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## BILL COLOUR OF BREEDING ROSEATE TERNS

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### ABSTRACT

Breeding Roseate Terns in two separate colonies on Masthead Island were scored for bill colour. In Colony 1 88% of observations were of birds with wholly or predominantly red bills and 3% of birds with wholly black bills. In Colony 2 respective figures were 59% and 24%. Attention is drawn to disparity of these observations with regard to those in the literature and comparisons are made with results of studies of this species overseas.

### INTRODUCTION

Bill colour is one of the features used in the field identification of the difficult group of medium-sized *Sterna* Terns. In the Holarctic the bill of the breeding Arctic Tern *S. paradisaea* is wholly red whilst that of the Common Tern *S. hirundo hirundo* is tipped black, both turning black in winter. However the eastern Asian race of the latter *S. hirundo longipennis* has a black bill throughout the year and in this respect most resembles the Roseate Tern *S. dougalli*, the base of whose otherwise black bill is generally stated to turn red during the breeding season. That there is in fact some vagueness, if not confusion, regarding the bill colour of the Australian race *gracilis* is shown by the quotations listed in Table I.



1. Adult Roseate Terns *Sterna dougalli* in basic plumage photographed at Heron Island, Queensland in November, 1984. (Michael J. Carter).

**TABLE I.** DESCRIPTIONS OF BILL COLOUR OF ROSEATE TERNS IN AUSTRALIAN IDENTIFICATION LITERATURE.

Source	Description
Frith (1982)	Bill red to black, usually with red base and black tip. In non-breeding plumage..bill black.
Macdonald (1973)	Bill black or red but usually red with black tip.
Mathews & Iredale (1921)	Bill black, base red.
Pizzey (1983)	Breeding plumage ..:bill black with scarlet base. Non-breeding...:bill black.
Serventy & Whittell (1967)	Beak, red at base and black towards the base.
Slater (1970)	Bill black, except in breeding season when red at base.
Storr & Johnstone (1979)	Bill usually red, tipped black (occasionally it is all red or black with red base).

This subject was drawn to my attention on Masthead Island in the Capricorn Group (23° 32'S, 151° 44'E) where casual observations revealed great variation in the bill colour of Roseate Terns breeding there. I therefore began a series of systematic counts to determine the proportions of the various colour phases.

### METHODS

Observations took place from January 10th-14th 1984 at two colonies of Roseate Terns, some 300m apart, at the top of the beach on the south side of the island (for brief description of which see Jahnke, 1977). The birds, all with complete black caps, were paired and holding territories and some eggs were seen. However no specific search for nests and eggs was made in order to keep disturbance to a minimum. For the same reason visits took place at low tide. Observations were made from a distance of about 20m with 10X50 binoculars. On each visit to the colony there were two separate counts: a) of the maximum number of birds present (in order to ascertain sample size) and b) of the number of birds with bills of the following (arbitrarily chosen) colours:

- 1) wholly black;
- 2)  $\frac{1}{2} - \frac{3}{4}$  black (extending back from tip);
- 3)  $\frac{1}{3} - \frac{1}{2}$ ;

- 4) up to  $\frac{1}{3}$  black (mostly in fact with only about  $\frac{1}{4}$  of the upper part of the upper mandible black);
- 5) wholly red.

### RESULTS AND DISCUSSION

Table II shows the sample size for counts on each visit. Colony 2 appears to have been larger than Colony 1 but due to the difficulty of seeing clearly many of the birds (because of vegetation) a lower percentage (44% against 55%) was scored for bill colour.

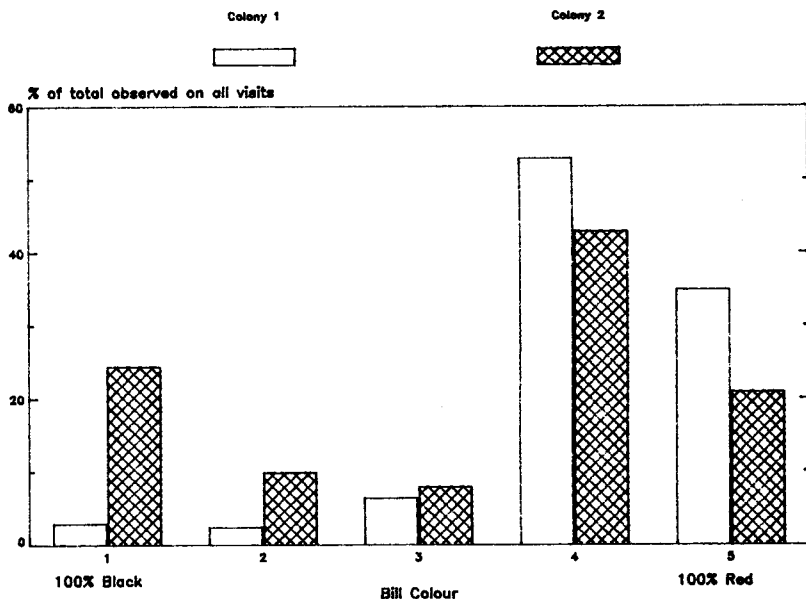
**TABLE II.** MAXIMUM NUMBER OF BIRDS COUNTED ON EACH VISIT AND NUMBER SCORED FOR BILL COLOUR

COLONY	VISIT	MAXIMUM NUMBER COUNTED	NUMBER SCORED	% SCORED
1	1	?	45	-
	2	101	41	40.6
	3	62	30	48.4
	4	58	41	70.7
	5	48	32	66.7
	6	64	39	60.9
	7	32	17	53.1
	TOTAL	365	245	54.8* 365 (200)
2	1	54	26	48.1
	2	89	46	51.7
	3	106	45	42.5
	4	109	41	37.6
	5	99	49	49.5
	6	87	33	37.9
	TOTAL	544	240	44.1 -

\*Excludes number scored from Visit 1.

Fig. 1 and Table III illustrate not only the variation in bill colour within the colonies but also an unexpected difference between them.

FIGURE 1: SCORING OF BIRDS FOR BILL COLOUR  
percentages of observations of  
scored birds in each colour phase\*



\*For descriptions of colour phases, see Methods

The general description of red base to black bill given by many authors (Table 1) would apply here to a mere 29 observations of scored birds (colour phase 2), 6% of the total. In fact no birds at all were seen with a bill that was less than 1/4 red (i.e. more than 3/4 but less than completely black). The low number of observations of birds in colour phases 2 and 3 suggests that these phases are of short duration. It appears then that the bill turns red fairly quickly and furthermore to a far greater extent than is generally realised. Dunlop (1979) observed at a small Western Australian colony of Roseate Terns that "when breeding the adults had black bills, red at the base. In the eclipsing adults the bills

TABLE III. SCORING OF BIRDS FOR BILL COLOUR

COLONY VISIT		BILL COLOUR									
		1		2		3		4		5	
		100% Black		3/4 - 1/2 Black		1/2 - 1/3 Black		Up to 1/3 Black		100% Red	
		No.	%*	No.	%	No.	%	No.	%	No.	%
1	1	1	2	1	2	3	7	23	51	17	38
	2	1	2	1	2	4	10	22	54	13	32
	3	1	3	1	3	2	7	12	40	14	47
	4	3	7	1	2	3	7	18	44	16	39
	5	0	0	0	0	1	3	21	66	10	31
	6	1	3	2	5	3	8	23	59	10	26
	7	0	0	0	0	0	0	11	65	6	35
Total		7	3	6	2	16	7	130	53	86	35
2	1	9	35	3	12	1	4	8	31	5	19
	2	11	24	3	7	4	9	16	35	12	26
	3	8	18	4	9	6	13	17	38	10	22
	4	8	20	5	12	4	10	15	37	9	22
	5	12	25	5	10	3	6	22	45	7	14
	6	9	27	3	9	1	3	12	36	8	24
Total		57	24	23	10	19	8	90	38	51	21

\* percentage of total observed on visit

had turned wholly red." If by eclipsing he meant that the birds were beginning to lose their black caps, then this is some indication of how long the red bill is retained.

In the nominate European race *S. dougalli dougalli* Witherby *et al.* (1943) stated: "bill (winter and Juv.) black, (ad. summer) commencing end May base becomes red-vermillion extending to half upper and third lower mandible." In France and the south of England only all-black bills have still been observed in colonies as late as mid-June (Ferry, 1950; King, 1950) whilst further north in Scotland it may not be until the first few days of July that the change to red sets in (Onslow, 1949). (N.B. All these dates are well after the commencement of the breeding season.) Unlike the Australian race entirely red bills appear not to occur at all.

This is also the case with Roseate Terns intensively studied in New York, where Donaldson (1968) noted that "the maximum (amount of red) observed in the field extended along at least two-thirds of the culmen." Summarising information about this colony she states that it was not until the birds had nests with eggs that red appeared at the bases of their bills. Her own observations showed that the amount continued to increase with the maximum being reached as the young began to fly. The return to an all-black bill could take place within a month and was probably dependant on the absence of non-flying young.

On Masthead Island I saw no young Roseate Terns. If the bill colour of the Australian Roseate Terns similarly changes through the breeding season, then the final percentage of birds with completely red bills will be considerably higher than that observed in this study. The corollary of this is that the difference in colour phase proportions between the two colonies can be explained by the earlier establishment, and more advanced stage of breeding, of Colony 1 than Colony 2.

The problems of determining the timing of bill colour changes can only be resolved by observations of marked birds at a colony throughout the breeding season. Such a study may also reveal some behavioural differences from other races of Roseate Terns which throws light on the significance of the different bill colour noted here. At present however this study does indicate that a wholly red bill, far from belonging to a minority of individuals, may be quite typical of the Australian race at least for a period during the breeding season.

#### ACKNOWLEDGEMENTS

I should like to thank the University of Queensland Underwater Club for organising the trip to Masthead Island, and Dr. M.R. Walker for comments.

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## THE BUFF-BREASTED PARADISE KINGFISHER IN CENTRAL QUEENSLAND

H.A. NIX

One subspecies of the Buff-breasted Paradise Kingfisher *Tanysepta sylvia* winters in New Guinea and migrates across Torres Strait to breed in the rainforests of North Queensland during the wet season. Published records show that the known breeding range extends only as far south as the Paluma Range (19°10'S ; 146°25'E) just north of Townsville. Most birds have arrived by mid to late November and have departed by late March or early April.

On November 20, 1981 at 1450 hours while traversing between bird census sites along a walking track in Finch Hatton Gorge (21°04'S ; 148°37'), 60 km inland from Mackay, I heard a Buff-breasted Paradise Kingfisher calling at a distance. Mimicry brought a single adult in bright plumage into close range, where my companions, Bjorn Sundberg and Anna Johansson and I had excellent views and I was able to obtain sound recordings of its call. Playback of the bird's calls elicited territorial type behaviour, with furious dashes and retreats and loud repetitive piping calls while perched close to the recorder. Lack of time and threatening weather precluded any further investigation. This record is included in the Atlas of Australian Birds (Blakers *et al.*, 1984) as an extension of the known range.

On February 5, 1984 at 1240 hours while traversing the same walking track in Finch Hatton Gorge I heard the characteristic piping call of this kingfisher, but at a higher elevation than the initial observation in 1981 (350 metres versus 240 metres). Again, mimicry brought the bird close enough for viewing, but it remained wary, perching high in the sub-canopy and calling continuously. About 100 metres down the track it became obvious that two birds were calling. Playback brought both birds to my vicinity, whereupon one bird attacked the other, driving it away with a harsh screeching chatter. Presumably two breeding territories were involved. A limited search of the area revealed terrestrial termitaria with evidence of tunneling, but no occupied nest. Some 500 m further down the track another bird was calling and again mimicry brought it into view. All three birds sighted were adult, in bright plumage and without noticeable plumage wear or warping of the long white tail feathers. Other birds were heard calling from other sections of the track, but I am confident that at least three territories were occupied along a section of the walking track between 1.5 km and 2.5 km in from the picnic area entrance to

the Finch Hatton Gorge. Later that afternoon a bird was heard calling from a rainforest valley across to the east from the picnic area, indicating a further potential territory.

On the following day, February 6, 1984 while censusing a site at 50 metres elevation on the south-western slopes of Mt. Ossa, some 22 km east of Finch Hatton Gorge I heard the strange wheedling downward trill given by the Buff-breasted Paradise Kingfisher during the breeding season. Playback brought glimpses of a very wary adult with worn tail feathers, but searching failed to locate a nest site. Terrestrial termitaria were present, but a very low density. Upon return to my vehicle, parked on the Mt. Charlton road, I could hear the loud, piping territorial call coming from the rainforest spur in the vicinity of the census site and another bird calling from far up the valley to the south in foothill rainforest. This would suggest that at least two territories were occupied on the rainforested south-western slopes of Mt. Ossa (20°59'S ; 148°48'E).

It should be emphasized that these records were the byproduct of a rapid reconnaissance technique of bird census at predetermined sites along a 100 km transect from the coast at Seaforth inland to Eungella. Time at each site was limited and no special effort was or could be made to locate unusual species. The fact that Buff-breasted Paradise Kingfishers were found in just those two sites that would be predicted to have suitable habitat is of some significance. Taken together, my observations would suggest that the Buff-breasted Paradise Kingfisher may well be a regular, but hitherto overlooked, summer breeding migrant to the foothill rainforests of the Mackay region.

The absence of previous records could be due to lack of familiarity with the distinctive territorial call and the wheedling downward trilling of this species. If it had not been for initial recognition of these calls and use of mimicry and/or playback techniques it is doubtful whether I would have recorded the species. Difficulty of wet season access to sites such as Finch Hatton Gorge is another factor most visiting ornithologists either travel straight through the region to the better known and rather more accessible rainforests of far north Queensland or they restrict their activity to the dry season when the Buff-breasted Paradise Kingfisher is absent.

It is possible that isolated breeding pairs occur further south in east central Queensland, although only small pockets of lowland and foothill rainforest remain south of Carmila. At Eurimbula

(24°11'S ; 151°50'E) south of Gladstone, an Australian Museum expedition collected an immature Buff-breasted Paradise Kingfisher on March 25, 1975 in an isolated patch of lowland rainforest (Broadbent and Clark, 1976). These authors admit the possibility of 'wrong-way' migration, since the date is commensurate with the return of the species to New Guinea. However, the date also fits with the observation that adults depart some two weeks earlier than the young of the year. I think it entirely possible that the immature Kingfisher had been bred in the local region. Once again, the Eurimbula rainforest pocket (now a National Park) is difficult of access during the wet season.

The true status of this species in Central Queensland can be established only by systematic survey. Familiarisation with the piping territorial call and an auditory census of foothill rainforests during late November/December, when birds are active and vocal, would facilitate rapid inventory. Areas worthy of such investigation are the Conway National Park east of Proserpine; the foothills along the eastern fall of the Clarke Range and further south, the Connor's Range. Isolated pockets of rainforest in the Shoalwater Bay Defense Training Area might repay investigation as, of course, would the Eurimbula rainforest pocket near Round Hill Head.

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## SOUTHERN SPECIMEN RECORDS OF THE BROAD-BILLED FLYCATCHER

WALTER E. BOLES

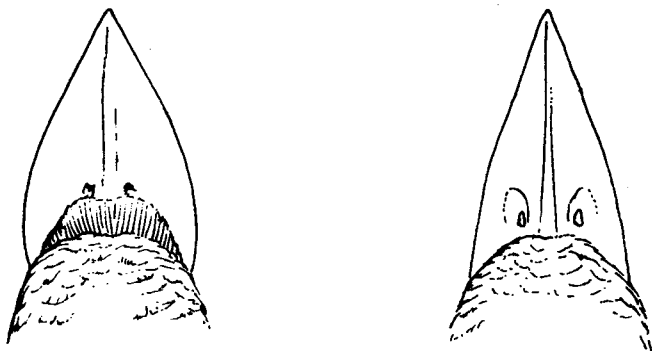
The southern extent of the occurrence of the Broad-billed Flycatcher *Myiagra ruficollis* along the eastern coast of Queensland is unresolved. Storr (1984) gives it as Cape Grenville on Cape York Peninsula, but unconfirmed sight records from further south are not infrequent. Determinating this distributional limit is complicated by the difficulty of separating in the field this species from female-plumaged birds of other *Myiagra* species and by the apparent absence of any specimens.

While visiting overseas museums for the RAOU Historical Atlas of Australian Birds, Ms Penny Paton discovered in collections three purported Broad-billed Flycatcher specimens from south of Cape Grenville. I was asked to obtain them on loan to confirm their identification. Two birds were borrowed from the Field Museum of Natural History, Chicago (CMNH) and one from the University Museum of Zoology, Cambridge (UMZ). One of the CMNH specimens (CMNH 154263) was identified as a Leaden Flycatcher *M. rubecula*. The others were confirmed as Broad-billed Flycatchers and represent significant extensions of the known range of this species.

Specific identification of female-plumaged *Myiagra* flycatchers can be made by measurements and characters of the bill and plumage. The Satin Flycatcher *M. cyanoleuca* is larger than either *ruficollis* or *rubecula* and can be reliably separated by measurements (Boles 1980). The overlap in size of the two smaller species makes most measurements useless and identification must depend on other characters. The following features, used in combination, enable separation of individuals of *ruficollis* from those of female-plumaged *rubecula* in the hand.

1) BILL SHAPE AND WIDTH. Viewed from above, the bill of *ruficollis* flares out in the region of the nostrils before curving back inwards to the skull (Fig. 1).

Figure 1



The bill of *rubecula*, however, tapers gradually outward until it meets the skull. At the base, the bills of both species are about the same width. By measuring just in front of the nostrils, where the flaring is greatest, that of *ruficollis* is consistently larger. The CMNH specimen does not show the degree of flaring exhibited by most individuals but is still 0.7 mm wider than the *rubecula* specimen (6.8 vs 6.1 mm). Usually the difference is at least 1.0 mm. In northern Australia, west of the Gulf of Carpentaria, this difference is more pronounced because the local subspecies, *M. rubecula concinna*, is separated from other forms on the basis of its narrower bill.

2) WHITE IN THE TAIL. Several recent field guides give the presence of white in the tail of *ruficollis* as a species character and suggest it is diagnostic. This is only partly correct because white tail feathers in this species are an age character: the outer feathers are all white in juvenile birds, but the white is subsequently reduced in successive moults until it is absent in adult males. I have not seen specimens of known females without some white in the tail but this does not rule out its absence in older specimens. Outer tail feathers may be pale in *rubecula* but this is a light grey-brown, not white. Thus, if a bird has white in the tail it is *ruficollis* but if it lacks white, it is not necessarily another species.

3) INTENSITY OF COLORATION. Females and immature males of both species are very similar to each other in intensity of coloration. Often, however, the breast and dorsum of *ruficollis* are richer, like that of the larger *cyanoleuca*, and its mantle has more of a steel blue tinge than the greyer back of *rubecula*. Its breast is also a deeper shade of orange. Adult male *ruficollis* continue this trend but are noticeably darker than females of either species. This may provide a clue to identification in the field but, without considerable familiarity with both species, should not be used by itself.

Using these characters, two Broad-billed Flycatchers were identified. These were collected far to the south of other known specimen records and one extends the currently accepted range of the species by about 1500 km. Their pertinent data are as follows:

- CMNH 154264; imm. male; Cooktown, Queensland; 13 May 1938; wing 84 mm, tail 76 mm, culmen length (to skull) 17.5 mm, culmen width (at front of nostrils) 7.2 mm.  
UMZ 27/Mus/33/p/1; imm. male; Casuarina Is., Keppel Bay, Queensland; 14 January 1901; wing 74 mm, tail 69 mm, culmen length (to skull) 18.4 mm, culmen width (at front of nostrils) 6.8 mm.

I wish to thank the curators of the Field Museum and University Museum for making the specimens available to me on loan. Dr. Melvin Traylor provided me with further information on the Chicago specimens. Mr. Terry Lindsey kindly drew the accompanying figure.

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### NOTE FROM THE EDITOR

The current volume of *Sunbird* has seen the most substantial changes made to the journal for several years. A change of printers has obviated the often considerable delays encountered with the University of Queensland press, and has allowed us to have right-hand justified typesetting for the first time.

A reduced, more compact format, together with the use of glossy paper, have improved the attractiveness of the journal. Much greater use has been made of photographs, and readers have had the fortune of seeing some excellent shots taken by Chris Corben, Tony Palliser and others.

A regular "Mystery Bird Photograph" section has introduced a light-hearted element to the journal, in addition to being a useful guide to solving some of the more difficult bird-identification problems. The introduction of an Annual Bird Report for Queensland is a long-overdue and useful concept which, we hope, will be actively supported by readers.

Much of the credit for these innovations is due to QOS President, Anita Smyth, who has given much of her own time and energy in a concerted effort to improve the quality of the journal.

Greg Roberts

## MYSTERY PHOTOGRAPHS

3. With its short, stubby bill, general body form and overall mottled appearance lacking any strong head markings, this bird must be either a Baillon's Crake *Porzana pusilla* or Australian Crake *P. fluminea*. Identification to specific level is simple once it is realised that the outer undertail coverts are pure white - a feature diagnostic of Australian Crake.



This bird, which I photographed at Werribee Sewrage Farm, Victoria in the late 70's, is in juvenal plumage. At such, it lacks the typical bluey slate colour of an adult bird, being instead mainly brown with barring and spotting of white and buff. Birds like this, seen only briefly, have often been mistaken for Baillon's Crakes because of their pale, brown appearance. But the similarity is only superficial and the lack of dark barring on the lateral undertail coverts is always diagnostic.

CHRIS CORBEN

Mystery Photograph 4. Identify the species. Answer next issue.

