Le Gerfaut 77 : 275-279 (1987)

ALBINISM IN THE GRAY GULL, LARUS MODESTUS, IN NORTHERN CHILE

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Albinism, though rare, has been reported in many bird species (reviews by Sage, 1962 and 1963 ; Gross, 1965). Low frequency within the species can be interpreted in terms of reduced relative fitness of albinos. Albinism apparently is extremely rare and until now unreported for the Gray Gull, *Larus modestus*. Here we make the first report of albinism in *L. modestus* and speculate on three possible maladaptive correlates.

Larus modestus ranges on the west coast of South America between latitudes 0° and 40°S (Howell *et al.*, 1974). During the breeding season (November-December to January-February) large numbers congregate on the beaches of northern Chile, court and mate, and establish nest sites as far as 90 km inland (Guerra and Cikutovic, 1983) on the desolate pampas of the Atacama Desert. Nesting pairs alternate foraging flights to the coast, roundtrips up to 180 km, during their brooding period. These trips plus daily extremes in temperature (40°C air ; 61°C surface) and wind velocity (50 km/h) must make severe demands on nesting gulls.

During five years of studying and censuring more than 20,000 gulls in northern Chile, only three albinos have been observed. Two were partial albinos and one was complete. The partials were collected on the beaches of Antofagasta (23° 41' S) and Mejillones, 40 km to the north, on 9 March 1981 and 18 February 1983 respectively. The complete albino was observed on the Antofagasta beaches in November 1982, but not collected. The two partials were weighed, measured (Table 1), sexed (females), photographed (Fig. 1) and preserved in the permanent collection at the senior author's institution.

Larus modestus and the other true hot desert-nesting species, Heermann's Gull, *Larus heermanni*, unlike other gulls are uniformly gray, except during the breeding season when the head molts to white. The only other conspicuous white is the distinct border on the wing secondaries. Both appear to be important in the Gray Gulls' courtship, specifically the wing border secondaries (Moynihan, 1962 ; Guerra, unpublished). The adaptive significance of gray color in *L. modestus* and

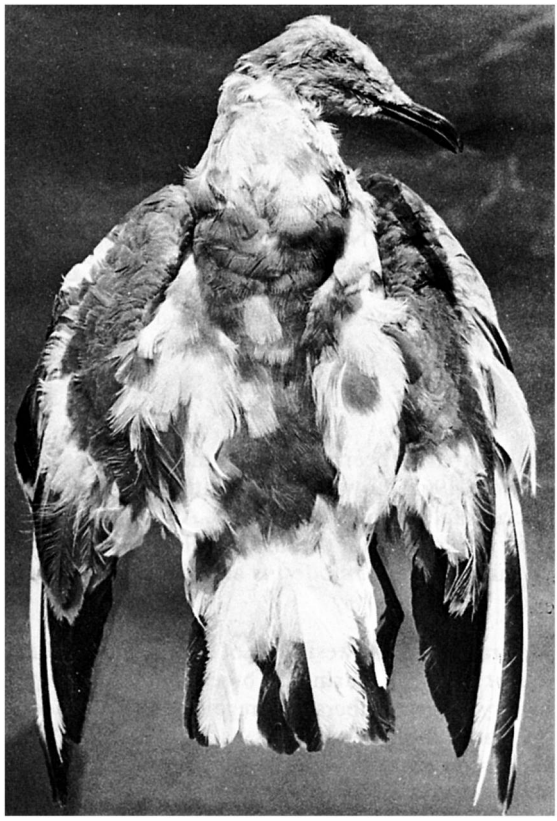

Fig. 1. A partial albino Gray Gull, *Larus modestus*, collected in northern Chile.

L. heermanni has not been formally studied. However, Walsberg *et al.* (1978) suggested that natural selection may favor dark plumage in desert birds such as *L. modestus*. They reported that erected black plumage transmits less heat to the body than does white plumage at winds greater than 3 m sec-1. Bartholomew and Dawson (1979), following Walsberg *et al.* (1978) stated that « our observations on *L. heermanni* (which closely resembles *L. modestus* and which also nests in a desert environment) document the effectiveness of dark plumage and forced convection in minimizing heat load of nesting gulls exposed to intense solar radiation. » If gray plumage is an adaptation for hot desert nesting, then *L. modestus* albinos should certainly have greater difficulty than normal pigmented cohorts reproducing in the Atacama. The only known nesting sites for the Gray Gull are in the desert.

In addition to thermal properties, dark feathers should be more resistant to abrasion by wind-blown sand grains than white ones (see Averill, 1923 ; Burtt,

1979 ; Barrowclough and Sibley, 1980). Burtt's (1979) experiments on the differential abrasive effects of silicon particles on feathers with and without melanin demonstrated that pigmented feathers had superior resistance. Occurrence of melanic feathers on wing tips of many birds and reports on differential wear between white and melanic feathers support Burtt's (1979) conclusion that abrasion resistance is an adaptive correlate of feather melanism. Gray Gulls are exposed to potential sand abrasion on the beaches and in the desert where high winds occur during times when adults are shading their nests with elevated wings. The tips of the wing primaries, which are important for flight are normally black in Gray Gulls. Thus, wear should be greater for albinos than normal pigmented gulls with melanic-tipped primaries. Fig. 1 clearly demonstrates differential abrasion between melanic and non-melanic primaries in one of the partial albinos.

Effects of differential abrasion on flight energetics has been discussed somewhat in the literature, but without clearcut conclusions. Barrowclough and Silbey (1980) calculated that the maximal differences in power requirements for sustained flight and maneuvering between complete albino and normal Yellow-rumped Warblers (*Dendroica coronata auduboni*) were *ca.* 4 and 9% respectively, but drew no firm conclusions as to their significance to warblers under natural conditions. The effects of a 4% power reduction for sustained flight in *Larus modestus* is purely speculative. Gray Gulls that nest in the Atacama near Palestina make 180 km roundtrips to the beaches near Antofagasta ; a total flight time of *ca.* 6 hours (Guerra and Cikutovic, 1983 ; Guerra and Fitzpatrick, unpublished). The energetics of a 6 hour 180 km flight is estimated at 888 KJ for a 400 g gull (assumptions : BMR = 14.8 KJh-1, Flight = BMR x 10 ; see Lasiewski and Dawson, 1967 ; Tucker, 1974). If a 4% power decrease translates directly, a 400 g albino would require an additional, but probably insignificant 35.5 KJ for the round trip.

Albinism probably has minimal effects on growth and development of Gray Gulls. Both partial albinos were healthy with body measurements indistinguishable from normal Gray Gulls (Table 1). The complete albino appeared healthy and to differ from normal Gray Gulls only in color.

Table 1. Quantitative comparisons between two partial albino and normal pigmented Gray Gulls, *Larus modestus*

Measure	Albino		Normal Pigmented Females		
	1	2	$\bar{X}$	± 1 SD	(N)
Total length (mm)	405	420	417.3	20.9	(109)
Wing length (mm)	320	328	339.4	12.2	(108)
Bill length (mm)	38	45	41.2	2.3	(109)
Tail length (mm)	—	128	120.8	8.2	(22)
Tarsus length (mm)	—	56	55.4	5.6	(22)
Weight (g)	311	360	343	35.6	(105)

The effects of albinism on successful courtship and subsequent mating is unknown. Based on behavioral observations (Moynihan, 1962 ; Guerra, unpublished), *L. modestus* conspicuously display their white wing borders during their elaborate courtship. Both partial and complete albinos lack that ability. If albinos fail to consummate courtship, for whatever reason, effects of albinism on flight energetics or thermoregulation are moot. Observations of albinos on the beaches during courtship and at nesting sites during breeding season are necessary to test the implied hypothesis.

ACKNOWLEDGMENTS

We wish to acknowledge Marcos Cikutovic, Enrique Hernandez and students of the Juventudes Cientificas de Chile for help in collecting data which appear in this paper.

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SAMENVATTING

Volledig en gedeeltelijk albinisme bij *Larus modestus* wordt hier voor de eerste maal beschreven. Voor deze vogels die in de woestijn van Noord Chili broeden, en 180 km moeten afleggen om hun jongen te voeden, worden de voordelen voor normaal donker gekleurde vogels en de nadelen voor de albino exemplaren vermeld. De nadelen van het albinisme zouden hier gecompenseerd kunnen worden als deze individu's niet aan de voortplantingscyclus deelnemen.

RESUME

L'albinisme total et partiel chez le Goéland gris, *Larus modestus*, est décrit ici pour la première fois. Cette espèce niche dans le désert du nord du Chili et les adultes doivent parcourir 180 km pour nourrir leurs poussins. Les auteurs décrivent les avantages du plumage foncé et les désavantages du plumage albino. Les inconvéniants de l'albinisme seraient compensés si ces individus ne participent pas à la reproduction.

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Accepted 15 January 1986