37.83	119.04	01/02/2008	Hong Kong Bird Watching Society (2011)
	Shandong	Yellow River Delta	280	37.83	119.04	01/12/2008	Hong Kong Bird Watching Society (2011)
	Shandong	Yellow River Delta	26	37.83	119.04	01/02/2009	Hong Kong Bird Watching Society (2011)
	Shandong	Yellow River Delta	2	37.83	119.04	01/12/2009	Hong Kong Bird Watching Society (2011)
	Shandong	Yellow River Delta	5	37.83	119.04	01/01/2010	Hong Kong Bird Watching Society (2015)
	Shandong	Yellow River Delta	21	37.83	119.04	01/02/2010	Hong Kong Bird Watching Society (2015)
	Shandong	Yellow River Delta	65	37.83	119.04	01/12/2010	Hong Kong Bird Watching Society (2015)
	Shandong	Yellow River Delta	78	37.83	119.04	01/01/2011	Hong Kong Bird Watching Society (2015)
	Shandong	Yellow River Delta	70	37.83	119.04	01/02/2011	Hong Kong Bird Watching Society (2015)
	Shandong	Yellow River Delta	65	37.83	119.04	11/12/2011	Hong Kong Bird Watching Society (2015)
	Shandong	Yellow River Delta	150	37.83	119.04	06/02/2014	Shan (2014)
	Shandong	Yellow River Delta	400	37.83	119.04	10/01/2015	Yellow River Delta National Nature Reserve Administration <i>et al.</i> (2015b)
	Shandong	Yellow River Delta	4	37.73	119.09	05/01/2019	Unpubl. data from Cao's non-breeding counts at key sites in Shandong in winter 2018/19
	Shandong	Yellow River Delta	5	37.75	119.09	05/01/2019	Unpubl. data from Cao's non-breeding counts at key sites in Shandong in winter 2018/19
	Shandong	Yellow River Delta	10	37.75	119.06	05/01/2019	Unpubl. data from Cao's non-breeding counts at key sites in Shandong in winter 2018/19

Table S3. Numbers of Mute Swans counted in Japan during winters 1987/88–2019/20.

Winter	No. of swans	Winter	No. of swans
1987/88	117	2004/05	265
1988/89	119	2005/06	227
1989/90	114	2006/07	209
1990/91	101	2007/08	240
1991/92	122	2008/09	247
1992/93	103	2009/10	200
1993/94	154	2010/11	269
1994/95	178	2011/12	215
1995/96	145	2012/13	218
1996/97	162	2013/14	256
1997/98	134	2014/15	380
1998/99	139	2015/16	337
1999/00	149	2016/17	367
2000/01	173	2017/18	304
2001/02	226	2018/19	136
2002/03	160	2019/20	61
2003/04	138		

Notes: January surveys conducted nationwide from 1987–2019. The current population estimate for Mute Swan in Japan is 240, based on the average of counts over the last five winters, from 2015/16–2019/20 (Ministry of the Environment of the Government of Japan 2019).

Table S4. One key wintering site was identified for Mute Swans in China, from the count data recorded during surveys in winters 2014/15–2018/19.

ID	Wetlands	Management unit	Longitude	Latitude	2014/15	2015/16	2016/17	2017/18	2018/19
C1	Yellow River delta	China	119.04	37.83	400	–	–	–	19

References for Supporting Materials

- Dou, H. 2014a. Dalai Lake, Inner Mongolia. *Cranes and Waterbirds Migration Briefs* 1(4): 12.
- Dou, H. 2014b. Dalai Lake, Inner Mongolia. *Cranes and Waterbirds Migration Briefs* 1(5): 6.
- Dou, H. 2016. Dalai Lake, Inner Mongolia. *Cranes and Waterbirds Migration Briefs* 3(7): 1–2.
- Hong Kong Bird Watching Society. 2009. China coastal waterbird census report (9.2005–12.2007). HKBWS, Hong Kong, China.
- Hong Kong Bird Watching Society. 2011. China coastal waterbird census report (1.2008–12.2009). HKBWS, Hong Kong, China.
- Hong Kong Bird Watching Society. 2015. China coastal waterbird census report (1.2010–12.2011). HKBWS, Hong Kong, China.
- Li, L., Chen, X., Li, S. & Lin, B. 2015. Xianghai, Jilin. *Cranes and Waterbirds Migration Briefs* 2(4): 5.
- Li, L., Li, S. & Lin, B. 2016. Xianghai, Jilin. *Cranes and Waterbirds Migration Briefs* 3(2): 10.
- Liu, J., Zheng, J., Chen, G., Ma, T., Wu, Y., Zhang, Y., Hong, J. & Mo, X. 2016. Beidagang, Tianjin. *Cranes and Waterbirds Migration Briefs* 3(3): 2.
- Liu, S. & Dou, H. 2014. Argun River, Inner Mongolia. *Cranes and Waterbirds Migration Briefs* 1(4): 14.
- Liu, T., Zhou, H. & Lv, Y. 2015a. Horqin Zuoyi Houqi, Inner Mongolia. *Cranes and Waterbirds Migration Briefs* 2(3): 14.
- Liu, Z., Jia, J., Zhang, T., Gu, Y., Zhang, J. & Xiao, D. 2015b. Beidagang, Tianjin. *Cranes and Waterbirds Migration Briefs* 2(8): 15.
- Ministry of the Environment of the Government of Japan. 2019. *Japan Integrated Biodiversity Information System*. Ministry of the Environment, Tokyo, Japan. Available at http://www.gankamo/gankamo_top.html (last accessed on December 12 2019). [In Japanese.]
- Mo, X. 2016. Beidagang, Tianjin. *Cranes and Waterbirds Migration Briefs* 3(2): 1–2.
- Mo, X., Jia, Y., Liu, Y. & Geng, X. 2016a. Beidagang, Tianjin. *Cranes and Waterbirds Migration Briefs* 3(1): 18.
- Mo, X., Quan, Q., Liu, X., Q. & Que, P. 2016b. Beidagang, Tianjin. *Cranes and Waterbirds Migration Briefs* 3(2): 2.
- Shan, K. 2014. Yellow River Delta, Shandong. *Cranes and Waterbirds Migration Briefs* 1(1): 1.
- Shan, K., Li, Z., Niu, R., Zhang, X. & Wang, L. 2014. Yellow River Delta, Shandong. *Cranes and Waterbirds Migration Briefs* 1(7): 17.
- Su, L., Wo, Q. & Wu, Z. 2014. Argun River, Inner Mongolia. *Cranes and Waterbirds Migration Briefs* 1(5): 4.
- Sun, S. 2008. Featured bird news. *Bird observation in China* 61: 24.
- Wu, X. 2014a. Beidagang, Tianjin. *Cranes and Waterbirds Migration Briefs* 1(6): 14.
- Wu, X. 2014b. Beidagang, Tianjin. *Cranes and Waterbirds Migration Briefs* 1(7): 14.
- Wu, X. & Su, L. 2014. Beidagang, Tianjin. *Cranes and Waterbirds Migration Briefs* 1(1): 2.
- Yellow River Delta National Nature Reserve Administration. 2015a. Yellow River Delta, Shandong. *Cranes and Waterbirds Migration Briefs* 2(2): 1.
- Yellow River Delta National Nature Reserve Administration, National Bird Banding Center & Dongying Bird Watching Association. 2015b. Yellow River Delta, Shandong. *Cranes and Waterbirds Migration Briefs* 2(1): 2.
- Zhang, Z. 2014. Horqin Youyi Zhongqi, Inner Mongolia. *Cranes and Waterbirds Migration Briefs* 1(6): 2.
- Zhao, G., Liu, S., Gerelchaokt, Li, G. & Cui, G. 2009. Distribution, migration and protection of *Cygnus olor* – A case study in the Dalai Lake Nature Reserve. *Arid Zone Research* 26: 80–83.
- Zhao, G., Ling, Y. & Gao, M. 2019. Population variation and its cause of Mute Swan in the Wuliangsuhai Lake in recent years. *Chinese Journal of Zoology* 54: 8–14.