NOTES ON MOULT AND SEASONABLY VARIABLE CHARACTERS OF THE ANTARCTIC BLUE-EYED SHAG

Phalacrocorax atriceps bransfieldensis

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ABSTRACT

A summary of timing and patterns of moult is presented for adult *Phalacrocorax atriceps bransfieldensis* based on 14 months of continuous observation. Changes in flesh characters are also noted. Observations differ from reports in the literature, and the significance of the new data on taxonomic studies of the blue-eyed shag complex is discussed.

Differences in plumage patterns and eyelid colour of the blue-eyed shag complex *(Phalacrocorax atriceps, P. albiventer, P. verrucosus, P. carunculatus,* and *P. campbelli)* have been used for taxonomic classifications (e.g. Murphy 1936, Jouanin 1950, Behn *et al,* 1955, Voisin 1970, 1973, and Watson 1975).* More recently, Devillers & Terschuren (1978) also used these morphological characters in proposing evolutionary relationships within this species complex, basing their conclusions on breeding characters while paying little attention to non-breeding plumage patterns or the fact that the eyelid colour is variable throughout the year. This paper summarises 14 months of observations on the plumage and flesh characters of *P. atriceps bransfieldensis* at Cormorant Island near Palmer Station, Anvers Island, Antarctica (64°46'S 64°03'W). The results of the study indicate that the current literature on timing and extent of moult does not adequately describe *P. atriceps bransfieldensis* and that, although classifications based upon morphological characters may be true, they are ill-founded.

From 16 January 1979 to 13 March 1980, 78 female and 92 male Cormorant Island shags (800 birds resident most of the year) were caught and hand-inspected for moult of wings, tail, breast, back, and head (Table 1), and also for colour of the eyelids and nasal caruncles. Special attention was given to moult of the dorsal patch of white feathers located between the wings and to the moult of the wing bars.

Capture was not possible in August owing to adverse ice conditions and was not attempted during the shags' courtship period in September and October. Since birds immediately before and after this time exhibited moult, we can only conclude that moult had not been completed.

* Although the genus **Leucocarbo** is also used for this group, for ease of comparison with recent literature, we prefer to use **Phalacrocorax** in this paper.

In summarising the work of past researchers (e.g. Murphy 1936), Watson (1975) writes the following regarding the moult of *P. atriceps:*

> Twice per cycle. A complete molt begins during breeding and lasts into June. This produces the elongated crest plumes and leaves the back and wings entirely black. Another partial molt takes place in the spring just after courtship and involves loss of the crest plumes and rapid growth of the white middorsal patch and wing bars.

Despite the fact that Watson states that the timing and extent of these two moults need further study, his description is widely quoted and implied as being valid.

At the Cormorant Island colony, the heaviest moult of all feather tracts occurred between the last week of March and mid-April (Table 1). No differences in moult were noted between sexes and, as Owre (1967) reported for *P. auritus,* an irregular and often unilateral moult of remiges and rectrices often occurs. If an orderly sequence of moult occurred in Cormorant Island shags, it was not apparent.

Although moulting slowed noticeably during the austral winter from mid-April on, a bird showing light breast moult still retained old and worn remiges as late as July, probably indicating that a complete moult had not occurred in June. All but 11 of the many birds examined throughout the 14-month study showed some form of moult; old and worn remiges were usually present with new ones. Shaw (pers. comm.) observed that 2- and 3-year-old *P. atriceps bransfieldensis* often retain juvenile primaries and secondaries on Signy Island, and Potts (1971) has noted the same in *P. aristotelis.* It appears that, like *P. aristotelis* (Potts 1971) and *P. capensis* (Berry 1978), *P. atriceps* does not have two separate moults but rather a multicycle moult or *Staffelmauser* (see Stresemann & Stresemann 1966). Potts (1971) cites other incidences of multicycle moult in seabirds and believes that conservation of energy is a primary reason for the slow moult, especially the winter pause which occurs when food resources are often depressed.

By mid-May, the Cormorant Island shags had well-developed nuptial crests, which they retained until the third week in December. Back moult was found in 96 of the shags examined. Contrary to Murphy's (1936) and Watson's (1975) description, in all but three (1 male, 2 females) white feathers had replaced other white feathers in the dorsal patch and wing bars. No reduction in the size of the dorsal patch was evident, and with the exception of a single female (31 January 1980), none of the 96 lost these white areas. In agreement with the above authors, however, 2 males and 5 females had incoming black feathers emerging in the dorsal patch between mid-February and March 1980. At most, 25% of the patch contained black feathers.

It is important to note that even at the species level the presence of a dorsal patch is used to distinguish *P. atriceps* and *P. albiventer,*

TABLE 1 — Monthly summary of moult for *Phalacrocorax atriceps bransfieldensis*

Date	Sex	N	No. With No Moult	Primaries* 1-3	Primaries* 4-6	Secondaries 1-3	Secondaries 4-6	Tail 1-3	Tail 4-6	Breast lgt	Breast mod	Breast hvy	Back lgt	Back mod	Back hvy	Head lgt	Head mod	Head hvy
1979																		
Mar	M	38	3	20	1	9	3	9	8	11	6	3	10	7	10	5	6	17
	F	35	2	18	4	14	2	20	3	10	4	5	10	9	8	5	6	19
Apr	M	7		6		4		3	1	5	2		4	1	2		2	4
	F	4		4		1		4		3			3	1		1	1	2
May	M	7		2		3		3	3	4	3		3	4		3	2	1
	F	7		7		3		4	2	6	1		4	1	2	4	3	
Jun	M	20	2	6		9		13		9	1		1	2		6	1	
	F	9		7		4		6		6			4			4		
Jul	M	1								1								
	F	0																
Nov	M	2	2															
	F	2					1						1					
Dec	M	10	2	3		3	2											
	F	6	1	2		2	3	3								5		
1980																		
Jan	M	4		4		4	3	2		1			2				1	
	F	5		3		3	1	1					1			1		
Feb	M	3		3		3	2	1	1	2			2			1	2	
	F	10		9		2	3	3		4	2		4	4		3	2	4

*Numbering of feathers indicates absolute number of feathers that are moulting.

which are sympatric in part of their ranges and which Devillers & Terschuren (1978) believe to be conspecific. Our data indicate that descriptions of moult for the dorsal patch and wing bars in *P. atriceps atriceps* do not apply to *P. atriceps bransfieldensis* at Cormorant Island. Further study is needed from other locales to reveal geographic variances that may exist.

Colour of the shag eyelids and nasal caruncles has also been used to distinguish species of the blue-eyed shags with no regard to intraspecific variability within the yearly cycle. At the onset of courtship in the third week of September, the eyelid is a deep shade of cobalt blue, the enlarged caruncles a bright orange-yellow. By the peak time of egg laying in mid-November to mid-December, both the eyelids and the then shrunken caruncles fade in colour. Many years ago Clarke (1913) mentioned a change in caruncle size, but apparently these changes have gone unnoticed by most recent researchers (but see Williams & Burger 1979). Although taxonomic classifications are often based on differences in colour of the eyelids and caruncles, most researchers observe shag colonies only for brief periods in making their comparisons. This may lead to false conclusions since the characters are highly variable during the year and rapid changes occur between courtship and egg laying.

In conclusion, if taxonomic or evolutionary distinctions are to be based on morphological characters within this group, cursory observations at breeding colonies are inappropriate. Our study indicates that moult is poorly understood for this group and that additional studies are needed to discover how widely applicable our observations regarding retention of the dorsal patch and wing bars and multicycle moult are to other members of the *Phalacrocorax atriceps* complex. To establish relationships of the blue-eyed shags, the birds should be examined throughout the year, including early and late stages of the breeding season.

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SHORT NOTE

PREDATION ON STARLINGS *(Sturnus vulgaris)* IN NEST BOXES IN HAWKE'S BAY

In Hawke's Bay nearly 2000 wooden nest boxes were erected along fences to investigate whether or not it was possible to increase starling numbers for grass grub control. The nest boxes, 205 x 105 mm and 305 mm high, as described by Moeed & Dawson (1979, NZ J. Zool. 6: 613-618) were nailed to vertical wooden battens (7.5 x 5.0 cm) attached to the top of concrete or wooden fence posts about 1 m high. The bottom of each box was 50 cm above the top of the post. The centre of the entrance hole was 25 cm above the bottom of the box and 6 cm from the top and side.

Two study areas 5 km apart are referred to as Gull Rd and Poporangi Rd (Table 1). Up to 19 October 1976 all boxes were examined each week, then a group (A) of only 97 boxes at Gull Rd and another 101 at Poporangi Rd examined regularly. All Gull Rd boxes were examined once at night between 29 October and 1 November, except for group A. By 29 November, when it was obvious that a predator, probably a stoat, was visiting boxes over an increasing area, all boxes at Gull Rd were again examined weekly (Table 1).

On 19 October, 49% of 41 boxes on a particular fence (group B) at Gull Rd and 60% of the remaining 387 boxes at Gull Rd had eggs. However, by the end of the month only 7% of group B boxes were occupied (1 or more eggs or young). Eggs in these occupied boxes were broken and empty and the expected young were missing. By comparison, 47% of group A boxes and 46% of the rest of Gull Rd boxes (group C) were occupied (Table 1). Group A boxes also