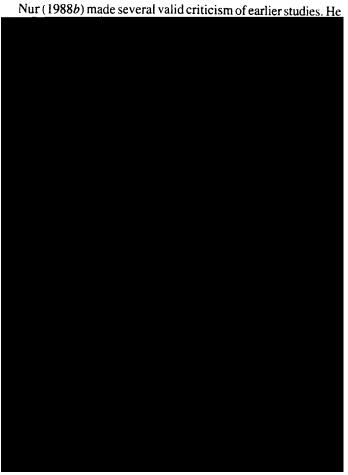


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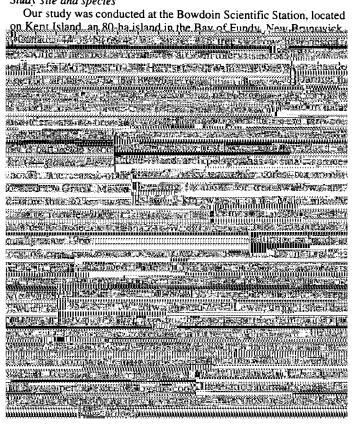
Introduction

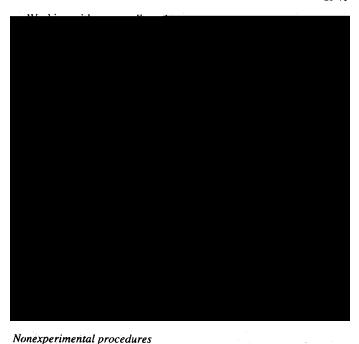
searched for evidence for both types of trade-off by manipulating clutch and brood size in birds (e.g., De Steven 1980; Wiggins 1990b; references in Lessells 1986; Nur 1988a). The last few years in particular have seen a flurry of published experiments and some controversy about the generality of reproductive tradeoffs (Reznick 1985; Bell and Koufopanou 1986; Murphy and Haukioja 1986; Winkler and Wilkinson 1988; Stearns 1989), although Nur (1988a) concluded that most research published as of 1987 demonstrated at least some costs of reproduction. The The strike was a hear of the light (1988) where he continued to the strike was a st WHEELWRIGHT ET AL



Methods

Study site and species





Results Unmanipulated nests Record size fledeling analytic and survival	1980; Røskaft 1985; Finke et al. 1987; Korpimäki 1988). Given that individual differences in parental abilities are often invoked to explain margina se celta no di haviaitia della chiaracteria.	undetected. Such problems are probably of only minor importance for adult females at Kert Island, give reduces a service of a translativisment in the control of the contro
Unmanipulated nests		Results

Table 1. Spearman rank correlations (r_s) between brood size and three measures of nestling size (averaged across the brood) in unmanipulated nests measured when nestlings

	n	ank correlation	R	
	Tarsus length	Wing length	Mass	
12			-0.26	1987
55	-0.28*	0.02	-0.29*	1988
形	0.00 0.26		-0.21 0.12	1989 1990

^aNumber of broods.

TABLE 2. Fraction of all individuals that returned in a given year as a function of chuck gizo-thnorms and seems and the chuck gizo-thnorms and giz

	Rate of			
		6-8 eggs ^a	P^b	
1987 to 1988				
Nestlings	0.035 (114)	0.027 (328)	0.89	
Females		0.538 (65)	0.30	
Males		A AS 6-60500	0.33	
1988 to 1989		741811111111111111111111111111111111111		
Nestlings	0.011 (93)	0.011 (177)	~1.00	
Females	0.308 (26)	0.457 (46)	0.32	
Males	0.500 (10)	0.143 (35)	0.06	
1989 to 1990				
Nestlings	0.033 (60)	0.026 (222)	~1.00	
Females	0.364 (22)	0.453 (64)	0.63	
Males	0.105 (19)	0.462 (52)	0.01	

Brood size, parent survival, and future reproductive success Females that produced small clutches were no more likely to Experimental nests

Effects of brood size on fledgling size

Brood size had no significant effection nestling wing length, mass, or tarsus at age 11 or 12 days in experimental nests (Table 3 combining probabilities for the significant of the sig
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The course of the control of the con
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Totalskie in 1968 had produces 4.5 ± 26 Posicios sincios represiones LW sus institute to 20 20 1 the success of these of the
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^{*}P < 0.05.

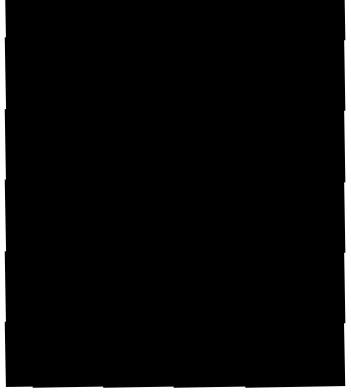
TABLE 3. Effects of brood-size manipulations on nestling size and fledging success

		Marie and Company and Address		
				P^a
1988 Wing length (mm) Mass (2)		43.3 (5.9) 20.9 (2.7) 12.3 (0.3) — 0.77 (0.26) 學習 (1.6)	A2 A 12 A	0.44 0.07 0.27 0.27 0.12 :0.01
	49.5 (6.9) 21.6 (3.3) 10.7 (1.2)	52.8 (5.1) 22.7 (2.4) 11.1 (0.4) 0.89 (071) 5.3 (1.1.2) 53	51.8 (6.7) 23.6 10.8 0.85 3.3	0.52 0.60 0.05 0.55 0.01
	40.9 .0) 20.4 .0) 12.1 .5) 22.6 .0) 0.57 .43) 4.6 .0)	43.0 (4.6)	47.1.(6.8).	0.20 0.67 0.84 0.27 0.35 0.02

TABLE 4. Fraction of all individuals that returned in a given year as a function of brood-size manipulations the previous year.

In minimum in the contract of		enlarg		Special Control	•
988 to 1989 Nestlings Females Males 0.033 (61) 0.011 (270) 0.00 (39) 0.400 (15) 0.330 (3) 989 to 1990 Nestlings 0.000 (35) 0.027 (291) 0.00 (19) 0.625 (8) 0.418 (91) 0.375 (8) 0.250 (4) 0.397 (63) 0.00 (6) 0.86		enlarg			
988 to 1989 Nestlings Females Males 0.033 (61) 0.011 (270) 0.00 (39) 0.400 (15) 0.330 (3) 989 to 1990 Nestlings 0.000 (35) 0.027 (291) 0.00 (19) 0.625 (8) 0.418 (91) 0.375 (8) 0.250 (4) 0.397 (63) 0.00 (6) 0.86			CAM.	T(
Nestlings		by 2	24 Contr	ota t	y 24
Nestlings	1988 to 1989				_
Females 0.400 (15) 0.330 (3) 989 to 1990 Nestlings 0.000 (35) 0.027 (291) 0.00 (19) 0.625 (8) 0.418 (91) 0.375 (8) 0.62 (19) 0.250 (4) 0.397 (63) 0.00 (6) 0.80 Treatment in previous year.		0.033.(61)	0.011 (270)	0.00 (39)	
Males 0.330 (3) 989 to 1990 Nestlings 0.000 (35) 0.027 (291) 0.00 (19) 0.625 (8) 0.418 (91) 0.375 (8) 0.62 0.250 (4) 0.397 (63) 0.00 (6) 0.80 Treatment in previous year.)
989 to 1990 Nestlings	Males			•	<i>,</i>
Nestlings 0.000 (35) 0.027 (291) 0.00 (19) 0.625 (8) 0.418 (91) 0.375 (8) 0.62 (10) 0.250 (4) 0.397 (63) 0.00 (6) 0.80 (4) (4) (4) (4) (4) (4) (4) (4) (4) (4)	1989 to 1990				
0.625 (8) 0.418 (91) 0.375 (8) 0.625 (8) 0.250 (4) 0.397 (63) 0.00 (6) 0.80 Treatment in previous year.		0.000 (35)	0.027 (291)	0.00 (19)
0.250 (4) 0.397 (63) 0.00 (6) 0.80 Treatment in previous year.		` '		,	0.62
^a Treatment in previous year.			` '	, ,	0.80
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Discussion		<u> </u>	moducaomana.		

their intuitive appeal (Lack 1947; Williams 1966; Charnov and



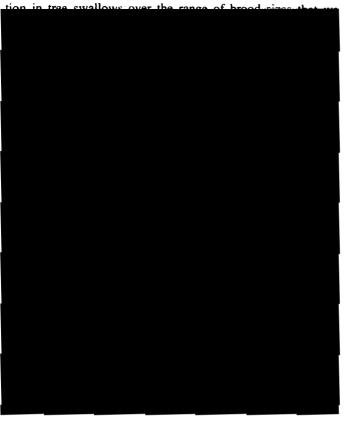
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Treatment in previous year

Brood enlarged by



Acknowledgements

We thank Juan Amat, Peter Dunn, Kate Lessells, Nadav Nur,

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1990. The cost of reproduction in birds: evaluating the evidence from manipulative and non-manipulative studies. *In* Proceedings of the NATO Workshop on Demographical, Physiological, Genetical and Behavioral Aspects of Population Biology of Passerine Birds, Evisa, Corsica, France, 1989. *Edited by J. Blondel, A. Gosler, J.-D.*



