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SHORT NOTE

No evidence for a reduction in egg size in introduced populations of European starlings (*Sturnus vulgaris*) and song thrushes (*Turdus philomelos*) in New Zealand

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Cassey *et al.* (2005) measured the egg sizes of 29 European starling (*Sturnus vulgaris*) clutches from an unspecified area of the North I, and concluded from comparison with data published by Cramp *et al.* (1977-1994) the eggs were smaller (29.1 mm × 20.9 mm) than eggs of birds in Britain (29.7 × 21.2). My measurements of 5549 starling eggs from Belmont, Lower Hutt, average 29.7 × 21.1, which is almost exactly the mean for starling eggs in Britain. The eggs were measured using Vernier callipers, checked for accuracy, over 10 years, 1970-79, and the average quoted is the mean of the annual means, to allow for yearly variation. Even in 1975, the year when the eggs were smallest (29.29 × 20.93, $n = 715$), they exceeded the measurements given by Cassey *et al.* Hence, I do not consider that the egg size of starlings has changed since the 1860s, when starlings were introduced into New Zealand.

For the song thrush (*Turdus philomelos*), however, I suggested that egg size at St Arnaud, South I, New Zealand, based on 165 eggs from 43 clutches (27.2 × 20.4) was smaller than in Britain: "British eggs seem a little larger: 28.4 × 20.9 (Kirkman 1911); 28.7 × 20.9 (Kirkman & Jourdain 1938); 27.6 × 20.9 (Witherby *et al.* 1943)" (Flux 1967). Cassey *et al.* (2005) measured a similar sample-size (38 clutches) from the North I, which averaged 27.6 × 20.5, almost the same as the value for British eggs (27.5 × 20.8) given by Cramp *et al.* (1977-1994). It is interesting that thrush eggs in Britain are now smaller than in the 3 earlier references I quoted. Indeed, this is a greater decline than Cassey *et al.* (2005) claim to have resulted from isolation in New Zealand.

However, when I published that suggestion I was unaware, as Cassey *et al.* (2005) apparently still are, that egg size in many passerines is positively correlated with clutch size (Greig-Smith *et al.* 1988). Hence the only way to compare egg sizes between geographic areas is to compare clutches of the same

size. When this is done for my song thrush data quoted above, the average volume of an egg in 4-egg-clutches is 5.8 mL, as against Cramp *et al.*'s average for Britain for all clutch sizes of 6.1. However, my 5-egg clutches averaged 6.5 mL. Hence the smaller egg sizes in New Zealand could result entirely from the preponderance of 4-egg clutches (75%) in New Zealand as against 57% in Britain (Flux 1967).

Starlings are anomalous passerines in several ways, and it is hard to justify their inclusion in Cassey *et al.*'s (2005) analysis. Being hole-nesters, they are under different selective pressures; they nest colonially and neighbouring starlings interfere by laying in other nests (dumping as well as by mistake) and by throwing out eggs. Starlings are synchronous breeders and hence will not exhibit the looked-for seasonal variation in clutch size. In New Zealand at least, the timing of the breeding season is not related to latitude as it is in other passerines (Bull & Flux 2006). Finally, egg measurements are confounded by unexplained variation which depends on clutch size: Ojanen *et al.* (1978) found a marked linear increase in egg size with clutch size; Smith *et al.* (1993) a linear increase in 1 year but not in 2 subsequent years; Margis (1989) a humped distribution, with a peak egg size at a clutch size of 6, and Greig-Smith *et al.* (1988) found very little correlation between egg size and clutch size for starlings in England, in comparison to open-nesting species. At Belmont, egg size was the same regardless of clutch size except for larger eggs in 3-egg clutches: restricting the comparison to 1 year to avoid annual variation, eggs in clutches of 2 to 6 averaged 29.7×21.0 , 3.03×21.1 , 29.8×20.9 , 29.8×21.1 , and 29.8×21.0 , respectively (all samples based on 30 clutches except clutches of 2 ($n = 9$) and 6 ($n = 23$)). In New Zealand, the mortality rate in starlings is far lower than anywhere in Europe, so breeding populations will have a different proportion of 1st-year birds, which have smaller clutches, and a higher proportion of birds older than 3 years, which again have smaller clutches (Flux & Flux 1981).

Egg size of starlings in Britain, as in the song thrush, seems to have declined: Kirkman & Jourdain (1938) give 30.2×21.3 ($n = 50$), and Ojanen *et al.* (1978) quote 30.2×21.2 ($n = 100$) for English starlings, compared with 29.7×21.2 according to Cramp *et al.* (1977-1994). Other European studies based on good samples give intermediate values. For example, Hund & Prinzinger (1981) give 29.8×21.5 for 1000 eggs from southwest Germany, and Margis (1989) measured 2291 eggs from 449 clutches at 4 colonies in Lithuania ($56^{\circ}.14$ N) and the average of 8 yearly averages was 29.1×21.3 ; but he also found significant differences between colonies and

between years. He concludes: "Thus, the length and breadth information can be of questionable value, if long-term study of these traits was not carried out in different habitats", with which I agree.

Two of the 3 species for which Cassey *et al.* (2005) have adequate data do not, in my view, show a decrease in egg size, and the other, the blackbird (*T. merula*), is likely to have the same pattern of variation in egg size with clutch size as the song thrush. For their 5 remaining species, measurements are based on only 3-15 clutches, which are totally insufficient sample sizes on which to base their claim to have demonstrated a reduction in egg size of New Zealand populations of passerines originating in Britain, or their theoretical arguments.

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