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Biometrics of Redshanks (*Tringa totanus*) caught in the region of the Gulf of Gdańsk during autumn migration

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Abstract: MEISSNER, W. (1999): Biometrics of Redshanks (*Tringa totanus*) caught in the region of the Gulf of Gdańsk during autumn migration. Vogelwarte 40: 110–116.

Biometrics of the Redshank migrating in autumn through the Gulf of Gdańsk were studied between 1983 and 1990. A total of 78 adult Redshanks and 775 juveniles was caught and measured. On average all measurements of adults were longer than those of juveniles. Almost all measurements of juveniles differed significantly among half-month periods, but not seasonally (except wing length). There was a significant decrease in tarsus plus toe length from the second half of July to the first half of September. Similar trends were shown in total head length and wing length. These facts correspond with dates of arrival of birds from the "southern" and "northern" populations.

Key words: Redshank (*Tringa totanus*), biometrics, migration, Gulf of Gdańsk.

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Introduction

Analysis of ringing recoveries showed that Redshanks (*Tringa totanus*) migrating through the Gulf of Gdańsk originate from a very wide area: from Norway, Sweden, Finland and eastern Baltic countries (GROMADZKI 1985). Also, some of them probably originate from northern Russia. Among these birds at least two migratory populations can be distinguished (MELTOFTE 1993). The first, called "southern", inhabit southern Scandinavia (up to about 60°N), southern and south-eastern Baltic coast, whereas "northern" come from the Scandinavian mountains, northern Norwegian coast and Finland. Redshanks from the "southern" population pass the Baltic area earlier than "northern" ones (MELTOFTE 1993). Thus, the duration of autumn migration of this species is quite long. First migrants arrive at the Gulf of Gdańsk in the beginning of July and about the end of September the last ones depart (MEISSNER & SIKORA 1995).

The main aim of this study is a biometrics analysis of Redshanks migrating through the Gulf of Gdańsk region with a focus on birds arriving in different periods.

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Methods

Between 1983 and1990 the Waterbird Research Group KULING studied wader migration in three sites: at the mouth of the river Reda, at Rewa and at Jastarnia (Fig. 1, MEISSNER 1997a). Reda mouth and Rewa are localised very close to each other, so biometrics from these sites were combined. Waders were caught in walk-in traps (MEISSNER 1998). The traps were checked every two hours from dusk to dawn. All birds caught were aged (PRATER et al. 1977). Wing length (maximum chord, EVANS 1986), total head length (GREEN 1980), bill and nalospi length (PRATER at al. 1977) and tarsus plus toe length (PIERSMA 1984) were measured. All measurements were taken to the nearest 1 mm using a stopped ruler. Every year, ringers' accuracy and measuring repeatability were checked according to BUSSE (1994). Statistical methods followed SOKAL & ROHLF (1995) and ZAR (1996).

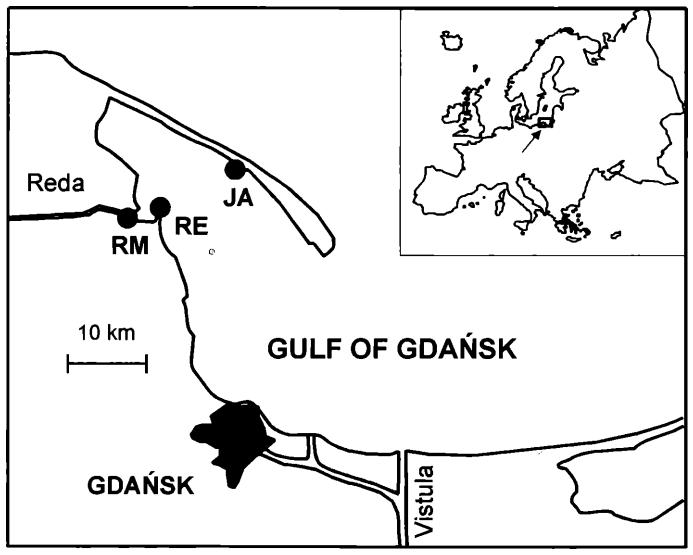

Fig. 1: Study area. JA – Jastarnia, RM – Reda mouth, RE – Rewa.
Abb. 1: Untersuchungsgebiet.

Results

During the years of 1983–1990, a total of 78 adult and 775 juvenile Redshanks was caught and measured. There were no significant differences in measurements taken at Jastarnia and the mouth of the Reda (t-test, $p > 0.05$), so data from both sites were combined.

On average all measurements for adults were longer than measurements from juveniles (Table 1). Only the difference in the tarsus plus toe length was not significant. Number of measured adults was insufficient for further analysis. In juveniles two-peak distribution was visible for the tarsus plus toe and wing length. Distributions of the remaining measurements were unimodal (Fig. 2). In order to find differences among birds passing the Gulf of Gdańsk earlier and later during the season, time of catching was divided into five half-month periods from mid July to the end of September. Almost all measurements of juvenile birds differed significantly among half-month periods, but not seasonally (except wing length) (ANOVA II). More detailed analysis showed, that Redshanks caught in 1984 had significantly longer wings than those from 1983, 1988, 1989. Sea-

Table 1: Comparison of mean measurements of juvenile and adult Redshanks.
Tab. 1: Vergleich zwischen den für juvenile und adulte Rotschenkel festgestellten Mittelwerten der Parameter Kopflänge, Schnabellänge, Länge Nasenloch–Schnabelspitze, Flügellänge und Länge Tarsus + Zehe.

	Juveniles		Adults			
	Mean (SD	N	Mean (SD	N	t-test	p
Total head	71,0 ± 2,6	718	73,7 ± 2,0	69	–10,34	p < 0,001
Bill	40,2 ± 2,3	743	42,5 ± 1,9	66	– 8,75	p < 0,001
Nalospi	30,3 ± 1,9	535	32,5 ± 1,6	53	– 9,10	p < 0,001
Wing	158,5 ± 4,5	743	160,2 ± 3,6	49	– 3,21	p < 0,005
Tarsus + toe	81,6 ± 3,7	303	82,4 ± 2,9	25	– 1,20	ns

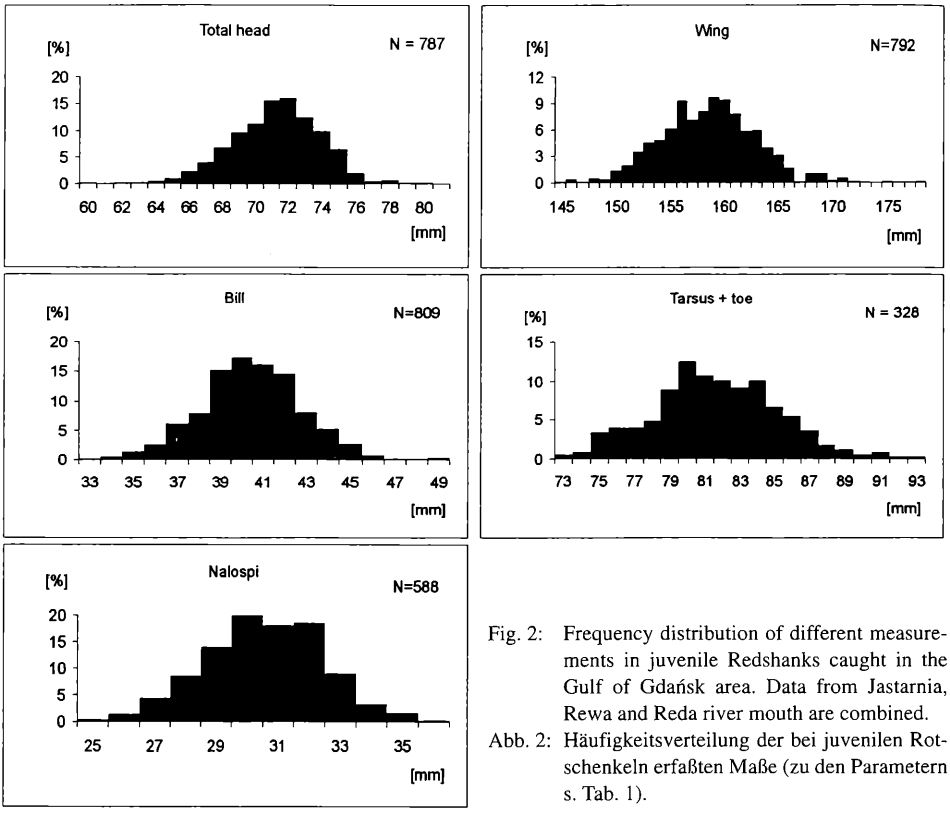

Fig. 2: Frequency distribution of different measurements in juvenile Redshanks caught in the Gulf of Gdańsk area. Data from Jastarnia, Rewa and Reda river mouth are combined.

Abb. 2: Häufigkeitsverteilung der bei juvenilen Rotschenkeln erfaßten Maße (zu den Parametern s. Tab. 1).

sonal differences disappeared after eliminating data from both 1984 (the longest average wing length) and 1989 (the shortest average wing length) (ANOVA $F_{4,486} = 1.02$; $p = 0.42$).

There is a significant decrease in tarsus plus toe length from the second half of July to the first half of September (ANOVA $F_{4, 326} = 27.90$; $p < 0.001$). In the second half of September the average value of this measurement increased, but the sample size was very small and difference was not significant (Fig. 3). Similar tendencies were shown in total head length (slight decrease from second half of July to the second half of August, ANOVA $F_{4, 785} = 3.17$; $p = 0.02$, correlation coefficient: tarsus plus toe – total head: 0.64) and wing length (decrease during the whole investigated period, ANOVA $F_{4, 486} = 3.53$; $p = 0.03$, correlation coefficient: tarsus plus toe – wing: 0.67). In case of nalospi length there was a slight increase from the second half of August to the second half of September (ANOVA $F_{4, 586} = 5.84$; $p < 0.001$, Fig. 3).

Discussion

Among Redshanks inhabiting Europe three subspecies different in size were described. British (*T. t. britannica*) and Icelandic Redshanks (*T. t. robusta*) winter in western Europe, whereas Fenno-Scandian and Baltic populations (*T. t. totanus*) spend winter in the Mediterranean and in West Africa (Fournier & Spitz 1969, Furness & Baillie 1981, Cramp & Simmons 1983, Summers et al. 1988). The obtained average values of measurements fit well to the scheme of biometrical variability of this species described by Glutz von Blotzheim et al. (1975). Redshanks caught during autumn migration in the Gulf of Gdańsk region had shorter wings than Icelandic and British birds, but

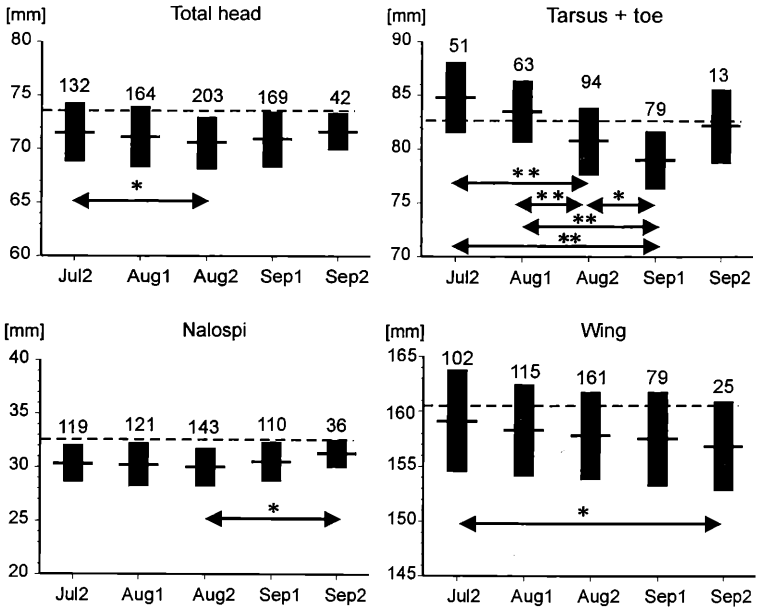

Fig. 3. Mean value (horizontal lines) and standard deviation (rectangle) of different measurements of juvenile Redshanks caught in the Gulf of Gdańsk region in subsequent half month periods (1983 – 1990). Arrow shows significant difference between two half month periods (Tukey test, * = $p < 0.05$, ** = $p < 0.001$). Horizontal, dashed line – average value of given measurement for adults. Numbers above rectangles indicate sample size.

Abb. 3: Durchschnittswerte (horizontaler Strich) und Standardabweichung (Rechteck) für verschiedene bei juvenilen Rotschenkeln erfaßte Parameter (s. dazu Tab. 1), aufgegliedert nach forlaufenden Halbmonats-Perioden (1983–1990). Pfeile verweisen auf signifikante Unterschiede (* = $p < 0.05$, ** = $p < 0.001$). Horizontale gestrichelte Linie = Durchschnittswert adulter Vögel. Die Zahlen über den Rechtecken kennzeichnen jeweils die zugrundeliegende Anzahl an Werten.

longer than those breeding in southern France (Tab. 2). It is noteworthy that Redshanks migrating through southern France revealed the same average wing length as juveniles measured on the Gulf of Gdańsk. Redshanks wintering in Mauritania were somewhat larger, but those which spend winter in Guinea-Bissau are similar in biometrics to birds passing the Polish coast in autumn (Tab. 2). This fact supports the conclusion of WYMENGA et al. (1990) that among birds wintering in Guinea-Bissau a higher proportion of Redshanks originates from Northern Scandinavia, whereas in Mauritania – from West Europe. British and Icelandic Redshanks had longer tarsus plus toe and total head length than birds caught on the Gulf of Gdańsk. The average bill length of British birds falls between values obtained for adults and juveniles in this study, whereas Icelandic Redshanks had the shortest bills. It confirms the finding of SUMMERS et al. (1988) that Icelandic birds have a proportionally shorter bill in relation to length of skull from other populations.

Changes in measurement averages of migrating juvenile waders have been described in Ruff (*Philomachus pugnax*, OAG Münster 1990), Common Sandpiper (*Actitis hypoleucos,* MEISSNER 1997a) and Wood Sandpiper (*Tringa glareola,* LEUZINGER & JENNI 1993). Two different explanations of this phenomenon have been given. The first suggests that different populations of migrants might pass a study area at different times. According to the second one, juveniles migrating in subsequent periods are in different growth stages. For Redshanks, both explanations could be genuine.

Table 2: Average measurements (in mm) of Redshanks caught at different localities: southern France (FOURNIER & SPITZ 1969), Mauritania and Guinea-Bissau (WYMENGA et al. 1990), Iceland and Great Britain (SUMMERS et al. 1988) and Gulf of Gdańsk (this study).
Tab. 2: Durchschnittliche Maße für mehrere Rotschenkel-Parameter getrennt nach Fangorten.

		Total head	Bill	Wing	Tarsus + toe
Gulf of Gdańsk (autumn migrants)	Adults	73,7	42,5	160,2	82,4
	Juveniles	71,0	40,2	158,5	81,6
Southern France	Local breeders			150,0	
	Autumn migrants			158,5	
Mauritania	Adults		43,6	161,2	
Guinea-Bissau	Adults		42,5	158,9	
Iceland	*T. t. robusta*	75,0	39,7	172,4	85,8
Great Britain	*T. t. britannica*	74,2	41,0	165,9	83,7

Birds from the "northern" population are smaller than those from "southern" and those from Russia are larger than birds that inhabit Scandinavia and also Central Europe (KOZLOVA 1961, GLUTZ VON BLOTZHEIM et al. 1975). Recovery analysis showed that juvenile "southern" Redshanks arrived in western Europe in early August, while "northern" ones arrived in the second part of August and early September (MELTOFTE 1993). These facts correspond with dates of arrival of birds with significantly longer (second half of July – first half of August) and shorter (second half of August – first half of September) tarsus plus toe in the Gulf of Gdańsk (Fig. 3). Moreover, slight decline in wing length was noted throughout the entire season and decrease of average total head and nalospi lengths from July to September confirm presumption about different migration timing for different populations. An increase of tarsus plus toe length in the second half of September might indicate the appearance of another group of Redshanks, but the sample size is too small. It should also be noted, that earlier migrants came from more southern breeding grounds (MELTOFTE 1993), where the breeding season is longer and they had enough time to reach almost final dimensions. Birds arriving later originate from the "northern" population and they might be forced to start migration in earlier growth stages. The latter could enhance differences between earlier and later migrants.

In this study, all measurements of adults, on average, were longer than the measurements of juveniles. The bill and especially its horny part is still growing during the first autumn (NITECKI & ZAMAJSKA 1979, HOLLAND & YALDEN 1991) and this could be the main reason for shorter total head, bill and nalospi lengths in juveniles. Although shorter wing and tarsus plus toe lengths in juveniles were also noted in Knots (*Calidris canutus,* MEISSNER 1992) opposite results were obtained in some other wader species caught at the same place and the same period. Adult Common Sandpipers and Wood Sandpipers had shorter wings due to wear on the longest primary and shorter legs, because of higher cartilage content in the joints in juveniles (MEISSNER 1997a, b). Shorter linear dimensions of juvenile Redshanks compared to adults might indicate that they are still growing and are less advanced in development than young Wood and Common Sandpipers at the same age. Another explanation is also possible. Studied sample of measured juveniles consists of both "northern" and "southern" birds, which differ in biometrics. Different to that, among the adult birds from the "southern" population prevail, because the smaller ones that inhabit northern Europe move rapidly from their breeding grounds to moulting areas in Wadden Sea (MELTOFTE 1993) and they probably pass over the Gulf of Gdańsk region (only 18% of measured adults were caught in August and September). This different proportion of "northern" and "southern" birds in adults and juveniles, respectively, might be responsible for the difference in size observed in this study.

Female Redshanks are on average larger than males (PRATER et al. 1977). Bimodal distribution of tarsus plus toe and wing lengths found in this study could be a result not only of sexual dimorphism, but also the variability in bird's sizes in subsequent periods.

Differences in average wing length in juveniles caught in subsequent seasons was described in Wood Sandpiper (MEISSNER 1997b), in Coot (*Fulica atra*, FJELDSÅ 1977) and in some passerines (BUSSE 1976). One of the possible explanations of this phenomenon could be the difference in food availability at the breeding grounds (FJELDSÅ 1977, MYRBERGET et al. 1977). Chicks that were not well fed grow slower and reach smaller size (FJELDSÅ 1977, KERSTEN & BRENNINKMEIJER 1995). This suggests, that extremely good and bad condition for raising Redshank chicks appeared in 1984 and 1989 respectively.

Zusammenfassung

Im Golf von Danzig wurden zwischen 1983 und 1990 jeweils während der Herbstzugzeit insgesamt 78 adulte und 775 juvenile Rotschenkel (*Tringa totanus*) gefangen und vermessen (Länge von Kopf, Schnabel, Nasenloch–Schnabelspitze, Flügel, Tarsus + Zehe). Bei allen Parametern lagen die Maße adulter Vögel höher als bei den juvenilen Individuen. Bei letzteren gab es in fast allen Maßen signifikante Unterschiede, wenn die Befunde verschiedener Fangzeiträume – Halbmonatsperioden – verglichen wurden, aber mit Ausnahme der Flügellänge keinen gesicherten „Saisontrend". Erklärungsmöglichkeiten für dieses Phänomen werden diskutiert.

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