Do Adult Little Egrets Respond to Disturbance at Their Nest by Increased Breeding Dispersal?

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Abstract.—When studying breeding dispersal with marked individuals, manipulation-induced disturbance should not affect movement patterns. As part of a study on the Little Egret (*Egretta garzetta*), we tested whether the capture of breeding adults at their nest and handling (i.e., disturbance) increased their probability to move to a new colony in the subsequent breeding season (i.e., breeding dispersal). The proportion of adults disturbed in a given year that had changed colony in the subsequent breeding season was compared with the dispersal of adults observed during at least two consecutive years at colonies and not disturbed on the previous year: (1) birds marked as chicks and (2) birds marked as adults and observed ≥ two years after capture at the nest. Disturbed birds were not found to have an increased propensity to disperse. We conclude that, for this species, capture did not increase the subsequent breeding dispersal. *Received 28 November 2003, accepted 7 August 2004.*

Key words.—Breeding dispersal, capture, disturbance, *Egretta garzetta*, Little Egret.

Waterbirds 27(4): 480-482, 2004

When studying life history traits, the techniques used should not affect the trait under study. Nevertheless, some studies induce unavoidable disturbance. For banding studies, the impact of capture method or marking used is infrequently investigated (Rodgers and Burger 1981; Calvo and Furness 1992). The few studies that have assessed the impact of disturbance focused mainly on intra-annual consequences on breeding success, nest desertion, chick mortality or parental behavior. But, to our knowledge, the hypothesis that such disturbance induces breeding dispersal (i.e., change of breeding location between subsequent years) has not been investigated.

As part of a study of the Little Egret (*Egretta garzetta*), adults were captured at their nest using baits containing a narcotic drug. This disturbance, which included drugging, capture at the nest and handling, may have increased the propensity for birds to change colony in the next year. Two pseudo-control groups were available to us: birds initially marked as chicks and observed as breeding adults, and adults captured at their nest but observed ≥ two years subsequent to the year of capture. Disturbance at the nest was assumed to affect the breeding dispersal in the season following capture but not on latter breeding attempts. A difference in dispersal propensity was tested by comparing disturbed (i.e., recently captured) and not disturbed (i.e., control-like groups) birds.

METHODS

Our study group consisted of five to nine colonies each year from 1981-1997, scattered across the Camargue (1,800 km^2, Rhône Delta, Southern France). Chicks (N = 7,267) and adults (N = 558) were captured and individually marked with color-bands or wing-tags in five colonies each year (Hafner *et al.* 1998; Fasola *et al.* 2002). Chicks were captured at the nest and marked before fledging. Adults were narcotized while incubating by placing a small fish containing a capsule of 9 mg of α-chloralose on nest. Once narcotized, adults were caught by hand at their nest, marked, measured, and placed back on their nest; handling lasted less than ten minutes. All colonies were searched for marked individuals once a week each year, from 20 May to 30 July, re-sighting effort being higher in years 1988-1995.

To test our prediction, only re-sightings of birds observed during incubation or nestling stage in colonies (considered as breeders) in two consecutive years were used. Re-sightings were separated into three groups: (1) *disturbed* birds (individuals re-sighted the year subsequent to the year they were captured at their nest), (2) *undisturbed* birds *marked as chicks* (never captured at their nest as breeders) and (3) *undisturbed* birds *marked*

as adults (not captured at their nest on the year previous to the re-sighting). For each re-sighting, breeders that had changed of colony (i.e. *dispersed*) were distinguished from those that had remained in the same colony (i.e. *not dispersed*).

First, the homogeneity of dispersal probability between the two groups of undisturbed birds was checked and, second, the dependence on disturbance was tested using χ^2-tests after Yates' correction of the data. The power of tests was estimated as $1 - \beta$, where β was the probability that a random variable with non-central Chi-square distribution fell below the observed value, given actual sample sizes and a α level of 0.05 (software GPOWER 2.0; Faul and Erdfelder 1992). Arbitrary effect sizes were computed assuming that (i) undisturbed birds marked as adults would have dispersed one third less than those marked as chicks, and (ii) disturbed birds would have dispersed one fifth more than undisturbed birds.

RESULTS

Dispersal probability did not significantly differ between undisturbed birds marked as chicks or as adults ($\chi^2_1 = 2.29$, n.s.; $1 - \beta = 0.385$). The data did not indicate that disturbed birds dispersed more than undisturbed birds; the proportion of birds that dispersed was even lower for disturbed (0.37) than for undisturbed birds (pooled data for birds marked as chicks and as adults: 0.48; $\chi^2_1 = 2.36$, n.s.; $1 - \beta = 0.962$; Table 1).

DISCUSSION

Our results were not consistent with the hypothesis that disturbance at the nest, resulting from narcotizing, capture and handling, during a given year induced breeding dispersal in the subsequent year. The trend was in the opposite way, breeding dispersal being 22% lower for disturbed birds. The statistical power of the test was high, thus ensuring that, if disturbed birds had dispersed at least one fifth more than undisturbed birds, type II statistical error was unlikely. The effect of disturbance was not confounded with annual variations in breeding dispersal (discussed in Fasola *et al.*, 2002) since conclusion remained the same when data were analyzed with a logistic regression model including a categorical year effect (results not shown). Thus, the opposite of what we expected was found: disturbance at the nest for this species did not induce a higher propensity to change colony in the subsequent year. This is congruent with results of Pineau *et al.* (1992), from the same location, indicating that disturbance had no effect on breeding success. The overall high breeding dispersal of the species is likely to be due to the natural high colony turnover of arboreal ardeids in the Camargue (see discussion in Fasola *et al.*, 2002).

The failure to demonstrate an impact of capture on dispersal could be interpreted in two ways. First, Little Egrets may not be particularly sensitive to this disturbance at the nest. Second, our capture and handling procedure may not have been particularly disturbing. Because birds were narcotized when handled, they may have been oblivious to handling, and therefore less disturbed than they would have been if manipulated awake and aware. To our knowledge, this is the first

Table 1. Numbers (x) and proportions (*p*) of breeding Little Egrets (*Egretta garzetta*) changing colony according to the disturbance status: disturbed at nest during the year or not disturbed (marked either as chicks or as adults). N is the number of individuals recorded as breeders both in year *i-1* and *i*.

Status in previous year	Year	1983	1988	1989	1990	1991	1992	1993	1994	1995	1997	Total
Disturbed	x	2	0	5	9	14	6	0	1	2	-	39
(marked as adults)	p	1	0	0.23	0.38	0.56	0.40	0	0.50	0.40	-	0.37
	N	2	7	22	24	25	15	2	2	5	0	104
Undisturbed	x	-	-	1	4	5	1	1	0	-	-	12
(marked as adults)	p	-	-	0.33	0.80	1	0.17	1	0	-	-	0.57
	N	0	0	3	5	5	6	1	1	0	0	21
Undisturbed	x	-	0	6	8	10	9	0	-	-	0	39
(originally marked	p	-	0	0.46	0.40	0.71	0.60	0	-	-	0	0.46
as chicks)	N	0	4	13	20	14	15	5	0	0	1	72

test of an impact of capture at the nest with narcotics on breeding dispersal propensity. Pradel *et al.* (1995) is the only other study we are aware of that appropriately tested the impact of a capture technique on dispersal. They quantified the change of molting site induced by capture of flightless molting Lesser Snow Geese (*Anser caerulescens caerulescens*).

ACKNOWLEDGMENTS

We thank two anonymous referees, John C. Coulson, David Cameron Duffy and Jean-Dominique Lebreton for their comments on previous versions of the manuscript. We are very grateful to all the persons involved in the herons' project of the Station Biologique de la Tour du Valat, especially Olivier Pineau for field work. All captures and marking were carried out under license of the French National Ringing Center (C.R.B.P.O.) and the French Ministry of Environment.

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