MIGRATION CHARACTERISTICS OF THE WOOD SANDPIPER (*Tringa glareola*) AT EILAT (ISRAEL)

Reuven Yosef, Piotr Tryjanowski and Magdalena Remisiewicz

ABSTRACT

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The Wood Sandpiper is a common passage migrant in Israel. However, the relative importance of this flyway remains unknown. Here, we present a general overview of Wood Sandpiper migration at Eilat (Israel). A total of 214 Wood Sandpipers were caught, ringed and measured at the IBRCE ringing station in years 1984-2001. Most of Wood Sandpipers were caught in spring (195 indiv. – 91%) and rarely in autumn (19 indiv. – 9%). Retrap analysis confirms that the region offers good foraging conditions for this species and the median body mass gain in Eilat was 2.0 g/day. The extreme gain of 5.5 g/day noted in Eilat exceeds the extremes reached by birds at other sites. The median length of stay of the birds was 4 days and the mean body mass of spring migrants in Eilat was distinctly lower than found in other sites both in northern Africa and in the Mediterranean region of Europe. The data suggest that in spring Eilat is probably the first site for Wood Sandpiper to restore energetic reserves after an exhausting crossing of the deserts. Low weight and occurrence of the extremely lean birds suggest that Eilat is used by Wood Sandpipers as an "emergency" stopover site primarily for disadvantaged birds.

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Key words: *Tringa glareola*, migration, stopover

INTRODUCTION

The Wood Sandpiper is a common passage migrant in most parts of Israel, and is a scarce over-wintering species in the north of the country (Shirihai 1996). It occurs mostly in aquatic, muddy or marshy habitats of fish, salt or sewage ponds. Shirihai (1996) reported that the bulk of the spring migration occurs in three distinct waves. The first of them passes through in mid-April, the second and the main wave

– in late April, and the third – in early May. In contrast, during the autumn migration only two waves are discerned: the first one – during July, and the second and the major wave – in late August to early September. Flocks consist often of 10-200 birds and the species migrates through the region in a broad front. However, the relative importance of this flyway remains unknown and justifies an in-depth study. Our goal was to present a general overview of Wood Sandpiper migration at Eilat (Israel).

MATERIAL AND METHODS

Israel is the only land bridge for birds migrating south from Europe and Asia to Africa in autumn and north to their breeding grounds in spring (Shirihai *et al.* 2000). Eilat is an important site because it is located on the northern edge of the Saharan-Arabian desert belt (Fig. 1) and is critical for many migrant species because it is reached after a flight of almost 2000 km of continuous desert regions of the Sahel, Sahara and Sinai deserts (Safriel 1968). To the north north east there are still 650 km more of the Syrian Desert, and to the east the vast Arabian desert. Hence, many birds are enticed to land in the green areas that surround Eilat and to rest before (in autumn) or after (in spring) crossing of the deserts (Morgan and Shirihai 1997).

Fig. 1. Location of Eilat (Israel)

During years 1984-2000, the International Birding and Research Center in Eilat (IBRCE) trapped and ringed over 140 000 birds of 131 species. Passerines and raptors have been the major focus of the ringing program. Waders were ringed when trapped accidentally in periods of their numerous occurrences, so that trapping results reflect to some extent migration dynamics. The exceptions are years 1989-1991 and 1999-2000 when waders where also targeted and trapped on a daily basis. The 1989-1991 project was a result of the encouragement of Dr G. Boere and WIWO (Foundation Working Group International Wader and Waterfowl Research). The recent focus is the initiative of the IBRCE. The waders during the latter period were trapped with 7 walk-in traps on the Salinas. The importance of the saltpans at Eilat to waders is well documented (Shirihai 1996) and on peak migration days more than 10 000 waders can be observed.

The dynamics of catching was presented on a pentade basis (Fig. 2), pooled for all the years due to small sample sizes from subsequent years. However, it should be treated cautiously as trapping was not regular in all years. Birds were aged according to Prater *et al*. (1977), however in spring ageing could be difficult, thus these results should be treated cautiously. All birds trapped were ringed with an aluminium ring of the Israel ringing scheme and the following measurements were taken: wing chord (Evans 1986) and tail length (to the nearest 1 mm), and body mass (to the nearest 0.1 g). From 1999, total head length (Green 1980) and tarsus+toe (Piersma 1984) were additionally measured (to the nearest 0.1 mm). Unfortunately, during years of ringing activity the measurements were taken by different ringers and were not standardised.

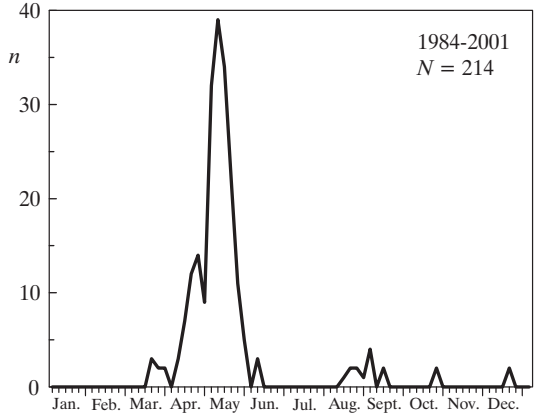

Fig. 2. Catching dynamics of Wood Sandpipers at Eilat in 1984-2001

Standard statistical methods were used to describe and analyse the data (Sokal and Rohlf 1995). Calculations were conducted using the SPPS for Windows package (Norusis 1986). In almost all cases parametric tests were used, as the data fulfilled the necessary assumptions. The only exceptions were comparisons between measurements of adult and immature birds, when non-parametric tests were applied due to low sample sizes. All statistical tests were two-tailed. We considered $p < 0.05$ as the minimum acceptable level of significance.

RESULTS

A total of 214 Wood Sandpipers were caught, ringed and measured at the IBRCE ringing station in years 1984-2001. Great variation in trapping success was noted and annually 1-86 birds (1988 and 1991, respectively) were caught. Wood Sandpipers were caught almost exclusively in spring (195 indiv. – 91%) and rarely in autumn (19 indiv. – 9%).

Spring migration

The spring migration was concentrated in one wave and peaked around 10 May (Fig. 2). In spring, adult birds (over second year of life) prevailed – they constituted *ca* 67% of all birds caught. The biometric characteristics of caught birds is presented in Table 1 and at Figure 3. The distribution of all measurements for birds trapped in spring, analysed separately for each age class, did not depart from the normal curve (χ^2-test, in all cases $p > 0.05$). Average wing length of birds caught in spring did not differ between the age classes (Student t-test, $p = 0.67$). In the distribution of that measurement a bimodality could be seen (Fig. 3). Also the distribu-

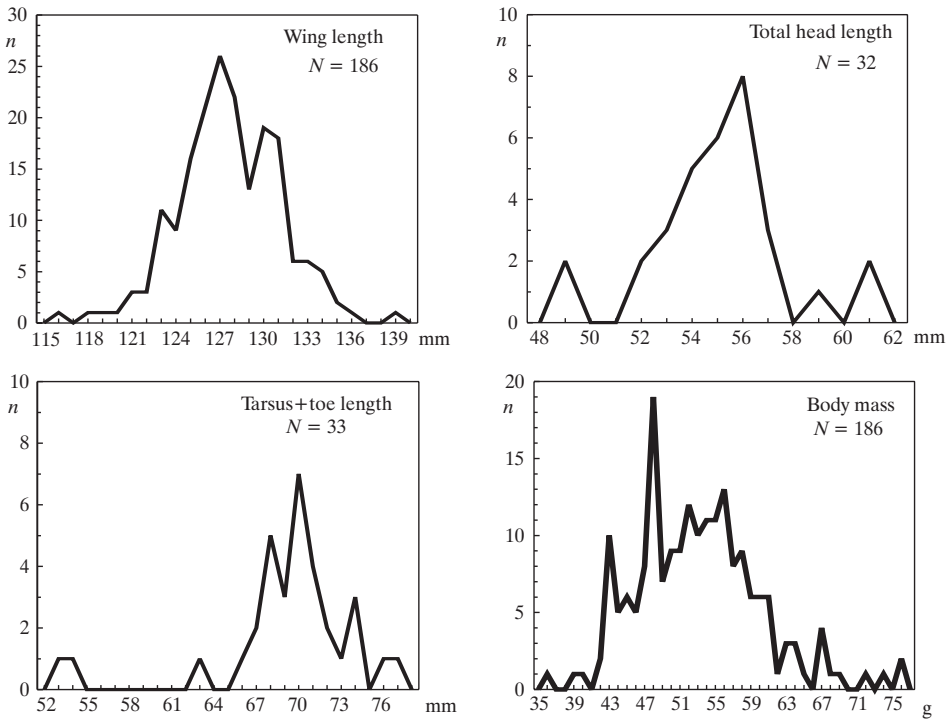

Fig. 3. Distribution of measurements of Wood Sandpipers ringed on spring migration at Eilat. Body mass presented for the first capture, for both age classes combined.

tion of tarsus+toe length showed some (but weak probably due to the small sample size) tendency to bimodality (Fig. 3).

A great variance in body mass was found (Table 1, Fig. 3). However, there were no significant differences between the age classes (Student t-test, $p = 0.52$). For both age classes jointly we found a positive, but weak, correlation between body mass and wing length (correlation coefficient – $r = 0.26, p < 0.001$; Fig. 4) for each age class separately the result was very similar ($r_{imm.} = 0.32, p < 0.01$; $r_{ad.} = 0.24$, $p = 0.007$).

Table 1
Biometrics of Wood Sandpipers ringed during spring and autum nmigration at Eilat in 1984-2001. Data for total head length and tarsus+toe length come from period 1999-2001.

	ad.			*imm.*			*ad. + imm.*		
Measurement	*N*	Mean	*SD*	*N*	Mean	*SD*	*N*	Mean	*SD*
Spring									
Wing length (mm)	126	127.5	3.5	60	128.0	3.5	186	127.7	3.5
Tail length (mm)	28	52.7	5.3	6	50.5	3.1	34	52.3	5.0
Body mass (g)	131	53.0	6.9	62	53.5	7.0	193	53.2	6.9
Total head length (mm)	27	55.5	2.5	5	54.6	3.1	32	55.4	2.6
Tarsus+toe length (mm)	28	69.5	4.3	5	67.2	3.7	33	69.2	4.9
Autumn									
Wing length (mm)	4	131.8	5.5	8	126.7	3.9	12	128.4	4.9
Tail length (mm)	1	51.0	–	–	–	–	–	–	–
Body mass (g)	5	58.4	13.6	13	52.5	6.2	18	54.2	8.9
Total head length (mm)	1	59.0	–	–	–	–	–	–	–
Tarsus+toe length (mm)	1	66	–	–	–	–	–	–	–

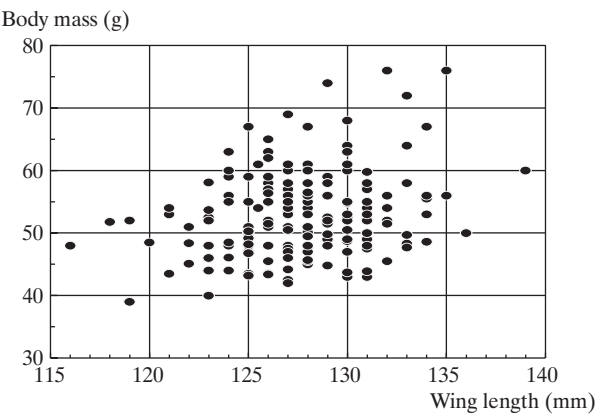

Fig. 4. The positive correlation between wing length and body mass for Wood Sandpipers caught on spring migration at Eilat, for adult and immature birds jointly. Regression equation: body mass = 0.53 * wing length – 15.

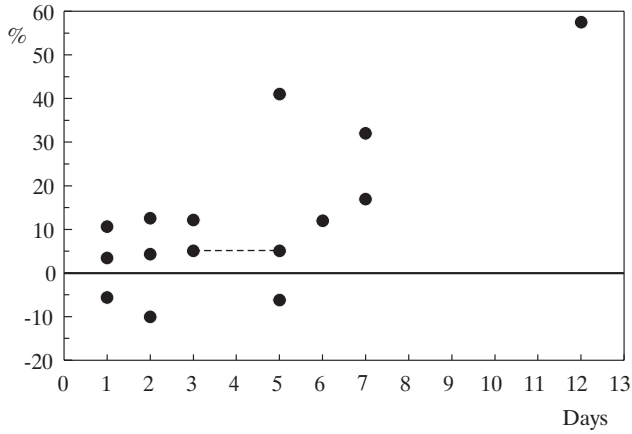

Fig. 5. Body mass change of retraps in relation to their initial body mass. The day and the body mass at first capture are treated as 0. The dashed line links points for the individual retrapped twice.

Fourteen (6.6% of caught birds) Wood Sandpipers were retrapped within the same spring season at Eilat, one of the birds was recaptured twice (Fig. 5). The duration of retraps' stopover was one to twelve days (median = 4 days). On recapture the birds were heavier than at the first capture (57.7 g ± 8.9 *vs* 50.5 g ± 5.3, paired samples *t*-test: $t = -3.11$, $p = 0.008$). Change in body mass was positively correlated with the duration of time (Spearman rank correlation: $r_s = 0.693$, $p = 0.006$) even after we controlled for body mass when first trapped (partial correlation: $r_p = 0.761$, $p = 0.003$). Three birds lost weight between captures. For the remaining eleven birds the median body mass gain was 2.0 g/day, with the extreme gain 5.5 g reached by a bird in 1 day. The median gain was 12% of the initial body mass and the extreme case of almost 60%-increase of the body mass (in 12 days) is conspicuous (Fig. 5).

Autumn migration

The low number of birds trapped in autumn ($N = 19$) reflects much lower number of Wood Sandpipers in the area than in spring. Contrary to spring, adults were the minority (26%) – the difference in proportion of age classes was significant (spring: $n_{ad.} = 132$, $n_{imm.} = 63$, autumn: $n_{ad.} = 5$, $n_{imm.} = 14$; χ^2-test with Yates' correction: $\chi^2 = 11.1$, $p = 0.0008$). Wing length of immature birds did not differ significantly between spring and autumn season (Student *t*-test, $p = 0.17$), as well as the body mass (Student *t*-test, $p = 0.99$). No retraps came from autumn season.

DISCUSSION

Eilat, located in the Syrio-African Rift Valley and at the north-eastern edge of the 2000-km Sahel, Sahara and Sinai deserts belt, is an ideal staging area for migratory birds (Shirihai and Christie 1992, Shirihai 1996, Yosef 1997). This appears to be the case also for the Wood Sandpiper. The maximum daily numbers at Eilat re-

ported from 1979-1990 by Shirihai (1996) reached 3000 birds in May and 400 in August. Also the retrap analysis confirms that the region offers good foraging conditions for this species. The median body mass gain in Eilat (2.0 g/day) was higher than observed on spring migration in southeastern Greece (1.2 g/day – Akriotis 1991), but it was the same as at a site located on route further north – the Gulf of Gdańsk (Poland) (2 g/day – Ściborski 2000). The extreme gain of 5.5 g/day noted in Eilat exceeds the extremes reached by birds in southeastern Greece and in Switzerland (Akriotis 1991), what would confirm good feeding conditions provided by the described area. The percent of retraps in Eilat (6.5%) was somewhat larger than in southeastern Greece (5.1% – Akriotis 1991), while it differed distinctly from other sites in southern Europe – in northeastern Greece it was only 1% (Meiniger 1990) and in southern Italy – no retraps occurred despite a remarkable number of birds caught – $N = 240$ (Scebba and Moschetti 1996). The median length of stay of these birds in Eilat (4 days, range 1-12 days) was higher than in southeastern Greece (2 days, range 1-14 days – Akriotis 1991) and in the Gulf of Gdańsk (2.5 days, range 1-6 days – Ściborski 2000).

The mean body mass of spring migrants Eilat was distinctly lower than found in other sites both in northern Africa and Mediterranean region of Europe (Table 2) as well as in sites located further north-west, where this value ranged from 55.6 g (in Switzerland) to 71.1 g (in southern Sweden) (Akriotis 1991, Persson 1998). This is explained by the range of the body mass (Table 2), which in Eilat was lower than reported on wintering quarters in Africa – 46-78 g (Cramp and Simmons 1983) and in majority of the presented sites on spring migration route, and distinctly lower than on their breeding grounds: White Sea – 51-89 g, Russia – 52-77 g and eastern Siberia – 51-58 g (Cramp and Simmons 1983). It is worth to note that in Eilat the lightest birds occurred (see Table 2) and even the heaviest migrants reached only the weight encountered in southeastern Greece. All the presented data show that in spring Eilat is probably the first site for Wood Sandpipers to restore energetic reserves after an exhausting crossing of the deserts. Similarly, they seem to recover in southern Greece after another critical moment on their spring route – the crossing of the Mediterranean Sea (Akriotis 1991). During further migration northwards, to their breeding grounds, the birds probably consequently build up their fat reserves but in smaller portions staying shorter at stopover sites. This would agree with the assumptions of Meissner (2001) that waders in general, including Wood Sandpiper, can adjust the stopover length to their actual condition and supply of a given resting site.

Flight range of Wood Sandpipers with a mean weight 63-76 g was estimated by Persson (1998) at 1250-2500 km. Taking into account the body mass values given for the wintering grounds (Cramp and Simmons 1983), some part of the birds would be able to cross the Sahel, Sahara and Sinai deserts with minimal difficulty. If the birds leave their wintering grounds along the Nile in Egypt or in sub-Saharan Africa, most of them can easily fly past Eilat without having to stop. Low weight and occurrence of the extremely lean birds suggests that Eilat is used by Wood Sandpipers as

an "emergency" stopover site primarily for disadvantaged birds, similar to the Gulf of Gdańsk as suggested by Meissner (1997). This concurs with Cramp and Simmons (1983) who stated that the paucity of recoveries in North Africa indicates that the Mediterranean Sea and the Sahara Desert are usually overflown in continuous flight.

The bimodality of the distributions of wing length and tarsus+toe length in spring Wood Sandpiper migrants (Fig. 3), corresponds with the tendency observed both in spring and autumn migrants in other sites, and can be explained by differences in measurements between males and females (Meininger 1990, Meissner 1997, Ściborski 2000).

The mean wing length of Wood Sandpipers (*ad.* and *imm.* combined) caught in spring in Eilat (127.7 mm – Table 1) did not differ from that noted in northeastern Greece (128.1 mm, $SD = 3.4$, $N = 99$ – Meininger 1990; t-test: p – *ns*), but was lower than in the Gulf of Gdańsk (129.6 mm, $SD = 2.8$, $N = 822$ – Ściborski 2000; t-test: $p < 0.0001$) and in southern Sweden (128.8 mm, $SD = 2.8$, $N = 43$ – Persson 1998, t-test: $p = 0.06$). This could be a result of differences in geographical distinct populations of migrants in the presented "southern" and "northern" sites. This conclusion should be treated with caution due to possible differences in measurement routine among them and the difficulty in ageing and sexing the birds between seasons.

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REFERENCES

Akriotis T. 1991. *Weight changes in the Wood Sandpiper Tringa glareola in south-eastern Greece during the spring migration.* Ring. & Migr. 12: 61-66.

Cramp S., Simmons K.E.L. 1983. (Eds) *Handbook of the birds of Europe, the Middle East and North Africa: The Birds of the Western Palearctic.* vol. 3. Oxford Univ. Press, Oxford.

Evans P.R. 1986. *Correct measurements of wing length of waders.* Wader Study Group Bull. 48: 11.

Glutz von Blotzeheim U.N., Bauer K.M., Bezzel E. 1997. *Handbuch der Vögel Mitteleuropas.* vol. 7. Akademische Verlag, Wiesbaden.

Green G.H. 1980. *Total head length.* Wader Study Group Bull. 29: 18.

Meininger P.L. (Ed.). 1990. *Birds of the wetland in north-eastern Greece, spring 1987.* WIWO Rep. 20: 102-107.

Meissner W. 1997. *Autumn migration of Wood Sandpiper (Tringa glareola) in the region of the Gulf of Gdańsk.* Ring 19: 75-91.

Meissner W. 2001. *Migration strategies of West Palearctic waders.* Wiad. ekol. 47: 119-141.

Morgan J.H., Shirihai H. 1997. *Passerines and passerine migration in Eilat*. IBCE Tech. Publ. 6.

Persson Ch. 1998. *Weight studies in Wood Sandpipers (Tringa glareola), migrating over south-western Scania in late summer and spring, with notes on related species.* Ring 20, 1-2: 95-105.

Piersma T. 1984. *International wader migration studies along the Atlantic Flyway during spring 1985. Final announcement of a Wader Study Group project.* Wader Study Group Bull. 42: 5-9.

Prater, A.J., Marchant J.H., Vuorinen. J. 1977. *Guide to the identification and ageing of Holarctic waders.* BTO, Norfolk.

Safriel U. 1968. *Migration in Eilat, Israel.* Ibis 110: 283-320.

Scebba S., Moschetti G. 1996. *Migration pattern and weight changes of Wood Sandpiper Tringa glareola in a stopover site in southern Italy.* Ring. & Migr. 17: 101-104.

Shirihai H. 1996. *The birds of Israel.* Acad. Press, London.

Shirihai H., Cristie D.A. 1992. *Raptor migrations at Eilat.* Br. Birds 85: 141-186.

Sokal R.R., Rohlf F.J. 1995. *Biometry.* W.H. Freeman & Co, New York.

Ściborski M. 2000. [*Spring migration of the Wood Sandpiper (Tringa glareola) in the Gulf of Gdańsk region.*] M.Sc. thesis, Univ. of Gdańsk. (In Polish).

Yosef R. 1997. *Clues to the migratory routes of the eastern flyway of the Western Palearctics – ringing recoveries at Eilat (I – Ciconiiformes, Charadriiformes, Coraciiformes, and Passeriformes.)* Vogelwarte 39: 131-140.