

Clutch and egg size in a Spanish population of Little Grebe *Tachybaptus ruficollis*

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It has been suggested that clutch size in the Little Grebe could follow a latitudinal cline in Europe. Clutch and egg sizes from complete first clutches were studied in the Llobregat Delta (NE Spain) between 1992 and 1995. Mean clutch size was 5.1 eggs (s.d. 0.93, $n=16$, range 4-7). Mean egg length was 37.4 ± 1.3 mm and mean egg width was 26.1 ± 0.8 mm ($n=67$, range 34.6-40.4 x 23.7-27.6) with a volume of 13.0 ± 1.1 cm³ ($n=67$). Mean clutch size was significantly greater than that estimated in Austria and Italy ($F_{2,44} = 6.0$, $p=0.005$ one-way ANOVA), being one of the highest reported for Europe. No differences in egg size were found between localities. Differences in clutch size cannot be explained by a latitudinal cline alone, as suspected until now. Additional factors such as habitat quality and wetland characteristics probably play a more important role in determining Little Grebe clutch size.

Key words: Little Grebe, *Tachybaptus ruficollis*, breeding biology, clutch and egg size, Llobregat Delta, NE Spain.

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INTRODUCTION

The Little Grebe *Tachybaptus ruficollis* breeds on a wide range of waterbodies, such as lagoons, reservoirs, canals, etc., throughout Africa, Europe and Asia (del Hoyo et al. 1992). Due to its secretive behaviour its breeding biology is not very well known (Cramp & Simmons 1977, Moss & Moss 1993). Data from the

Mediterranean basin are even more scarce (Calvario & Sarrocco 1988, Oró 1991). However, in spite of the scarcity of information available, Calvario & Sarrocco (1988) have suggested the existence of a latitudinal cline in the Little Grebe's clutch size after comparing the results obtained on an Italian river with others from north and central Europe. In this paper, we calculate the mean clutch and egg sizes of

the Little Grebe in a coastal wetland of NE Spain. These data permit comparison of the clutch size of the species on a broad scale, and the suggestion that a latitudinal cline alone cannot explain differences in Little Grebe clutch size.

MATERIAL AND METHODS

The data were collected between 1992 and 1995 in the Llobregat Delta, a coastal wetland south of Barcelona (Catalonia, NE Spain, 41° 16'–41° 25'N, 1° 58'–2° 10'E), where the species breeds in 27 water bodies ranging from 0.075 ha to 11.070 ha (Figueroa & Gutiérrez, in press).

Breeding Little Grebes were detected by mapping the calling males in one to three visits in the morning to each one of the sites in April–May. Nests were found by walking directly through the usually thinly vegetated areas that surround the water bodies (Tellería 1986). The monitoring of some of the detected territories allowed us to establish the timing of the first clutches. With subsequent brief visits to these nests we established the total clutch size. No layings after mid-June were considered, as second clutches can occur (Gutiérrez *et al* 1995).

For the analysis of clutch size, only complete first clutches have been considered. Second broods have not been taken into account as there were not enough data to be analysed separately and, furthermore, to reduce uncontrolled factors that could affect clutch and egg sizes. Also, only egg measurements to the nearest 0.1 mm from complete first clutches have been considered, to avoid deviations caused by intra-clutch egg-size variation (Jover *et al* 1993, Williams 1994). The most correct method to analyse differences in egg-size between localities is to use each clutch as a statistical unit (Jover *et al* 1993) but since the data published in the literature consider each egg as a unit, we have used this

approach to allow comparisons between localities in our statistical analysis. Egg volume was calculated according to Hoyt (1979) as volume = length \times (width)² \times 0.51 and are expressed as mean \pm SD.

Differences between localities were tested with a one-way ANOVA test in the case where literature sources presented complete sets of original data. Elsewhere t-Student tests were used to compare data where authors only gave means, standard deviation and sample size.

RESULTS

The mean clutch size was 5.2 eggs in 1992 (s.d. 1.1, n=9), 4.7 eggs in 1994 (s.d. 1.0, n=4), and 5.0 eggs in 1995 (s.d. 0.0, n=3). Mean clutch size over the three years was estimated as 5.1 eggs (s.d. 0.9, range 4–7, n=16). The small sample size prevented us from testing for differences in clutch or egg size among the three years. The clutch size in our study area was greater than data reported from other localities in Austria and Italy ($F_{2,44}=6.0$, $p=0.005$, one-way ANOVA, Scheffé unplanned comparison significant for Catalonia vs. Austria and Catalonia vs. Italy at $p<0.05$, Table 1). However, no differences in mean clutch size were detected between central Europe and our study area ($t=0.3$, d.f. 124, $p=0.76$).

The mean egg length was 37.4 ± 1.3 mm and the mean egg width 26.1 ± 0.8 mm (range 34.6–40.4 \times 23.7–27.6, n=67 eggs from 13 complete first clutches) with a volume of 13.0 ± 1.1 cm³ (n=67). We found no significant differences between the egg size and volume for Little Grebes in the Llobregat Delta and Italy (Table 2).

DISCUSSION

The observed egg size lies within the

Locality	n	1	2	3	4	5	6	7	mean	s.d.	ref.
C. Europe	110	-	-	-	-	-	-	-	5.2	1.34	Bandorf (1970)
Austria	7	0	1	2	1	2	1	0	4.0	1.27	Sackl (1982)
Italy	24	0	0	2	17	4	1	0	4.2	0.60	Calvario & Sarrocco (1988)
Spain	16	0	0	0	5	6	4	1	5.1	0.93	This study

Table 1. Number of clutches analysed (n), number of clutches of each size (1-7 eggs), mean and standard deviation of Little Grebe first clutches reported in different studies.

Taula 1. Nombre de postes analitzades (n), nombre de postes de cada mida (1-7 ous), mitjana i desviació típica de la mida de les primeres postes segons diferent estudis.

	Spain	Italy	t	p
Length (mm)	37.4±1.3	37.7±1.6	1.05	0.30
Width (mm)	26.1±0.8	26.2±0.7	0.65	0.52
Volume (cm ³)	13.0±1.1	13.2±1.0	0.91	0.36

Table 2. Mean length, width and volume ± standard deviation of Little Grebe eggs in NE Spain (13 clutches, n=67 eggs, this study) and Italy (n=38 eggs, Calvario & Sarrocco 1988). Differences between the two areas were not significant for any one of the three parameters (Student-t tests, 103 d.f., n.s.).

Taula 2. Longitud, amplada i volum mitjà ± error estàndard dels ous de Cabusset al NE d'Espanya (13 postes, n=67 ous, aquest estudi), i Itàlia (n=38 ous, Calvario & Sarrocco 1988). Les diferències entre les dues localitats no van ser significatives en cap dels tres paràmetres (t de Student, 103 g.l., n.s.).

known range for the species (Cramp & Simmons 1977).

To our knowledge, the mean clutch size reported in our study is the second highest estimate obtained in Europe (see Calvario & Sarrocco 1988), after the 5.2 eggs/clutch mentioned by Bandorf (1970) for several localities in Central Europe. As the size of second clutches seems to be significantly larger than that of first ones (Calvario & Sarrocco 1988), and we have only included first clutches, our figures are probably underestimated in relation to other studies including all clutches. Calvario & Sarrocco (1988) studied the breeding biology of the Little Grebe on an Italian river. Given the

lower mean clutch size of their population in comparison to other central and northern European localities, they proposed the existence of a latitudinal increase in Little Grebe clutch size. However, the comparison between the large clutch size obtained in our study area and the available data from the rest of Europe does not support this view. Therefore, we suggest that other factors such as habitat quality may have a greater influence on clutch size, as has been demonstrated in other species (e.g. Järvinen 1989, Días *et al.* 1984). In this context, the lower clutch size reported for the Italian population could be due to the fact this population breeds in a river and not in lakes

and ponds like most of the other studied populations. *

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RESUM

Mida de posta i de l'ou en una població de Cabusset Tachybaptus ruficollis del NE espanyol.

Fins ara es sospitava que la mida de posta en el Cabusset seguia una clina latitudinal a Europa. En el present estudi es va estimar la mida de posta mitjana i de l'ou del Cabusset al Delta del Llobregat el 1992, 1994 i 1995. Es van emprar únicament mesures de primeres postes completes per evitar tant la variació de la mida de l'ou dins una mateixa posta (Williams 1993) com les diferències entre primeres i successives postes (Calvario & Sarrocco 1988).

La mida de posta mitjana els tres anys de mostreig va ser de 5,1 ous/posta (S.D. = 0,93, n=16, rang 4-7). La mida mitjana dels ous va ser de $37,4 \pm 1,3$ mm de llarg per $26,1 \pm 0,8$ mm d'ample, amb un volum resultant de $13,0 \pm 1,1$ cm³ (n=67). Mentre que l'anàlisi de la mida de posta va donar diferències significatives amb resultats austríacs i italians ($F_{2,44} = 6,0$, $p=0,005$, ANOVA), aquests no van ser-ho amb poblacions centreeuropees citades per Bandorf (1970), Taula 1, ni tampoc va haver-hi diferències en la mida dels ous (Taula 2).

La mida dels ous de Cabusset es troba dins els límits descrits per a l'espècie, si bé la mida de posta obtinguda és de les més altes obtingudes a Europa (vegeu Calvario & Sarrocco 1988).

En contrast amb el que es pensava fins ara, les diferències en la mida de posta de les diferents poblacions de Cabusset a Europa no poden ser explicades per l'existència d'una clina latitudinal (Calvario & Sarrocco 1988). Factors addicionals com la qualitat de l'hàbitat i les característiques de les zones humides han de tenir un paper més important en la mida de posta del Cabusset.

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