Birds captured at automatic baited traps are heavier

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As with other automatic trapping methods, funnel traps allow the ornithologist to trap birds while devoting time to other activities. In these methods, trapped birds remain within the trap until the investigator removes them. The time involved is always greater than for traps directly activated by the investigator, because in the latter the birds can be taken out immediately after capture. In funnel traps, birds can feed on the bait for several minutes before they are extracted or realize that they have been trapped, and, as a consequence, one might predict a higher body mass than for those birds trapped by other methods. Here, we compare the body mass of birds captured at a specially designed funnel trap, which we described previously, with the corresponding results from a non-automatic platform trap. We analysed 953 captures of Serins Serinus serinus *caught using this trap during the autumns of 1995-1997 in Barcelona, north-eastern Spain. Standardized body mass and number of seeds ingested (counted by visual inspection of the gullet through the skin) was higher for birds trapped in the funnel trap than for birds captured in the platform trap. Results also show that funnel and platform traps sample birds in an equivalent way in relation to sex, age and residence status, at least in autumn. Investigators should take into account this bias in body mass. The solution is simple: the investigator should visit the trap at brief intervals, in order to reduce the time available for captured birds to consume the bait.*

Key words: funnel trap, platform trap, trapping methods, Serin, body mass, trapping bias.

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INTRODUCTION

Traps are becoming increasingly popular among bird researchers, because of the high number of birds that can be trapped at one time, as well as the relative irrelevance of weather conditions (e.g. wind), and the speed at which birds can be removed (Bateman 1979, Davis 1981, Ceballos *et al.* 1984, McClure 1984, Bub 1991). Funnel traps are one of the trapping methods most commonly used in many bird studies, mainly because, as in the case of other automatic methods, once they are set up birds become trapped while the investigator can devote time to other activities (Senar *et al.* 1997).

Different trapping methods can produce biases in the sampling of the population (Balph & Balph 1976, Karr 1981, Buckland & Hereward 1982, Wooller 1986, Greenwood *et al.* 1986, Schmidt *et al.* 1986, Senar 1988, Prescott *et al.* 1989, Bauchau & van Noordwijk 1995). The kind of bias could be different for different species (Weatherhead & Greenwood 1981) and in some cases important interactions of several factors could appear (Figuerola & Gustamante 1995); this is why a multifactorial approach is advisable (Borras & Senar 1986; Senar *et al.* 1994a).

With funnel traps, the trapped birds remain within the trap until the investigator takes them out. The time involved is typically higher than for traps that are activated by the investigator, since in non-automatic traps the birds are generally taken out immediately after capture. This time may be of importance because in baited funnel traps the birds can feed on the bait for several minutes before they realize that they have been trapped, and, as a consequence, birds trapped with these methods can show a higher body mass than those trapped with non-automatic traps.

In this paper we describe a baited funnel trap specially designed for the capture of finches, buntings and sparrows. We compare the body mass of Serins *Serinus serinus* captured at funnel traps with the corresponding results of non-automatic platform traps, for which we have already investigated other trapping biases (Senar 1988, Domènech & Senar 1997, Domènech & Senar 1998).

MATERIAL AND METHODS

The trapping of Serins was carried out in autumn (1 October-21 December) from 1995 to 1997 in a suburban area of Barcelona, north-eastern Spain (41°.25'N 02°.10'E). A total of 953 captures were used in the analyses.

Birds were captured using a Yunick platform trap and a funnel trap. The platform trap is an elevated wire funnel like a cage, with two doors, one at each end; these doors are operated manually by means of a string (Yunick 1971, Senar 1988). The funnel trap is also a wire funnel like a cage, but it is situated at ground level and birds are presented with an easy way into the trap but no readily visible way out (Figure 1). Both traps were associated with feeders of the same surface area, baited with rape seeds *Brassica napus*, and both were simultaneously used at the same locality. The distance between the two trapping devices was 5 m.

All birds were individually ringed on first capture. Age and sex were determined according to Svensson (1992). Two age classes were defined: yearlings (Euring age 3) and adults (Euring age 4).

We included residence status (newly ringed birds vs. recaptured ones, see Senar 1988, Domènech & Senar 1998) in the analyses, in addition to age and sex. We used residence status in a broad sense to classify birds into those that do not yet have any experience with trap-

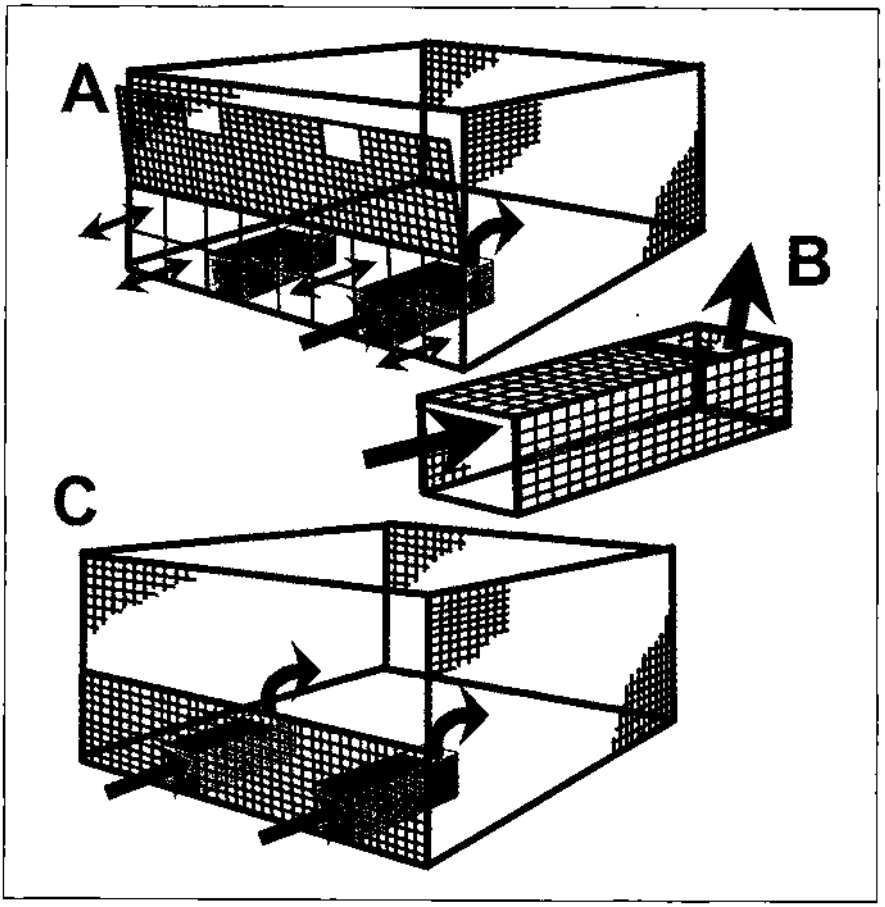

Figure 1. Funnel trap design. A) Lateral view in free-access position. B) funnel; arrows indicate how the birds get into the trap. Note that the end of the funnel is closed but roofless. C) side view in the activated position; the bait is on the trap floor.

Figura 1. Disseny de la trampa túnel. A) Vista lateral en posició d'accés lliure per als ocells. B) Túnel; les fletxes indiquen per on entren els ocells a la trampa. Noteu que el final del túnel està tancat i obert per la part superior. C) Vista lateral en posició activada. El menjar per atreure els ocells està situat al terra de la trampa.

ping devices (newly ringed birds) from those already familiar with them (recaptured ones) (Domènech & Senar 1998).

In addition, we measured body mass (to 0.1 g, with a digital balance). Body mass was standardized for size (i.e. tarsus length) according to Senar *et al.* (1994b). To study the possible differences in the amount of bait ingested by the birds in both traps, we estimated the number of recently ingested seeds by visual inspection of the gullet through the skin, by blowing aside the feathers of the neck (Newton 1972) in 558 birds. We used

four semi-qualitative classes related to number of seeds seeing (0: no seeds; 1: one to five seeds; 2: six to ten seeds; 3: more than 11 seeds).

The four-factor contingency table relating the number of birds trapped with each method (i.e. platform vs. funnel trap) and factors sex, age and residence status was analysed using backward stepwise log-linear analysis with an automatic model selection procedure. This analysis allowed us to obtain the simplest model that fits the data with the least number of interactions necessary (Norusis 1986).

We used a non-parametric Mann-Whitney U test to compare the number of seeds ingested by birds at the two traps. Otherwise, we used parametric statistics.

RESULTS

Standardized body mass was higher for birds trapped in the funnel trap than for birds captured in the platform trap (funnel trap: mass =11.12g, sd=0.83, n=160; platform trap: mass =10.89g, sd=0.68, n=398; ANOVA, $F_{1, 556}$= 10.96, p<0.001). Moreover, there were differences in the number of seeds ingested by birds between the two trapping methods, with birds taken at the funnel trap carrying more seeds (funnel trap: median = 1, range=0-3, SD= 1.19, n= 160; platform trap: median = 0, range = 0-3, SD = 0.76, n = 398; Z =-6.77, p<0.001).

The best model (goodness-of-fit test: H^2_{10}=13.99, p=0.17) explaining the variation in the four-factor log-linear analysis relating trapping method to age, sex, and residence status of the birds included two factors, sex and trapping method and only one significant interaction: age to residence status (Table 1). Results showed that in the sample there were more males than females, and that

	Partial Association		Marginal Association	
Hypothesis	H^2	P	H^2	P
Capture method	25.36	<0.001	25.36	<0.001
Residence	105.88	<0.001	105.88	<0.001
Sex	11.59	<0.001	11.59	<0.001
Age	66.09	<0.001	66.09	<0.001
Capture method × Residence	0.05	0.83	0.29	0.59
Capture method × Sex	1.14	0.29	1.12	0.29
Capture method × Age	2.79	0.09	2.93	0.09
Residence × Sex	0.84	0.36	0.81	0.37
Residence × Age	6.98	<0.01	7.11	0.01
Sex × Age	0.16	0.69	0.02	0.88
Capture method × Residence × Sex	1.46	0.23	1.08	0.30
Capture method × Residence × Age	2.06	0.15	2.06	0.15
Capture method × Sex × Age	1.39	0.24	2.34	0.13
Residence × Sex × Age	3.04	0.08	3.06	0.08

Table 1. Results of the log-linear test between the variables capture method (platform trap vs. funnel trap), sex, age (yearlings vs. adults) and residence status (newly banded bird vs. recaptured ones).

Taula 1. Resultats del test log-linear entre les variables mètode de captura (trampa plataforma vs. trampa túnel), sexe, edat (juvenils vs. adults) i residència (ocells anellats per primer cop vs. recaptures)

Capture method	Platform trap	Funnel trap
Sex		
Males	404	191
Females	238	120

Table 2. Number of Serins trapped by capture method and sex.

Taula 2. Nombre de gafarrons capturats segons el mètode de captura i el sexe.

Ringing status	New ringing birds	Recaptures
Age		
Young	118	494
Adult	30	312

Table 3. Number of Serins trapped according age and ringing status.

Taula 3. Nombre de gafarrons capturats segons l'edat i si són nous anellaments o recaptures.

the platform trap captured more birds than the funnel trap (Table 2). In addition, the interaction between age and residence status showed that in the adult class there was a higher proportion of recaptured birds than in the young class (Table 3).

DISCUSSION

Birds trapped at the funnel trap had ingested more seeds and showed a higher body mass than birds captured at the platform trap. This is probably due to the fact that in funnel traps the birds generally remain more time at the bait than in non-automatic traps. In traps operated by the investigator, we extract the birds as soon as they are captured, whereas in funnel and other automatic trapping devices, investigators visit and extract the birds after a more or less regular time interval. During most of this period, birds do not realize that they have been captured, and continue ingesting seeds until satiated (per. obs.).

Given that body mass is an important variable in many ecological and ethological studies (see for example: Witter *et al.* 1994, Kullberg 1998, Veasey *et al.* 1998), the bias detected here for automatic baited traps, but not previously been described, should be considered. At least one possible solution is, fortunately, simple: the investigator should visit the trap at more frequent intervals, in order to reduce the time available to the captured birds for ingesting bait.

The results also show that funnel and platform traps sample birds in an equivalent way in relation to the sex, age and residence status of the trapped birds, at least in autumn. The interaction between age and residence status may be explained because of the fact that adults have a more extended time to become trapped than do yearlings. This is due simply because yearlings, in having hatched just a few months prior to this, in the previous spring, have a shorter period of time in which to become marked. The higher proportion of males in the sample may be an effect of dominance by this class (Domènech & Senar 1998). The higher number of birds trapped at the platform trap compared to the funnel device may be because the birds might perceive a lower predation risk in feeding at the trap, because of its elevated position (Götmark & Post 1996, Domènech & Senar 1998). This possible difference between the two traps in perceived predation risk can not explain the difference we have found in body mass between the birds taken at the two trapping devices. This is because a higher perception of predation risk is supposed to decrease body mass (e.g. Gentle & Gosler 2001) whereas our data show that the trap with the supposed higher pre-

dation risk, the funnel trap, was the one that trapped the heavier birds. •

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RESUM

Els ocells capturats en trampes automàtiques pesen més

Les trampes túnel, com altres mètodes de trampeig automàtics, permeten capturar ocells mentre l'investigador pot dedicar temps a d'altres activitats. En aquests mètodes els ocells capturats resten dins de la trampa fins que l'investigador els extreu. El temps que els ocells romanen dins d'aquest tipus de trampes sempre és superior al de les trampes activades per l'investigador, en què els ocells són extrets immediatament després de la captura. En les trampes túnel els ocells poden menjar de l'esquer durant diversos minuts abans de ser extrets o adonar-se que estan atrapats, i com a conseqüència podríem predir que els ocells trampejats amb aquest mètode pesaran més que els trampejats amb altres mètodes. En aquest estudi es descriu una trampa túnel i es compara la massa corporal dels ocells capturats en trampa amb les dels ocells capturats amb una trampa plataforma no automàtica. S'han utilitzat 953 captures de Gafarrons Serinus serinus, *realitzades amb aquesta trampa túnel a la tardor dels anys 1995 a 1997 a Barcelona. La massa corporal estandarditzada i el nombre de llavors ingerides (comptades mitjançant inspecció visual del pap a través de la pell) va ser superior per als ocells capturats a la trampa túnel respecte als ocells capturats a la trampa plataforma. Addicionalment, els resultats mostren que la trampa túnel i la trampa plataforma mostregen els ocells de manera equivalent, és a dir, sense biaixos entre elles, pel que fa al sexe, edat i si es tracta d'ocells no anellats o recaptures, almenys a la tardor. Els investigadors haurien de tenir en compte aquest biaix en la massa corporal a l'hora d'utilitzar les dades obtingudes amb trampes automàtiques amb esquer. La solució, però, és senzilla: l'investigador hauria de visitar la trampa sovint per reduir el temps dels ocells per ingerir l'aliment que forma part de l'esquer.*

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