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WING-TAGGING TEMPORARILY AFFECTS TIME BUDGETS OF LARGE GULLS

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ABSTRACT

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We studied behaviour of large gulls recently marked with wing-tags at loafing sites at an inland refuse dump using focal birds. During the first 3-4 weeks after marking, wing-tagged gulls spent more time preening at the refuse dump than unmarked birds, which usually did not preen there, while no difference between those two groups was observed at other sites. The possible reasons for preening on the refuse dump are that marked gulls either avoided flying to the loafing water because wing-tags impaired their flight, or showed displacement behaviour.

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Key words: wing-tags, gulls, colour marking

INTRODUCTION

Colour marking offers a number of opportunities to study survival, migration and behavioural strategies in individual birds. Among the different marking techniques, wing-tags (patagial tags) strongly increase resighting rates in larger birds (*e.g.* Maddock and Geering 1994). Wing-tags can also have adverse effects on the marked birds. In several species increased mortality has been observed or inferred from resighting rates (Howe 1980, Hart 1987, Calvo and Furness 1992, Gauthier-Clerc *et al*. 2004) and reproductive success and behaviour have also been affected (Saunders 1988, Kinkel 1989, Gauthier-Clerc *et al*. 2004). In some waterbirds wing-tags have caused feather wear (Hart 1987, Green *et al*. 2004) and an increase in the time spent preening (Calvo and Furness 1992, Brua 1998). While Hart (1987) reported that the latter was likely to be restricted to a few days in the Herring Gull (*Larus argentatus*), Southern and Southern (1983) suspected wing-tags to be a constant annoyance for

Ring-billed Gulls (*L. delawarensis*). This would make wing-tags unsuitable for several types of behavioural studies even without affecting survival or reproduction. Here we test whether marking of large gulls wintering on inland refuse dumps in Western Germany influences their individual behaviour or time budget.

METHODS

During 1995-2003 large gulls feeding on two municipal refuse dumps at Bochum (51°29'N, 7°16'E) and Datteln (51°38'N, 7°21'E *ca* 19 km from Bochum) were caught by hand (see Bub 1974) and marked with one patagial tag on each wing. Tags were made of white or dark blue darvic (PVC), 25 by 65 mm wide and fitted with one U-shaped pin following the method described by Hart (1987). The birds were released immediately after marking. Catching and marking was done by the same person (A. Buchheim) at both sites.

The behaviour of wing-tagged gulls was studied in January 1999 on the refuse dump at Bochum, the adjacent loafing water and the roost at a reservoir 1.2 km and *ca* 6 km from the refuse dump, respectively.

Behaviour of marked and unmarked resting individuals was observed using continuous sampling of focal individuals (Altmann 1974). Unmarked birds were randomly selected from the landing or resting flock while marked birds were individually recorded by reading the wing-tag. A total of 30 marked individuals were observed during the study including 27 Herrring Gulls, two Caspian Gulls (*Larus cachinnans*) and one Yellow-legged Gull (*L. michahellis*). Herrring Gulls also dominated the unmarked sample but a few individual Yellow-legged or Caspian Gulls were likely to contribute to this sample, too.

Type and duration of all activities shown by the focal individuals were recorded either with a tape-recorder or with the help of a second observer. Duration of activities was measured to the nearest second using a stopwatch. A minimum duration of one second was assigned to activities occurring as events too short to record, *e.g.* a single shake of the head.

Observations were stopped either 15 minutes after the start or earlier when the focal bird left the observation site. Because most observations were terminated after less than 15 minutes we analysed subsamples of five minutes and one minute duration. Furthermore, *ca* 1/3 of them started when the focal bird landed at the observation site while in other cases the bird had already been present. To account for this difference the beginning of the five minutes subsamples was chosen to be two minutes after the original recording had started whereas the one minute subsamples started with the bird's arrival at the observation site.

Behaviour of marked and unmarked birds were compared using Wilcoxon matched pairs tests in order to correct for the influence of factors varying between observations, such as age of the individuals observed, weather, time of day or food supply. For each marked gull we selected a bird of the same age-class (first winter, immature or adult) from the unmarked group, which was observed on the same day at the same site by the same observer.

RESULTS

Comfort behaviour of unmarked gulls

The utilization of the three different sites differed clearly in unmarked birds. Within the five minute samples gulls at the refuse dump were mainly observed resting, whereas preening was usually observed at the other two sites. At the loafing water the different activities were most evenly distributed because all birds were observed drinking and swimming, whereas pecking and locomotion were infrequently recorded at the dry sites (Table 1). This pattern could also be confirmed during the first minute after landing for preening and resting (Table 2).

Table 1
Time budget (seconds) of unmarked birds during 5 min of observation 2 minutes after landing at the respective sites. Median (*M*), quartiles (*Q*) and range (*R*) are given.

Site	*N*		Preening	Pecking / drinking	Locomotion	Resting / sleeping
Refuse dump	18	*M*	2	0	4	288
		Q	0-12	–	0-10	243-299
		R	(0-194)	(0-23)	(0-26)	(104-300)
Loafing water	26	*M*	32	5	89	61
		Q	10-110	1-12	6-201	0-180
		R	(0-300)	(0-175)	(0-284)	(0-280)
Roost, dry places	13	*M*	102	0	4	160
		Q	60-125	0-10	0-43	70-197
		R	(0-293)	(0-52)	(0-188)	(7-296)

Table 2
Time budget (seconds) of unmarked birds during 1 min immediately after landing at different observation sites. Median (*M*), quartiles (*Q*) and range (*R*) are given.

Site	*N*		Preening	Pecking / drinking	Locomotion	Resting / sleeping
Refuse dump	30	*M*	0	0	0	56
		Q	0-2	0-2	0-4	35-58
		R	(0-55)	(0-29)	(0-26)	(5-60)
Loafing water	21	*M*	43	0	0	9
		Q	15-48	0-7	0-11	0-22
		R	(0-60)	(0-20)	(0-60)	(0-60)
Roost, dry places	5	*M*	7	0	3	0
		Q	–	–	–	–
		R	(0-60)	(0-57)	(0-25)	(0-28)

The between-site differences in comfort behaviour observed in unmarked birds disappeared in wing-tagged gulls on the refuse dump (Table 3). This was especially obvious for the amount of time spent preening (Fig. 1), which differed between sites in unmarked birds (*H*-test: five-minute samples – $\chi^2_2 = 18.16$, $p < 0.001$; one-minute samples – $\chi^2_2 = 18.21$, $p < 0.001$) but not in tagged birds (five-minute samples – $\chi^2_2 = 3.12$, $p = 0.21$).

Table 3
Time budget (seconds) of wing-tagged birds during 5 min of observation 2 minutes after landing at the respective sites. Median (*M*), quartiles (*Q*) and range (*R*) are given.

Site	*N*		Preening	Wing-tag preening	Pecking / drinking	Locomotion	Resting / sleeping
Refuse dump	35	*M*	12	0	0	1	268
		Q	1-86	0-9	–	0-8	210-290
		R	(0-237)	(0-46)	(0-23)	(0-23)	(52-300)
Loafing water	21	*M*	31	0	4	5	157
		Q	5-113	0-13	0-9	0-163	54-259
		R	(0-216)	(0-58)	(0-26)	(0-293)	(0-293)
Roost, dry places	24	*M*	57	0	0	7	148
		Q	2-111	0-5	0-5	0-146	43-243
		R	(0-275)	(0-56)	(0-76)	(0-290)	(0-300)

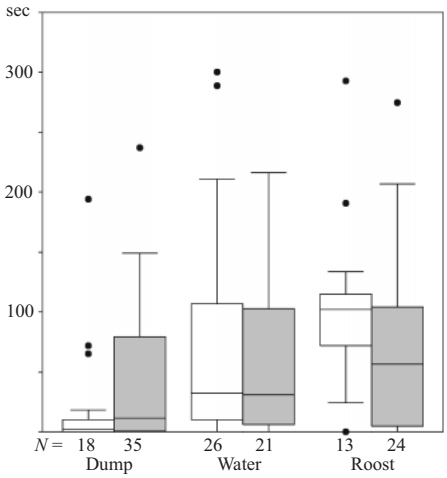

Fig. 1. Time devoted to preening within five-minute samples of unmarked (white boxes) and wing-tagged (grey boxes) gulls. Boxes represent quartiles with the median indicated by the horizontal line, whiskers depict the range with dots as outliers.

Pairwise comparison showed that marked gulls preened significantly more on the refuse dump during one minute (Wilcoxon matched pairs test: $z = -2.133$, $n = 39$, $p = 0.03$). Time spent handling the wing-tag was excluded in this analysis. At the other sites

marked gulls spent on a preening similar amount of time to the unmarked birds (z = –0.237, n = 30, p = 0.81). This was also true when preening movements directed towards the wing-tag were included in the analysis (z = –0.566, n = 30, p = 0.57).

The difference in the time spent preening during one minute of observation on the refuse dump between tagged and unmarked birds decreased with the time elapsed since catching and marking (Spearman's rank correlation: r_s = –0.479, N = 39, p = 0.002; Fig. 2). This decrease was also observed when the birds marked at Bochum and Datteln were tested separately (Bochum: r_s = –0.528, n = 15, p = 0.043; Datteln: r_s = –0.415, n = 24, p = 0.043). There was no similar change at the loafing water and the roost (r_s = 0.127, n = 30, p = 0.504; all marked birds pooled).

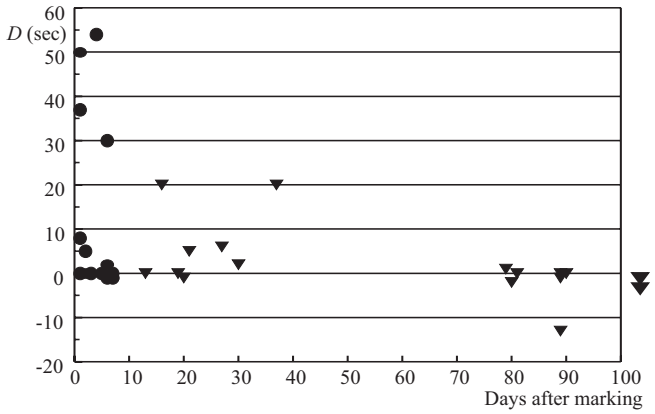

Fig. 2. Difference (D) in the time spent preening within one minute between tagged and unmarked gulls. Gulls marked at the study site Bochum (circles) and at Datteln (19 km distance; triangles). Two individuals outside the box were checked after more than 400 days.

DISCUSSION

Newly wing-tagged gulls behaved markedly different on the refuse dump where they regularly preened, whereas preening was rarely observed in unmarked birds. The birds spent more time on usual preening behaviour, thus our result is not simply caused by manipulations on the wing-tag itself. The decrease in the difference between tagged and unmarked gulls during the first weeks after marking also makes it unlikely that the tags caused feather wear, which in turn led to additional preening, as this effect should increase with time. Our observations do not indicate that damage (Hart 1987) or annoyance (Southern and Southern 1983) sufficiently explain the results. Since we did not study a sample of control birds that were captured but not wing-tagged, we cannot rule out that the temporal increase in preening have resulted from capture alone rather than from the tags.

Observations of an increase in the time spent preening in Ruddy Ducks (*Oxyura jamaicensis*) (Brua 1998) imply a change in the birds' total time budget. As preening was not reduced in marked gulls at the loafing sites and the roost in our study, it is

possible (although not certain) that the total time spent preening per day has increased temporarily after wing-tagging, too.

Another explanation for the increased preening on the refuse dump is that the newly marked gulls avoided flying to the loafing water. Although wing-tags did not obviously reduce the mobility of most species studied (Calvo and Furness 1992) they may impair movements *e.g.* by increasing energy demands. This has been suggested to explain effects of wing-tags on waders and penguins (Howe 1980, Gauthier-Clerc *et al*. 2004). Wing-tags are likely to influence the bird's aerodynamics and every single flight between the refuse dump and the loafing water may consume more energy after marking. As a consequence the birds may have preferred to stay at the refuse dump and preen there instead of moving between the dump and the loafing water. Wing-tags should affect aerodynamics permanently and marking effects could only disappear after a few weeks if the birds become accustomed to the tags.

Longer stays at the refuse dump further imply a difference in site attendance between marked and unmarked birds. Because it is impossible by definition to follow the movements of unmarked individuals and observations of colour-ringed birds from other marking schemes were not frequent enough to track individual movements, this effect could not be tested.

Increased preening could also arise from the fact that the birds soiled their plumage when they were stored in plastic tubes between capturing and marking. Most of those gulls that could be followed after release flew to the nearest water and only few birds resumed feeding without interruption. If additional preening was caused by soiled plumage it should take place for a short time also at the loafing water and the roost, whereas increased preening only on the refuse dump as observed would be rather a kind of displacement activity due to previous experience than regular preening.

Observations of increased preening or similar indications of discomfort have usually been reported for a short time after marking (Howe 1980, Southern and Southern 1983, Brua 1998, this study). In the Ring-billed Gull, the initial suspicion of a constant annoyance (Southern and Southern 1983) has not been supported by later work of the same authors (Southern and Southern 1985, Kinkel 1989). This suggests that discomfort only temporarily alters the comfort behaviour of gulls and possibly also of other birds. Behavioural patterns in space and time observed in wing-tagged gulls should thus be treated with caution, especially during the first two weeks after marking because they may not represent an unbiased sample.

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