Chinese Journal of Zoology 2019, 54(6): 775 ~ 783

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HASSELL Chris

MAGLIO Grace MINTON Clive *

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200433

3193 202150

Numenius phaeopus

- 2018 2

-

7

6 378 1 km 36 ± 4 d

1 ~ 3 23 ± 2 d 9 795 ± 346

km *n* = 7

90 ± 27 d 2 ~ 4

79 ± 29 d 10 101 ± 520 km *n* = 5

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Q958.13 A 0250-3263 2019 06-775-09

Tracking the Migration of Whimbrels along the East Asian-Australasian Flyway

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2019-07-30 2019-09-19 DOI: 10.13859/j.cjz.201906001

2017

-

Hua et al. 2015 Clemens et al. 2016 Studds et al. 2017

10%

Li et al. 2019

-

Johnson et al. 2016 Carneiro et al. 2019

Sheehy et al. 2011 -

-

del Hoyo et al. 2018

1

1.1

Broome 122°E 18°S

-

2018 2 Australian Wader Study Group AWSG canon net

leg-looped

Hunan Global Messenger Technology Co, Ltd 7 g HQBG1107

Microwave Telemetry Inc. 5 g

3%

Phillips et al. 2003

7 No. 1 ~ 7 3 No. 1 ~ 3

4 No. 4 ~ 7

No. 2 No. 3

5 No. 1 No. 4 ~ 7

1.2

1.2.1

Global Positioning System GPS

Global System for Mobile Communications GSM GPS-GSM

2 ~ 6 h 1

A ~ E 5

5 m 10 m 20 m 100 m 1 000 m

3 150

371 A ~ E

2 132 517 93 26 11

Platform Transmitter Terminal PTT

Argos

4 h 1

3 2 1 0 A B Z 7

3 2 1 0 < 150 m 150 ~ 350 m 350 m 350 ~ 1 000 m > 1 000 m A B Z

6 703 3 2 1 0 A B Z 906 1 097 1 596 1 322 918 836 28

1 km 11

23

6 378 65% ± 2 d 1 2

1.2.2 No. 1 2 5 6

No. 3

No. 4

25 km 7

> 24 h

2015 1 2

2.2

No. 1 No. 2 No. 4 No. 6 No. 7

No. 3

1.2.3 No. 5

R "Geosphere"

Hijmans et al. 2016 105 ~ 173° E

65 ~ 69° N 7

62 ± 8 d

ArcGIS No. 2 75 d No. 5

12.1 51 d

2

2.3

No. 3 No. 2

2.1 9 15 10 14

7 5

4 17 4 20 4 7 7 16 8

19 6 7 26

1 1

5 23 6 1 5 25

1 No. 5

7

1 1

9 795 ± 346 km 5

2 ~ 4 10 101 ± 520 km

90 ± 27 d 9 18 11 25

51% 10 22 1

36 ± 4 d 7

1 ~ 3 2 ~ 4

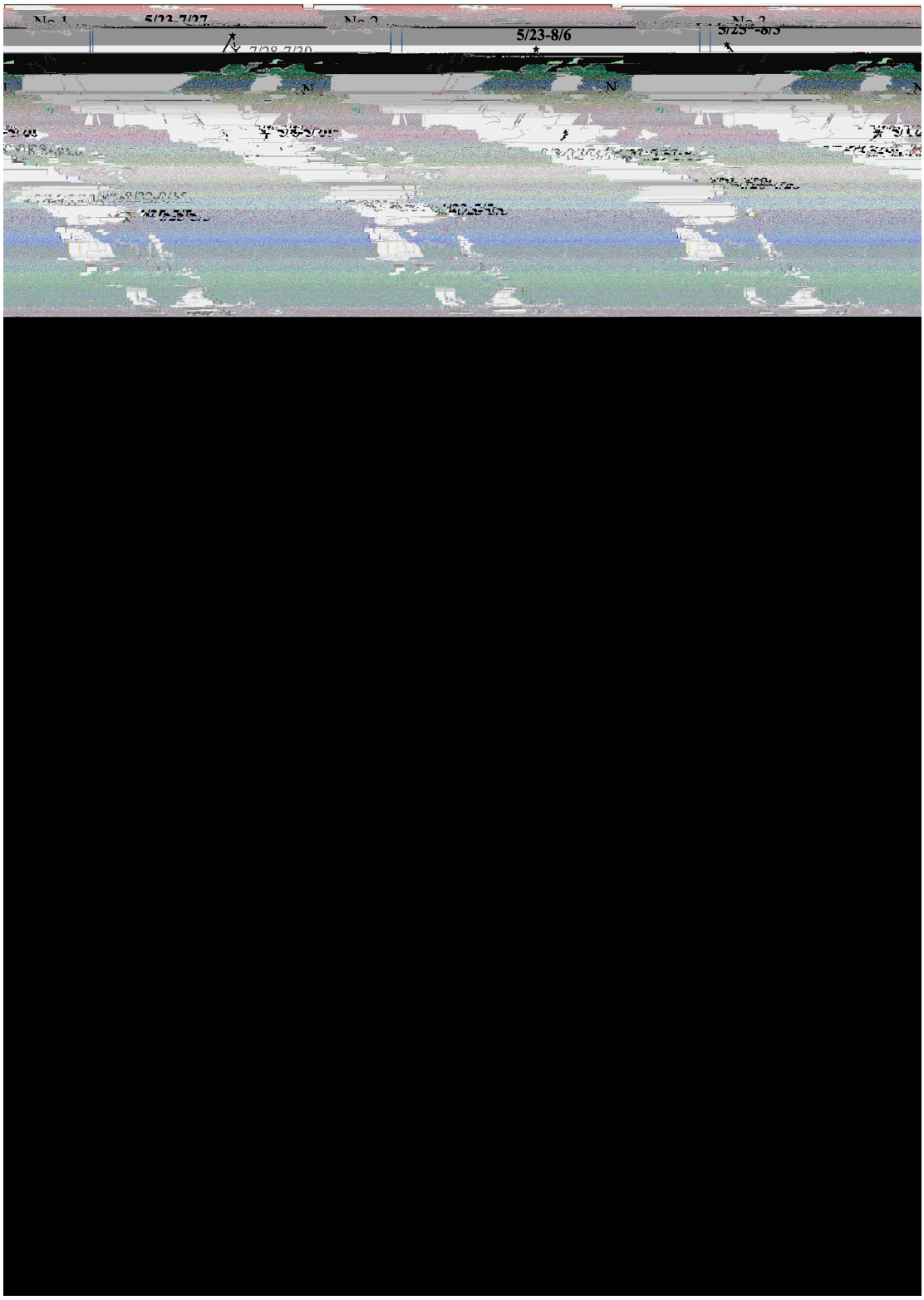

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Fig. 1 Migration routes and major stopover sites of Whimbrels

1

Table 1 Migration timing and distances of Whimbrels

	Individual number							Mean (SD)
	1	2	3	4	5	6	7	
Wintering ground departure date (Month-date)	4-19	4-20	4-17	4-19	4-18	4-20	4-18	4-19
Spring stopover duration (d)	21	20	24*	24	22	21*	28	23 (2)
Breeding ground arrival date (Month- date)	5-23	5-23	5-25*	5-23	5-26	5-25	6-1	5-25
Breeding ground departure date (Month- date)	7-27	8-6	8-3	7-17	7-16	7-23*	7-31	7-26
Autumn stopover duration (d)				58*	112	44	102	79 (29)
Wintering ground arrival date (Month- date)	10-12*			9-28	11-25	9-18	11-23	10-22
Spring migration duration (d)	34	33	38*	34	37	35	44	36 (4)
Autumn migration duration (d)	77*			73	130	57*	115	90 (27)
Migration distance (km)	9 782	9 483	9 615	9 697	10 616	9 690	9 679	9 795 (346)
Migration distance (km)	9 822			9 701	11 124	9 995	9 866	10 101 (520)

* *: inferential value.

2

Table 2 Stopover location and duration of Whimbrels

Individual Number	Spring migration			Autumn migration		
	Stopover times	Stopover sites	(d) Stopover duration	Stopover times	Stopover sites	(d) Stopover duration
1	2	Pudong New District, Shanghai	2	3	Tomponsky District, Sakha Republic, Russia	2
		Dongying City, Shandong Province	19		Dongying City, Shandong Province	46
					Wajo, Sulawesi Selatan, Indonesia	-
2	3	Zhangpu County, Fujian Province	10	-	Xingcheng City, Liaoning Province	12
		Huanghua City, Hebei Province	2		Pingyang County, Zhejiang Province	24
		Shuangliao City, Jilin Province	8		Zhongshan City, Guangdong Province	2
3	2	Jinjiang City, Fujian Province	12	-	Shishi City, Fujian Province	24
		Horqin Zuoyi Zhongqi, Inner Mongolia Autonomous Region	12*			
4	3	Xiapu County, Fujian Province	9	4	Verkhnevilyuysky District, Sakha Republic, Russia	2
		Zhuanghe City, Liaoning Province	5		Gaizhou City, Liaoning Province	7*

2

Individual Number	Spring migration			Autumn migration		
	Stopover times	Stopover sites	(d) Stopover duration	Stopover times	Stopover sites	(d) Stopover duration

Johnson et al. 2016

10°

N Carneiro et al. 2019

Hedenström et al. 1997

Adriaensen 1990

Kemp et al. 2010

Hedenström et al.

1997

Kiat et al. 2016 Verhoeven et al. 2016

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Klaassen

et al. 2010 Vansteelant et al. 2017 Briedis et al.

2018

No. 5

Hua et al. 2015

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La Sorte et al.

2014 Briedis et al. 2018 No. 5

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