UNEXPECTED PLUMAGE IN ANTARCTIC TERNS STERNA VITTATA DURING THE AUSTRAL WINTER

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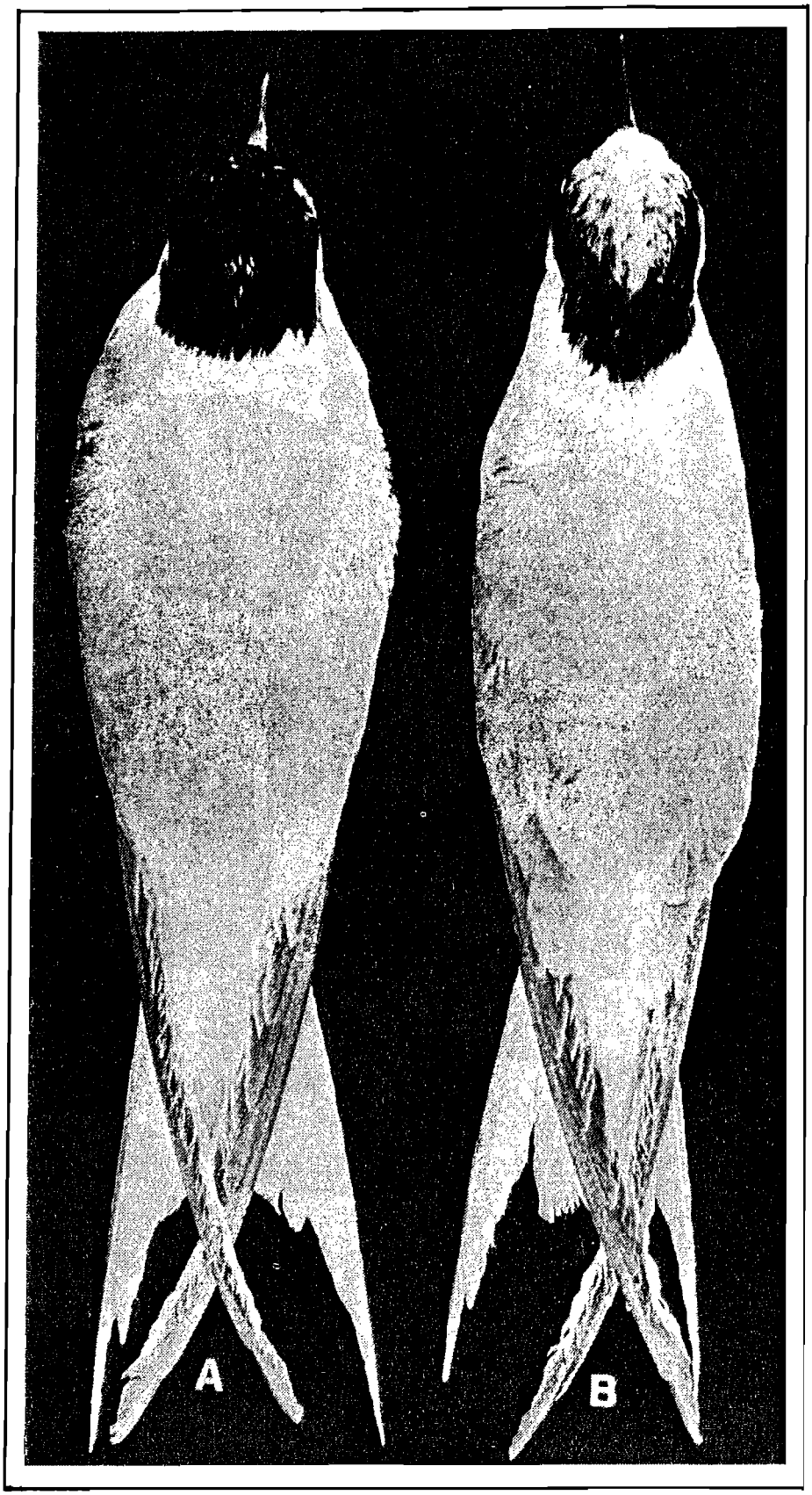
INTRODUCTION

With limited information available to him, Watson (1975) concluded that adult Antarctic Terns *Sterna vittata* undergo a complete moult which, following breeding, commences in February or March and alters the plumage considerably. In breeding condition the terns have "gray backs and underparts with contrasting white moustachial streak and cheeks, black caps, and bright red bills and feet." The complete moult not only results in a replacement of flight feathers but also a crown that becomes "streaked with white, and the forehead and lores that are almost entirely white. The underparts whiten ... the bill darkens to black or reddish black, and the feet darken to dull red." Evidently Watson (1975) believed that this non-breeding or winter plumage persisted until a partial moult of the head and body, extending from "September to December" changed the bird from its non-breeding plumage to its breeding plumage. Although I agree with Watson's description, his conclusions on the timing of the moult and duration of the two plumages are oversimplified.

During the years 1975-77 and in 1985, 27 Antarctic Tern specimens of both sexes, including 19 adults and eight subadults, were collected during the non-breeding season near the United States' Palmer Station at Arthur Harbor (64 46S, 64 03W) on Anvers Island west of the Antarctic Peninsula. In preparing them for museum skins, I found that adults taken at the height of winter were not in the non-breeding dullish plumage (Watson 1975, Harrison 1983), but were in bright breeding plumage, including red bills, legs and feet (Figs. 1 & 2). This disclosure led me to compare the plumages and moult schedule of these winter terns with 34 specimens, including 25 adults and nine subadults of both sexes, collected near Anvers Island at other times of the year. I now report for these year-round resident terns a peculiar moult schedule, previously undescribed.

RESULTS

The appearance of the 19 adult winter specimens are presented in Table 1. Four specimens taken during 8-20 May still have the appearance of winter birds, although in three the moult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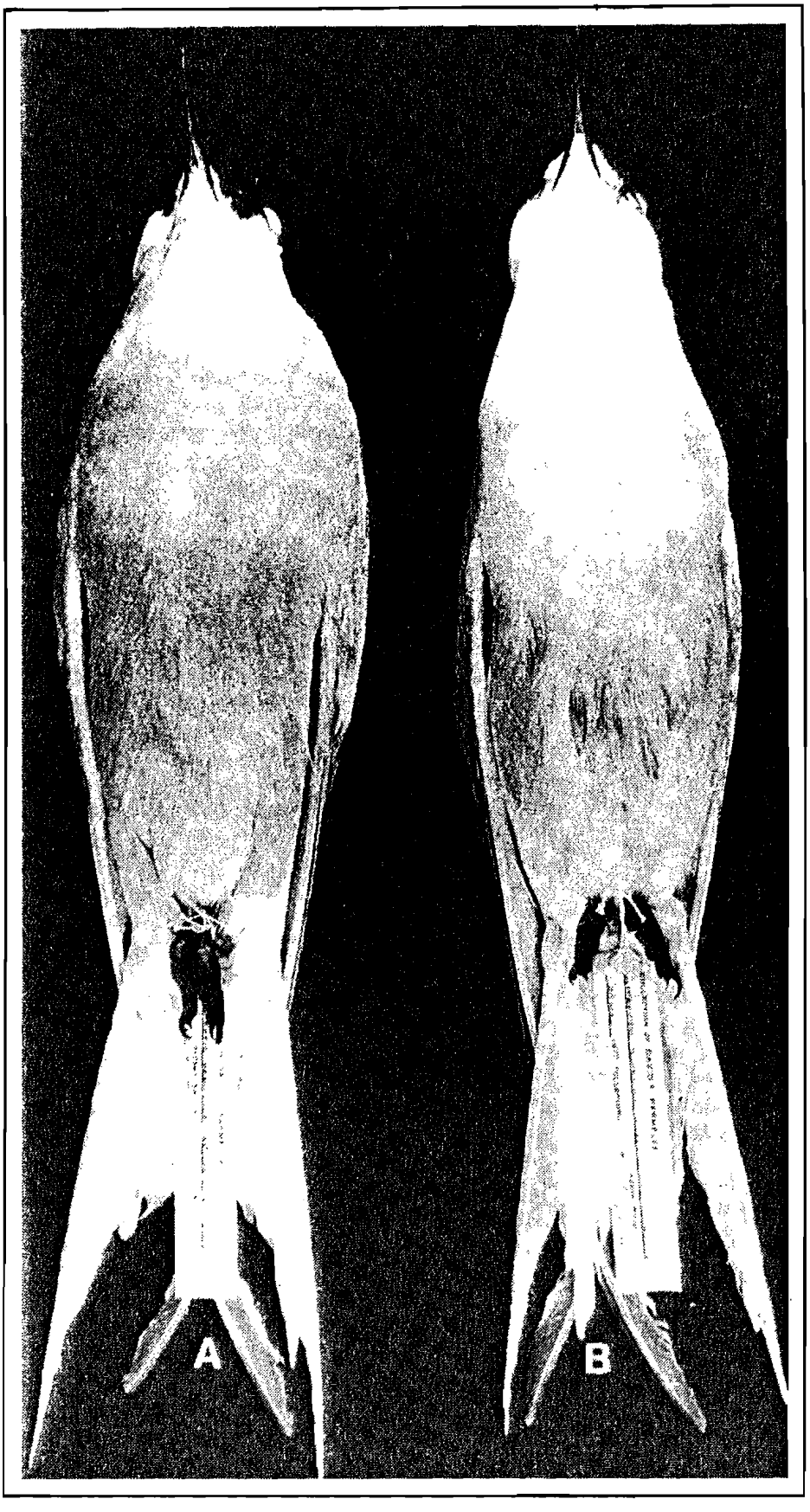
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TABLE 1

APPEARANCE OF 19 ADULT ANTARCTIC TERNS COLLECTED NEAR THE ANTARCTIC PENINSULA DURING THE NON-BREEDING OR WINTER SEASON

No.	Date	Sex	Crown	Under-parts	Bill	Legs & feet
1	8 May 1975	M	white	white	dark	red
2	16 May 1977	F	white	white	dark	trans.
3	20 May 1977	M	white	white	trans.	trans.
4	20 May 1977	F	white	white	trans.	trans.
5	26 May 1975	M	black	trans.	red	red
6	6 Jun 1977	F	black	trans.	trans.	trans.
7	19 Jun 1977	F	white	grey	trans.	trans.
8	22 Jun 1975	M	black	grey	red	red
9	29 Aug 1985	F	black	grey	red	red
10	29 Aug 1985	F	black	grey	red	red
11	29 Aug 1985	F	black	grey	red	red
12	30 Aug 1975	M	black	grey	red	red
13	9 Sep 1985	M	black	grey	red	red
14	9 Sep 1985	F	black	grey	red	red
15	9 Sep 1985	F	black	grey	red	red
16	9 Sep 1985	F	black	grey	red	red
17	19 Sep 1975	M	black	grey	red	red
18	19 Sep 1975	F	black	grey	red	red
19	30 Sep 1975	M	black	trans.	red	red

Note: With respect to plumage the term white refers to a black crown and/or grey underparts heavily streaked with white. Trans. refers to a transitional condition in which predominantly grey underparts show varying degrees of grey and white.

Transitional stages in the bill, legs and feet, refer to a condition in which distinct red and black areas are discernable. *e.g.* the bill may be entirely red except for a black tip, or the legs and feet may show black patches with red predominating elsewhere. Red refers to very bright red bills and somewhat duller legs and feet with no or very slight traces of black.

FIGURES 1 & 2

Adult Antarctic Tern specimens collected near the Antarctic Peninsula. Specimen A virtually had completed its moult by 26 May and shows a black crown and greyish underparts typical of the breeding plumage. Specimen B had nearly completed its flight feather growth but not its head and body moult by 20 May; its whitish crown and underparts are typical of the non-breeding plumage that appears annually for a short time only.

was far advanced and either the bills or the legs and feet were quite red. The incoming primaries (flattened wing 173 mm) and tail of the female taken on 16 May were very short compared to those of the remaining 18 specimens (flattened wing 271-287, mean 281 mm). One taken on 26 May had the appearance of a breeding adult, including bright red bill, legs and feet; except for a few body pinfeathers, it showed virtually no signs of moult. Specimens taken in late June and in August and September were in bright breeding condition, though some still retained traces of moult, especially on the crown, throat and under wing-coverts. The one notable exception was a male that retained a partial winter appearance as late as 30 September, including extensive moult on the crown, neck, body and outer two rectrices, although its bill, legs, and feet were bright red. All adults taken after September were in breeding condition. I find no evidence that the partial body moult extends from "September to December," as stated by Watson (1975). According to P.G. Ryan (pers. comm.) migratory Antarctic Terns that winter off South Africa do not moult until after their arrival during April-May. As a result of the delay they replace their flight feathers and assume their winter plumage during June-September; birds in full summer plumage are first seen in early August and most acquire it by mid-September.

DISCUSSION

Specimens from Anvers Island show that a moult of body feathers in some adults is underway as early as 19 January, that of flight feathers as early as 27 February. Other individuals do not, however, show an early moult and finish replacing their flight feathers as late as mid-May. This asynchronism is best explained by these resident terns' remarkably protracted breeding season (October-March). Among the earliest breeders at Anvers Island, they commence nest-scraping activities in October; viable eggs occur from at least 11 November to 25 February when penguin chicks in the same area already have abandoned their nests. Since the terns have short incubation (23-24 d) and chick-rearing (23-25 d) periods, I account for their extra long breeding season only in terms of late nesting pairs and observed high rates of nest predation which result in renesting. As a consequence of repeat or late laying, fledging of terns at Anvers Island occurs from as early as 29 December to as late as 22 March (Parmelee 1977). Thus, the known period from first egg to last fledging spans 132 days, a remarkably long time when compared to that of the Arctic Tern *Sterna paradisaea*, which at high latitudes has a breeding season that spans as little as 54 days (Parmelee & MacDonald 1960).

Adult Antarctic Terns that fledge young early, or for some reason fail to breed successfully, if at all, probably moult early. Conversely, the moult is late in those adults that attend eggs in January or February whether they are repeat layers or simply late layers. Asynchronous moulting occurs with other kinds of seabirds as well. Croxall (1984), who

reviewed the findings of several observers, stated that in failed breeders primary moult may begin within a week of egg or chick loss, and that nonbreeding birds also moult during the breeding season. According to Warham (1967) the moult may begin progressively later in the Whiteheaded Petrel *Pterodroma lessoni* as the birds get older.

Probably many terns at Anvers Island acquire their breeding plumage much earlier than previously believed. Whether early or late, the flight feathers evidently are shed soon after breeding and the accompanying body moult and colour transformations change the birds from a breeding appearance to a winter appearance and quickly back to a breeding appearance seemingly in one short, continuous effort. According to R.K. Brooke (pers. comm.), the nonbreeding plumage that lasts for a very short time seems to be analagous to the eclipse plumage of the males of many northern hemisphere ducks and some African sunbirds. It also explains why Harrison (1983) described the adult nonbreeding plumage as one that lacked tail streamers, suggesting that moult of the flight feathers and the winter plumage occur simultaneously.

Early breeding by the terns of Anvers Island may account in part for the much earlier than expected breeding plumage already present in some adults by late May. There may be an advantage in the early pairing of resident terns, also in the continuance of the pair bond throughout winter. Station personnel (pers. comm.) at Arthur Harbor have witnessed what appeared to have been tern courtship activities in mid-winter.

The early breeding also suggests an anti-predator adaptation, since predation on tern eggs and chicks increases after the hatching of South Polar Skua *Catharacta maccormicki* young (Parmelee 1977). A single pair of skuas can severely affect a tern colony, despite the fact that these predators rely chiefly on fish and krill. Some young terns are already flying by the time skua young begin to hatch, indicating that tern chicks from early hatchings have a distinct advantage over those that hatch late. However, repeat and late nestings may have another kind of advantage: since the terns are an inshore feeding species with rather small foraging ranges (pers. obs.), the asynchronous nesting may be an adaptation to reduce intraspecific competition especially during the chick rearing and adult premoult fattening periods, as suggested by Croxall & Prince (1980) for Gentoo Penguins *Pygoscelis papua*.

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