

**Supplementary material**

739 Appendix 1

741 DATA LOGGERS

742 The repeatability of the measures of data loggers, tested in climatic chamber on 10  
743 measurements at four stable temperatures (5, 25, 30 and 20 °C), were significant and high for  
744 both temperature ( $F_{36,324} > 46$ ,  $P < 0.01$ , intraclass correlation coefficient  $> 0.80$  (Lessells and  
745 Boag 1987)) and relative humidity ( $F_{36,324} > 6$ ,  $P < 0.01$ , intraclass correlation coefficient  $>$   
746  $0.96$ ). The greatest difference between the temperature measured by data loggers and the actual  
747 temperature applied was  $0.99^{\circ}\text{C}$ . The greatest difference in relative humidity measured by two  
748 data loggers was 15 % RH, probably due to the fact that the climatic chambers used did not  
749 control humidity.

750 Data loggers were placed in each nest always in the same position, in the nest cup under  
751 the eggs, in order to minimize variation in temperature and relative humidity measured among  
752 nests that might be due to placement. Data loggers were set to record temperature and relative  
753 humidity at 5 min intervals. As described in the main document, the data logger and the  
754 warming pad were separated by the deck and at least 1 cm of nest material: indeed, the minimum  
755 nest height measured in the nests included in the experiment was 4 cm at the fringe so around  
756 1 or 1.5 cm at the bottom of the cup. Before fledging, the data loggers were recovered in the  
757 same position they were installed before incubation, and removed.

758 Preliminary tests using an empty nest showed that the difference between temperatures  
759 recorded in the nest cup and temperatures recorded under the cup, within the nest material (i.e.

760 in the same position as in the experiment) varied from  $-2^{\circ}\text{C}$  to  $2^{\circ}\text{C}$  (mean  $\pm$  SE =  $-0.30 \pm 1^{\circ}\text{C}$   
761 for temperatures under minus in the cup). The temperatures recorded in the experiment thus  
762 reflect the incubation temperature of the eggs.

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#### 764 WARMING PADS

765 The efficiency of the heating treatment on nest temperature was measured without the presence  
766 of the female, using nest-boxes with deserted great tit (the identity of species was determined  
767 by egg mass, see main document) clutches. Three nests were deserted and available to this aim  
768 and the two closest to one another were chosen to limit microenvironmental variation of  
769 temperature. One nest was heated and the other served as a control, strictly following the  
770 experimental protocol for placing the warming pads and the data loggers (see material and  
771 methods). Temperatures were recorded over two days and three consecutive nights due to one  
772 of the two data loggers failing after 3 nights. To limit pseudo-replication and inflation of degrees  
773 of freedom, we used mean nocturnal and diurnal temperature per day, so we used three  
774 nocturnal means and two diurnal means per nest. We found an average increase of  $4^{\circ}\text{C}$  in the  
775 heated nest-box during the night and no difference during the day as compared to the control  
776 nest-box (see material and methods). Variation in the temperatures recorded in these two nest-  
777 boxes over two days and three nights are shown in Fig A1. Nest-boxes were visited and  
778 warming pads inserted between 7:00 pm and 9:00 pm in a random order. Warming pads started  
779 heating the nests between 30 and 60 minutes after insertion and during around 10 hours. The  
780 actual duration of heating (10h) was longer than expected from the warming pads  
781 manufacturer's information in normal conditions of use (+ 7H), probably due to the limited  
782 aeration in nest-boxes (warming is air-activated), and the insulation properties of their material  
783 (wood concrete). The greatest difference in temperature measured between the two nests was  
784  $10.5^{\circ}\text{C}$  (thin black line in Fig A1).

785 Figure A1: Warming effect of the warming pads, as tested in two great tit nests containing an  
786 abandoned clutch. Temperatures were recorded in the heated (solid black line) and the control  
787 nest (solid grey line) over three nights (i.e. between 8:00 pm and 8:00 am) and two days. The  
788 difference in temperature between the two treatments is also shown (thin black line).

