

**Article IV.—NOTES ON AMERICAN SUBANTARCTIC
CORMORANTS.**

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INTRODUCTION.

The material upon which the present paper is based includes seventeen specimens of the "blue-eyed shag" of South Georgia, collected by the writer, five skins of *Phalacrocorax atriceps* taken by Mr. R. H. Beck at Corral, Chile, and one skin of *Phalacrocorax albiventer* from Patagonia. The South Georgia birds are in the collections of the Brooklyn Museum and the American Museum of Natural History; the Chilean birds belong to the Brewster-Sanford collection in the American Museum; and the skin of *P. albiventer* is number 7911 in the ornithological collection of Princeton University.¹ Curiously enough, all of the adult birds in this assemblage, including the Patagonian and Chilean specimens and five of those from South Georgia, are females. These eleven wholly comparable skins of full-grown cormorants of the same sex have been studied with relation to the status of several species as expressed in the literature since 1898.

Up to the present, two species of cormorants having blue eyelids and entirely white under surfaces, have been recognized as inhabiting the southern extremity of South America and the outlying Subantarctic region. They are:

1. *Phalacrocorax atriceps* King, of the Chilean coast from Puerto de

¹ To Dr. Leonard C. Sanford of New Haven, and Dr. Charles F. Silvester of Princeton, I am indebted for the loan of specimens.

Corral southward, the Straits of Magellan and Fuegian waters, and the Patagonian side of the continent as far north as the mouth of the Rio Santa Cruz; this species is moreover reputed to be the cormorant of South Georgia and the South Orkneys (*vide infra*).

2. *Phalacrocorax albiventer* (Lesson), inhabiting the Falkland Islands, Fuegia, the Straits of Magellan, and the coast of Patagonia north to Port San Julian.

These two species are closely related but the adults are readily distinguishable by at least two characters that are pronounced and constant. In *atriceps* the caruncles at the base of the bill are always undeveloped, forming no excrescence, and the white plumage of the throat extends upward on the side of the head so as to cover the auricular region. In *albiventer*, on the other hand, the double caruncles attain a large size in the adult, forming two prominent, tuberculated, brightly-colored growths, while the dark plumage of the pileum extends downward over the greater part of the cheek, making a larger "cap" than that of *atriceps*. Ogilvie-Grant (3) as well as Scott and Sharpe (10) illustrate these differences by text figures.

According to Ogilvie-Grant, *albiventer* always lacks the white dorsal patch which is so conspicuous a feature of many specimens of *atriceps*. This is, however, a matter of serious doubt. The presence or absence of a dorsal patch in the white-breasted cormorants has been often misinterpreted. It is properly to be considered not as a permanent marking but as a nuptial or *post-nuptial*, perhaps inconstant, decoration of certain mature birds. In a key to several of the white-breasted cormorants, Sclater (1) groups *Phalacrocorax carunculatus* under the section "*Dorsi fascia nulla*," but this species is now known to have a well-marked white patch at some seasons. Of the five skins of typical *atriceps* in the Brewster-Sanford collection, only one shows a trace of the patch, and in this single instance it is indicated merely by a few new white feathers amid the dark plumage above the rump. It is noteworthy that none of my photographs of breeding South Georgia birds shows the patch. After the end of the breeding season, however, I saw in the same localities many living shags emblazoned with the striking mark. The 'Scotia' photographs (6, 7, 8, 9) of cormorant colonies at the South Orkneys reveal the dorsal surfaces of many birds, and the white patch appears to be missing about as often as it is present. It is therefore surely not improbable that further collection will demonstrate that *Phalacrocorax albiventer* agrees with its closely related circumpolar congeners *atriceps*, *carunculatus*, *onslowi*, etc., in the occasional presence of the patch. At any rate, the entire absence of this feature in some fully mature, breeding South Georgia shags demonstrates its untrustworthiness as a diagnostic character.¹

¹ In this I disagree with Forbes (2).

***Phalacrocorax atriceps* King.**

Phalacrocorax atriceps KING, Zool. Journ., IV, 1829, p. 102.

Type locality, Straits of Magellan.

Measurements in millimeters of the five specimens in the Brewster-Sanford collection are as follows:

Brewster-Sanford Coll. Corral, Chile	Culmen	Bill		Tarsus	Toe and claw	Wing	Tail
		from gape	depth to cutting edge				
1496 ♀, Sept. 17, 1913	60	87	8	63	101	255	112
1497 ♀, Oct. 6, "	56	86	9	64	97	272	116
1498 ♀, Oct. 8, "	59	86	8	66	100	267	112
1499 ♀, Oct. 8, "	58	89	8	63	99	260	110
1500 ♀, Oct. 10, "	60	88	9	67	101	270	123

These figures agree with the dimensions for the species given in the Catalogue of Birds and the Princeton Patagonia Report, except that the wings and tails of the Brewster-Sanford specimens are somewhat shorter through wear. It should be emphasized that lengths of wing and tail are the least useful of measurements unless the series of birds includes examples taken at various seasons of the year. According to Mr. Beck's careful notations on the labels, the ovaries of the specimen taken on October 10, are distinctly larger than those of the September bird. Additional facts recorded by the collector are that the eyelids were blue in life, the iris brown, the gular pouch yellowish (this is also clearly indicated in the dried skins), and that the feet varied from "whitish" to "pinkish flesh color." According to the literature, the irides of this shag become bright green during the breeding season. Darwin is said to be the authority for the statement that the tarsi of adult breeding birds are "scarlet."

The Brewster-Sanford specimens agree well with the colored plate of this species, designated as *Phalacrocorax imperialis*, in the Challenger Reports (1).

***Phalacrocorax albiventer* (Lesson).**

Carbo albiventer LESSON, Traité d'Orn., 1831, p. 604.

Type locality, Falkland Islands.

The Princeton University specimen of *Phalacrocorax albiventer* has been fully described by Scott and Sharpe (10). At a glance it is obvious that this

bird and the shag of South Georgia have closer affinities with one another than either has with *atriceps*. The striking characteristics of the Princeton specimen are its recurved crest, which is 52 mm. in length and composed of forty or more feathers, its large caruncles, and yellow legs and feet.

P.U. O. C. 7911 ♀ ad.	Culmen	Bill		Tarsus	Toe and claw	Wing	Tail
		from gape	depth to cutting edge				
Near Coy Inlet, Patagonia. Sept. 14, 1896	54	77	9	65	100	274	123

Further remarks concerning this and the preceding species will be made below.

***Phalacrocorax georgianus* Lönnberg.**

Phalacrocorax atriceps georgianus LÖNNBERG, Kungl. Svensk. Vetens. Akad. Handl., XL, 5, 1906, p. 69.

Type locality, Island of South Georgia.

A. M. N. H. & Brook. Mus. Colls., South Georgia	Culmen	Bill		Tarsus	Toe and claw	Wing	Tail
		from gape	depth of cutting edge				
R. C. M. 1574 ♀ ad. br. Dec. 23, 1912	49	72	8	64	103	276	119
" 1648 ♀ ad. br. Dec. 30, 1912	50	70	8	61	100	278	117
" 1654 ♀ ad. br. Dec. 30, 1912	51	75	7.5	62	101	278	122
" 1840 ♀ ad. br. Feb. 16, 1913	48	71	8	63	104	273	119
" 1841 ♀ ad. br. Feb. 16, 1913	44	70	8	—	—	270	116

Ogilvie-Grant (3), p. 392, described the skin of a nearly adult cormorant from South Georgia, and tentatively referred the specimen to *Phalacrocorax atriceps*. At the same time, however, he called attention to the short bill and other features in which it seemed to differ from typical *atriceps*, and suggested that this insular form might prove to be distinct.

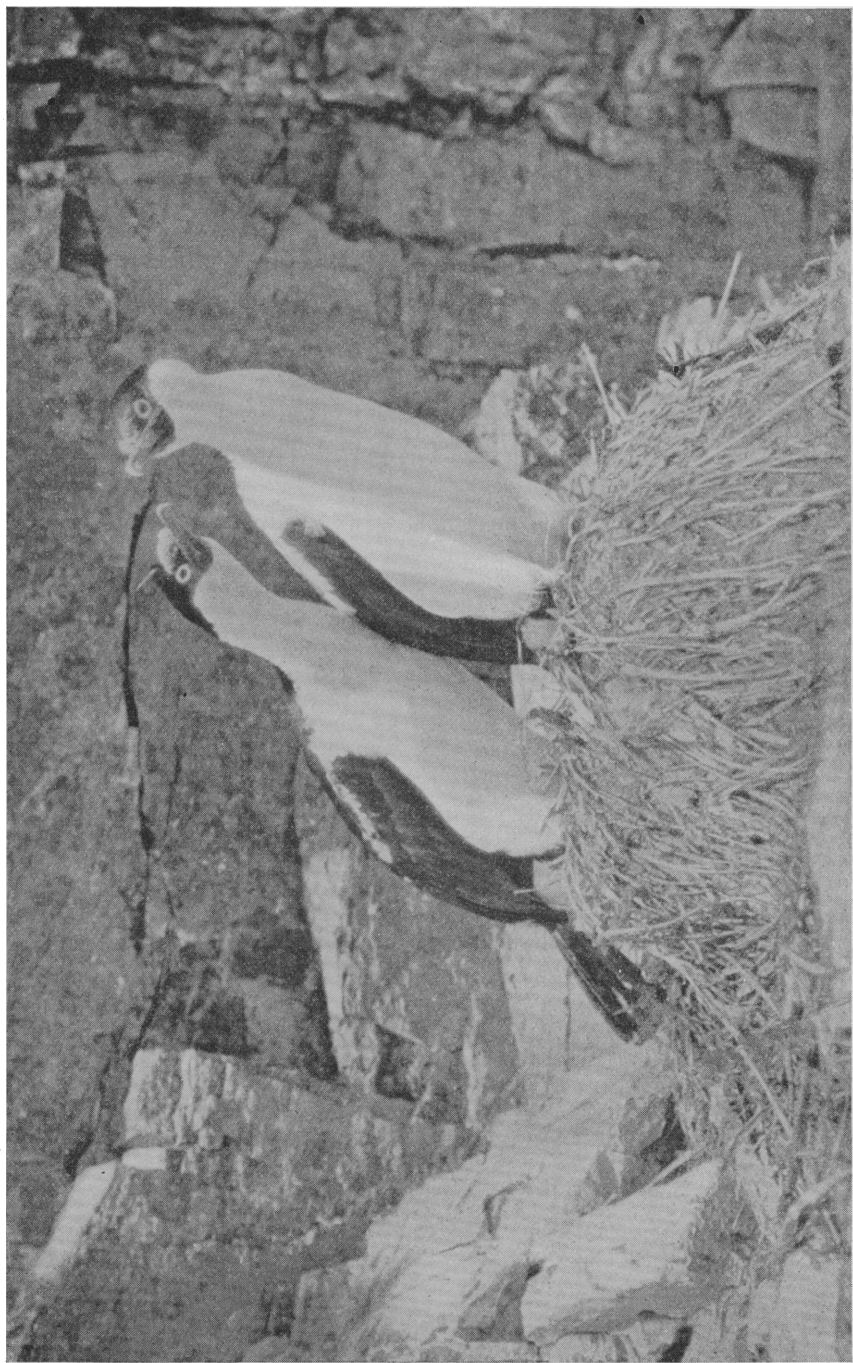


Fig. 1. *Phalarocorax georgianus*. A courting pair. Dec. 29, 1912.

Eight years later Lönnberg (5) studied four additional South Georgia cormorant skins, three of which were of young birds, and, on the basis of a single adult male, proposed with some hesitation the name *Phalacrocorax atriceps georgianus*. Lönnberg gave a satisfactory description of the type, and by extending the application of Ogilvie-Grant's key (p. 339 of the Catalogue), which is based on the position of the line of demarcation between black and white plumage on the side of the head, he showed that in the South Georgia shag this boundary crosses the ear opening, whereas the ear of *atriceps* is in the midst of white plumage, and the ear of *albiventer* in the midst of black. This diagnostic difference holds good for the eleven adult specimens which I have examined.

Lönnberg apparently had no material with which to compare his adult South Georgia bird, and so he based his subspecies upon Ogilvie-Grant's description of *atriceps*. A critical examination of the skins before me, however, shows that *georgianus* is in fact undoubtedly closer to *albiventer* than to *atriceps*, though not without unique characters of its own. As regards the borderline of white and black on the side of the head, the bird might be considered intermediate between the other two, but in the possession of prominent caruncles and a long crest it agrees entirely with *albiventer*. It may be added that from *à priori* considerations the shag of South Georgia might reasonably be expected to show greater affinities with a Falkland Islands form rather than with the chiefly, or perhaps wholly, continental *atriceps*. The status of the South Orkney cormorant, which has been referred to the species *atriceps*, will be discussed below.

Averaged measurements of examples of the three forms are as follows:

	Culmen	Bill from gape	depth to cutting edge	Tarsus	Toe and claw	Wing	Tail
<i>P. atriceps</i> 5 adult ♀ ♀	58.6	87.2	8.4	64.6	99.6	264.8	114.6
<i>P. albiventer</i> 1 adult ♀	54	77	9	65	100	274	123
<i>P. georgianus</i> 5 adult ♀ ♀	48.4	71.6	7.9	62.5	102	275	118.6

As regards measurements, therefore, it appears that *Phalacrocorax georgianus* differs from its two congeners mainly in that it has a much shorter bill. This character distinguishes the South Georgia bird particularly from

atriceps, for of the five adult females of each species which I have examined the length from tip to gape of the longest *georgianus* bill is 11 mm. shorter than the shortest *atriceps* bill. The average difference in length, as indicated by the table, amounts to 25 mm. Bills of adult males would doubtless prove considerably longer in all three species, and for this reason their measurements should not be compared with the present figures.

A study of the whole group of white-breasted cormorants, including the forms representative of the Indian Ocean and the New Zealand Subantarctic region, is much needed to throw further light on the origin and relationships of these birds. It is probable that several now recognized as species might then be shown to differ only subspecifically from the form nearest the parental stem. In the meantime it is not practicable for me to indicate precise relationships, even between birds having as much in common as *albiventer* and *georgianus*, especially since the latter has already been grouped by two authorities with *atriceps*. Comparative notes regarding the three American Subantarctic forms are tabulated below, but many of these data need confirmation and extension from field observations.

	<i>atriceps</i>	<i>albiventer</i>	<i>georgianus</i>
Max. length of crest	43 mm. (October) Brewster-Sanford skin.	52 mm. (September) Princeton Univ. skin.	"50-60 mm." (August) 46 mm. (December)
Caruncles	Small, practically no excrescence; yellowish or greenish.	Strongly developed; deep yellow.	Strongly developed; deep yellow.
Gular pouch	Yellowish (October) Yellowish-green (February)	?	Blackish-brown (December)
Iris	Green (February). Brownish except during breeding season.	"Green in breeding season; at other times yellowish brown."	Brown (Nov., Dec., Jan., Aug.)
Feet and legs	Flesh color (October). "Scarlet"	Cadmium yellow. (September)	Pale salmon color (December)
Dorsal white patch	Sometimes present.	Said to be lacking.	Sometimes present.
Max. length of white alar bar	100 mm.	93 mm.	120 mm.

Description of Phalacrocorax georgianus.

Adult breeding female. Upper surface black, with metallic green, blue, and violet sheen. The luster is dull violet on the occiput and neck; green-blue on the forehead and crest; dusky blue on the middle line of back, the rump and the flanks; rich, dark, bottle green on the scapulars and wings. The scapulars, interscapulars, and lesser coverts have a scaled appearance, each green feather bearing a narrow glossy bluish border. Quills of wings and tail blackish brown, with a greenish tinge when fresh; shafts of the rectrices basally white. A white alar bar, composed of lesser coverts, extends along the radial border of the wing for from 8 to 12 cm. Under wing coverts and thighs dusky, with a slight metallic gloss. Entire under surface white, the plumage of the throat projecting in a point onto the gular pouch to a position about under the center of the eye. The line of demarcation between black and white on the side of the head passes squarely from the bare face, just above the gape, and crosses the ear opening. Flesh colors: Iris hair brown, lightening to gray at its periphery; cornea chocolate. Skin about eye cyanine blue. Skin of lores and throat blackish brown. Caruncles deep chrome. Feet and legs pale salmon color; under side of toes clove brown. Dimensions: Length (skin), 620; crest, 46; culmen, from feathers between caruncles, 44-51 (48.4); bill from gape, 70-75 (71.6); depth of bill to cutting edge, 7.5-8 (7.9); tarsus, 61-64 (62.5); outermost toe and claw, 100-104 (102); wing, 270-278 (275); tail, 116-122 (118.6).

Probably the wing, tail, and crest, would prove to be longer at other seasons of the year, when the white dorsal patch might also be present. Adult males are apparently larger in most dimensions, a condition said to be true also of *atriceps* and *albiventer*. Lönnberg's adult male of *georgianus* was taken on August 15 (midwinter). It had prominent caruncles, a crest 5-6 cm. in length, a white dorsal patch broken in the middle line, and the following measurements: culmen, 57; tarsus, 60; outermost toe and claw, 105; wing, 280; tail, 135. Its irides were light brown, like those of my breeding birds.

White filoplumes on the head seem to be present only in young specimens of *georgianus*, and are not, therefore, indicative of breeding plumage, as stated by Ogilvie-Grant (p. 392).

The naked, black, newly hatched young of the South Georgia shag has a pinkish throat pouch, slaty blue mandible, and plumbeous legs and feet. Its appearance and anatomy have been described by Shufeldt (11). After four or five days of growth, tufts of soft, fuscous down begin to appear, covering first the back and the sides of the neck. Simultaneously the remiges and rectrices are indicated by the sprouting of a cluster of bristly plumules from each follicle. Finally, tufts of white down grow out among the darker tufts on belly, throat, and pileum, and the young shag is soon enveloped in a dense covering of prevaillingly fuscous, fluffy down, the face alone remaining bare.

In this overcoat the young shag grows for five weeks or more before the down wears off the center of the back, exposing the greenish contour feathers. After seven weeks it is mostly devoid of down except on the head and neck. At this stage the back is grayish brown mingled with green; the position of the alar band is indicated by a line of pale-edged feathers; the breast is white with a few dark flecks; the head and neck are sprinkled with white, broomlike filoplumes and down tufts, especially above and behind the eye; the rectrices have grown to a length of 12 cm. in spite of very active wearing away, but the primaries are still short and fresh.

Of the breeding adults collected, one, No. 1841, is obviously younger than the others, having a smaller bill and caruncles, short crest, and less metallic plumage over the whole dorsal surface. This specimen and one or two of the others illustrate that the quills of wing and tail are shed and renewed in irregular sequence. For instance, in the right wing of No. 1841, the outermost primary and two of the middle secondaries are old, frayed, and faded so that they have no resemblance to the other feathers. These are probably quills of the first plumage. The seventh (second from outermost) primary, and two or three secondaries are perfectly new and very greenish. The remaining quills are older, and slightly faded.

The Shag of the South Orkney Islands.

Clark (9) has identified the shags collected by members of the Scottish National Antarctic Expedition as *Phalacrocorax atriceps*, and has, he believes, settled the question as to the identity of the Antarctic shags which were reported by Ross at Louis Philippe Land and Cockburn Island as long ago as 1844. I have not had an opportunity of seeing a specimen from the South Orkneys, but fortunately many excellent photographs of this bird have been published (6, 7, 8, 9). A comparison of these pictures with the Brewster-Sanford skins, as well as with the figures of Sclater (1), pl. xxv, Ogilvie-Grant (3), p. 391, and Scott and Sharpe (10), p. 518, indicates that the South Orkney bird is not *atriceps*, after all. In the possession of large and prominent caruncles it apparently leans toward *albiventer* and *georgianus*, while in the location of the line of white and dark plumage on the head it also seems to resemble the South Georgia bird.

Notes on the Life History of Phalacrocorax georgianus.

I first saw the blue-eyed shags at sea along the north coast of South Georgia on November 24, 1912. The morning was clear and calm, and the birds were swimming about among small bergs and areas of floe ice. When

rising into flight, they kicked heavily along the surface for considerable distances. They flew in string formation, a dozen or more together, and often spread their broad feet to serve as an adjunct to the tail, particularly when stopping headway. Their flight seemed to be more or less aimless, for they travelled in circles, as a rabbit runs.

A few days later we found the shags common in Cumberland Bay. Numbers of them frequented some rocks lying off the Moraine Fjord, from which they would dive into the surrounding kelp for fish. I shot one of the birds just as it emerged from such a dive, and incidentally killed and captured the fish whose tail projected from its mouth. It proved to be a species of *Notothenia*, and it measured 27 cm. in length!

On December 16, 1912, we found the first breeding grounds of the shags on a small precipitous islet lying near the south shore of the Bay of Isles. Here I landed on December 29, and with some difficulty climbed to the top, where the rock proved to be covered with thick black soil and a luxuriant growth of tussock grass. A pair of pipits (*Anthus antarcticus*) inhabited the islet, and also a few whale-birds (*Prion*) to judge by the dismembered skeletons left on the ground by ravenous skua gulls; but the principal residents were the shags whose nests lined the rocky and grassy ledges all over the northerly or sunny face of the islet's declivity.

The nests were steep-sided truncated cones of mud and dead tussock grass, with a rather deep depression. In height they measured 20–25 cm., the diameter at the top being about 40 cm. Some were situated on the tops of dead tussock hummocks, others on the shelves of lichen-covered rock, with long icicles overhanging them. The area around the nests was whitened by the birds' ejecta, squirted to a distance of two meters.

Many nests contained sets of two or three eggs, others young birds just hatched or a few days old, and another held three full-grown fledglings which had lost nearly all their down. Two or three pairs of adults had not yet laid their eggs, and stood on their empty homes carrying on courtship antics which will be described below.

Both parents seemed to be together at all of the nests. I lifted off one female, which had been brooding with her wings spread, and discovered a blind, black, and unclad shaglet, the eggshell from which it had just crawled, and another egg not yet broken open. It was impossible to keep either parent away from the nest, although the male was less brave than his mate. Both were very gentle, not attempting to defend themselves; they merely watched me sharply with their close-set, blue-rimmed eyes. The only note that they uttered was a low croak. They kept their bills parted, however, the mandible and throat trembling violently, just as when one's teeth chatter. When I tossed them aside in order to see the nestling, they would



Figs. 2 and 3. Courtship. The female shag watching the circling male. Dec. 29, 1912.



Fig. 4. Egg and newly hatched young. Dec. 29, 1912.



Fig. 5. Two newly hatched young lying characteristically flat on their backs. Dec. 29, 1912.

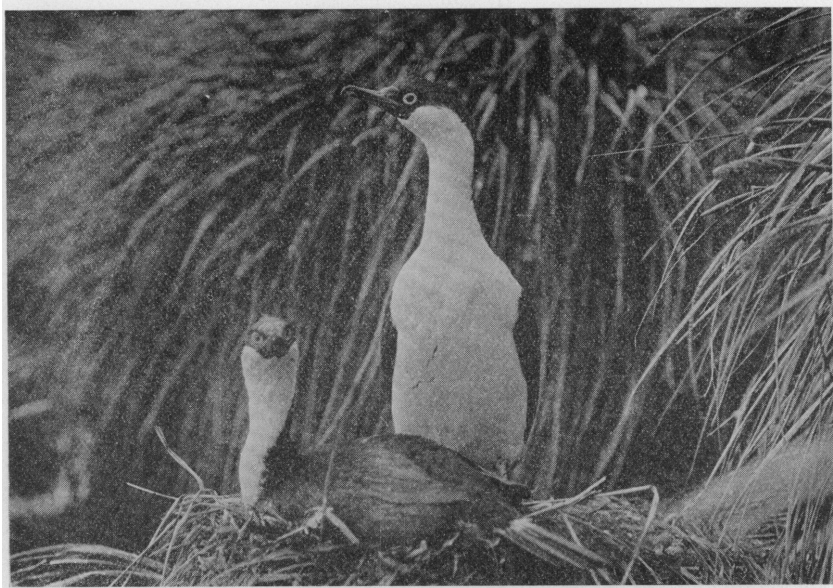


Fig. 6. Pair at the nest. The binocular vision of the sitting female is noteworthy. Dec. 29, 1912.



Fig. 7. Female shag brooding young. Dec. 29, 1912.



Figs. 8 and 9. Pair at the nest, the female brooding. Dec. 29, 1912.



Fig. 10. Female shag with young 49 days old. Feb. 16, 1916. The same young birds are shown in Fig. 5.

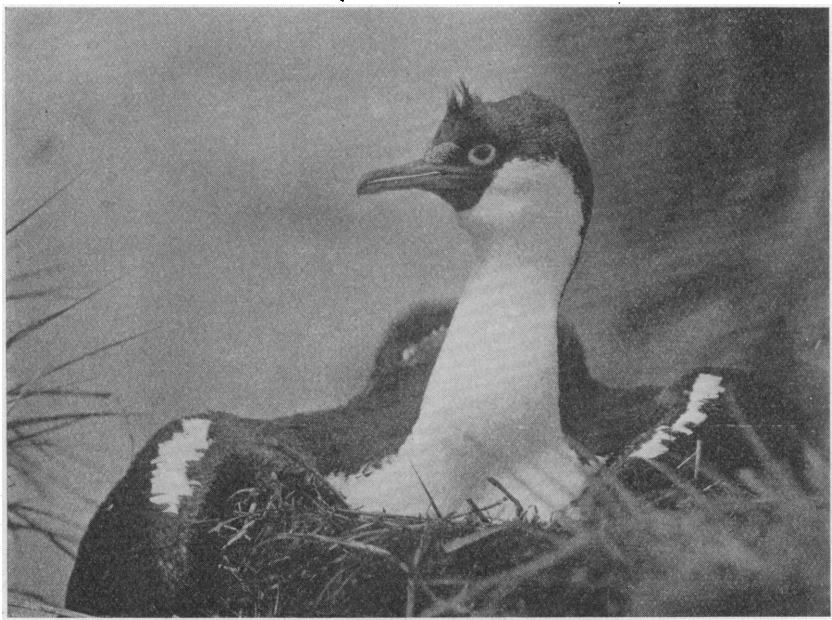


Fig. 11. Brooding female, showing the tremulations of the throat. Dec. 29, 1912.



Figs. 12 and 13. Two views of a shag standing on the brink of a cliff, Dec. 29, 1912. In the second figure the bird has twisted its neck through half a revolution. The vegetation is tussock grass (*Poa flabellata*).

fly back immediately, and the female would plump right into the nest. The ugly baby, the cause of all this solicitude, acted as though it were in a violent temper. Perhaps it was cold. It kicked about so that I could scarcely photograph it, rolling its belly upward, jerking itself around the nest cavity, and all the while squeaking loudly. Even as I stood beside the nest the male parent brought up a billful of fresh peaty soil which he worked into the edge of the structure.

The courtship of the shags seemed to progress while the nests were building. I saw one pair standing side by side, and curtseying. They would put their cheeks close together, bow down their heads and necks, then, twisting their necks, put the other cheeks together in the same way, and curtsey again. After this graceful minuet had been continued for several minutes, the male would launch off on a short exuberant flight, from which it would return to resume the love-making.

A few days later I visited the islet again. The shags were all together in pairs and were twisting and curving their sinuous necks without cessation. Most of the eggs had hatched. I noted again that the females were more unselfish and devoted than the males. I saw one pair attack and bite the neck of a neighbor which had alighted on their particular crag. The courting birds were still bowing, caressing, and circling, besides which they sometimes stretched up and beat their wings rapidly, without producing any drumming sound.

I found that the necks of the shags were infested with a species of tick (*Ceratixodes putus* Cambr.), the bag of which was about 6 mm. in length. Five such were among the blue feathers on the neck of one female bird.

On January 11, 1913, I made a third visit to the colony. The two young shags which had hatched on December 29 and 30 were now well covered with tufts of black feathers, but they still showed a slight difference in size. I found one set of three fresh eggs; another nest contained two newly hatched young and an addled egg. The parents were braver than ever, especially the females, which clung tenaciously to the nests, their mandibles trembling as they watched me. They allowed me to stroke their backs without moving, but the males always stood on the far side of their mates so as to avoid possible danger. I offered a small dead fish to one pair. It was accepted immediately, but was dropped again, doubtless because it was stale.

I did not land at the islet again until February 16, when most of the youngsters had begun to acquire greenish quills and white breasts, and were wandering away from the nests among the high tussock hummocks. They had a low, mellow whistle which they repeated over and over, swelling out their throats. The breeding ledges were foul with decayed fish remains

and excreta. The parents were rather less confident than when the young were more helpless, but the females as usual showed less timidity than the males.

On March 2 we found a small, inaccessible shag colony on the face of a cliff in Possession Bay, and the adults were still caressing and curtsying on some of the nests.

The few eggs collected are of a characteristic light greenish-blue ("pale dull glaucous blue" of Ridgway's 'Color Standards and Nomenclature,' 1912), with a chalky encrustation. Unfortunately they have been broken so that it is impossible to make satisfactory measurements.

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