THE SUNBIRD

Journal of the
QUEENSLAND ORNITHOLOGICAL SOCIETY

Volume 23 Number 3 September 1993

CONTENTS

OFFICERS AND COUNCIL FOR 1993

President
ROY SONNENBURG

Vice President
GRAHAM LEACH

Past President
DAVID NILAND

Country Vice Presidents
DAWN ALLEN, SHEENA GILLMAN

Treasurer
SUE HEUSSLER

Secretary
LYNDA LITZ-TYNE

Outings Officers
JAN ENGLAND, GAYLE JOHNSON

Sunbird Editor
PETER BRITTON

Assistant Editor
IAN GYNTHER

Librarian
GRAHAM LEACH

Slide Librarian
JOHN NOYCE

Projects Officer
IAN VENABLES

Conservation Officer
PETER ROE

Membership Secretary
SUE HEUSSLER

Newsletter Editor
DAWN MUIR

Property Officer
JAN BELL

Council Members
PETER DRISCOLL, IAN GYNTHER, DON MUIR,
ANDREW THELANDER, PHIL VENABLES.

The objectives of the Society are to promote the scientific study and conservation of birds by all means possible, with particular reference to the birds of Queensland.

Annual subscription rates to the Society are:

Ordinary Member	$25.00
Family Member	$30.00
Student Member	$12.00
Sunbird subscription only	$20.00 (Aust.)
Libraries, Universities	$25.00 (Aust.)
Overseas	$20.00 (U.S.)

All members receive a monthly newsletter and a copy of the quarterly journal, *The Sunbird*. The price of *The Sunbird* to non-members is $5.00 per issue. The Society holds a general meeting and a field excursion each month.

All correspondence, including membership fees, should be addressed to the Secretary. *The Society's address is.*

P.O. Box 97, St. Lucia, Queensland, 4067.

THE SUNBIRD

Volume 23 No. 3 September 1993

SOME RECENT RECORDS OF THE PLUMED FROGMOUTH *PODARGUS OCELLATUS PLUMIFERUS*

CHRIS CORBEN and GREG ROBERTS

ABSTRACT

The distribution of the Plumed Frogmouth *Podargus ocellatus plumiferus* is detailed from information gathered since 1980, largely by studies undertaken by the Queensland Ornithological Society and the Queensland Forest Service. The subspecies is now known to be patchily distributed in Notophyll Vine Forest between Lismore, north-east New South Wales and Gladstone, south-east Queensland. Since 1980 it has been recorded at over 250 sites in 18 widely separated localities up to 800 m above sea level and up to 104 km inland. Though much more widespread than was once thought, it must still be regarded as one of the rarest birds in Australia.

INTRODUCTION

The Marbled Frogmouth *Podargus ocellatus* lives in the rainforests of eastern Australia, Papua New Guinea and the Solomon Islands. There are two endemic subspecies in Australia, *marmoratus* in Cape York Peninsula and *plumiferus* in south-east Queensland and north-east New South Wales. The southern race, described by John Gould in 1845, has often been referred to by the vernacular name of Plumed Frogmouth. That nomenclature is adopted here to distinguish references to the subspecies *plumiferus* from those applying to the species as a whole.

It has been difficult to assess the status of *plumiferus* because frogmouths as a group show highly variable plumage, and there is no doubt that a number of reports of *plumiferus* have been based on misidentification of the much more common Tawny Frogmouth *P. strigoides* (pers. obs.). Tawny Frogmouths sometimes occur in rainforest, and they are much easier to see than the more secretive Plumed Frogmouths. The calls of these two species readily distinguish them and are more distinctive than visual characters. Plumed Frogmouths, being much easier to hear than to see, are most readily located, and identified, by their calls. The potential for confusion between these species is so great that sight records cannot be relied upon to give an accurate picture of the distribution or status of the Plumed Frogmouth.

Until the 1980s, Plumed Frogmouths were rarely reported and were generally considered to be extremely rare. McGill (1978) listed a number of records of *plumiferus* from localities as far south as Taree, New South Wales. However, many of these localities were included on the strength of sight records only, and should not be relied upon as evidence of the bird's past distribution. Unfortunately, some of the earlier reports, which were supported by specimens, lacked specific locality data. In fact, it is doubtful if there are any records prior to 1969 which combined precise localities with confirmation of identity, either by call or by the procurement of specimens.

In late 1969, a nestling Plumed Frogmouth was handed to David Fleay, after being found by bushwalkers in a pool of water along Cedar Creek, Mt. Tamborine, south-east Queensland. It was kept in captivity for over a year before being killed by a Grey Goshawk *Accipiter novaehollandiae* (Fleay 1981). The specimen was presented to the Queensland Museum as a study skin. On 28 June 1972, remains of a Plumed Frogmouth were found by Don Cameron in the Big Rocky Creek area north of Lismore and these remains are retained by The Australian Museum (McGill 1978). On 28 October 1976, Plumed Frogmouths were discovered in the Conondale Ranges, south-east Queensland, by Greg Roberts and Glen Ingram. This was 150 km north of any previously known occurrences. The calls were heard and noted, leaving the identification beyond doubt (Roberts & Ingram 1978). On 16 January 1981, a specimen was collected for The Australian Museum from Terania Creek in the Nightcap Range, north-east New South Wales (Milledge 1983).

These discoveries set the stage for a proliferation of reliable records which have led to a new understanding of the status of the subspecies. The Plumed Frogmouth is now known to inhabit the canopy in well-developed, sub-tropical rainforest. Its secretive nature makes it a difficult bird to see, but its distinctive calls are readily heard throughout the year, especially between August and December. This paper details recent information on the status and distribution of *Podargus ocellatus plumiferus*.

METHODS AND SOURCES

In late 1982, the Queensland Forest Service commenced a fauna study into the effects of logging on wildlife in the Conondale Ranges, approximately 100 km NNW of Brisbane. Because of its apparent rarity and possible susceptibility to logging operations, the Plumed Frogmouth was a major target species, albeit one that proved difficult to observe. It was soon found that playback of tape-recorded calls stimulated calling by wild birds. This approach proved effective throughout the year and was adopted as a standard census technique. The Queensland Forest Service Fauna Study (QFSFS) has involved intensive study of the local distribution of Plumed Frogmouths in the Conondale and nearby ranges, with some searches being made farther afield.

It was apparent that this census technique was ideally suited to a group project. The Queensland Ornithological Society Incorporated Marbled Frogmouth Survey (QOSIMFS) was accordingly set up with the aim of defining the overall distribution of Marbled Frogmouths in Australia with particular emphasis on the southern subspecies. Copies of tape-recordings made by CC at Mt. Tamborine were distributed to interested members who were organised to visit localities between Cooktown, North Queensland and Sydney, New South Wales. Although the official survey took place on the weekend of 19-20 November 1983, members were encouraged to continue to search for Marbled Frogmouths and later records are included. The findings of these surveys are presented in this paper, along with reports from other interested observers.

RESULTS

Abbreviations

Latitude South, Longitude East and Altitude Above Sea Level are given to the nearest minute of arc and 10 m, respectively. If preceded by "*ca.*", these values indicate that the precise values are unknown or that they refer to the approximate centre of the area under consideration. Other abbreviations are: QFS - Queensland Forest Service, QFSFS - Queensland Forest Service Fauna Study, QOSIMFS - Queensland Ornithological Society Incorporated Marbled Frogmouth Survey, FS - Forest Station, NP - National Park, SF - State Forest, LA - Logging Area.

The term "locality" is used to denote a general area such as a mountain range. The term "site" refers to the actual place at which a bird has been found or searched for.

Positive Localities

Since 1980, Plumed Frogmouths have been identified by call at the following localities. No locality has been included on the strength of sight records alone.

Many Peaks Range

ca. 24°33', 151°32'; *ca.* 500 m, 25 km S of Miriam Vale.

7 Plumed Frogmouths recorded at 4 of 8 sites tried along Bobby's Range and Scott Rds., 23 November 1983, Bill and Helen Horton (QOSIMFS).

Burnett Range

24°39', 151°21'; 600 m, 7 km NNE of Kalpowar.

1 at 1 of 5 sites on Mt Fort William and Burnett Range Rd., 25 November 1983, Bill and Helen Horton (QOSIMFS).

Cooloola

25°57', 153°07'; 160 m, 7.5 km WSW of Double Island Point.
5 at 2 of 5 sites along Freshwater Rd., 19 November 1983, David Allen Stewart, Barry O'Dowd (QOSIMFS).

Same area
19 March 1984, Jim Porter (QFS).

Cooran State Forest

26°16', 152°49'; 380 m, 2 km ESE of Boulder Mtn.
1 at 1 of 10 sites in Cooran SF, *ca.* 15 km SE of Gympie, 3 January 1985, CC (QFSFS).

Mt Kandanga

26°28', 152°35'; 180 m, 2.5 km SE of Mt Kandanga.
A single bird well inside a 20 year-old Hoop Pine *Araucaria cunninghamii* plantation, 11 December 1984, CC (QFSFS).

Brooloo Ranges

Several sites, centred on 40 km S of Gympie:
N to 26°33', 152°38' (N tip of Cliff LA)
E to 26°35', 152°42' (Cambroon LA 3 km WNW of Kenilworth)
S to 26°37', 152°38' (S end of Black Hut Rd)
W to 26°35', 152°36'
and at altitudes ranging from 125 m at Cambroon LA to 525 m at N end of Black Hut Rd.
Various dates, CC (QFSFS).

Blackall Range

26°34', 152°52'; 260 m, 3 km SW of Cooloolabin FS.
26°35', 152°52'; 220 m, East Cedar Creek.
26°36', 152°51'; 420 m, 2.5 km NNW of Mapleton.
26°38', 152°50'; 300 m, Mapleton Falls.
26°40', 152°52'; 250 m, Kondalilla Falls.
26°46', 152°54'; 400 m, Rainforest Tourist Park, Maleny.
Various dates, CC (QFSFS).

Walli State Forest

26°40', 152°45'; 475 m, 7 km NNE of Conondale.
4 February 1985, CC and John Hodgson (QFSFS).
26°38', 152°44'; *ca.* 300 m, 4.3 km SSE of Kenilworth.
One bird calling inside a plantation of 20 year-old Hoop Pine, 16 October 1985, CC (QFSFS).

Conondale Range

About 120 sites between Jimna FS and Bellthorpe FS:
N to 26°37', 152°38' (Allan LA)
E to 26°39', 152°39' (Booloumba Creek SF Park)
26°42', 152°39' (NE corner of NP477)
S to 26°46', 152°39' (Mike LA)
26°45', 152°34' (S end of NP1100)
W to 26°41', 152°31' (Rollman LA)
26°38', 152°36' (Summer Creek Rd)
at altitudes from 135 m at Booloumba Creek SF Park to *ca.* 800 m along Peters Rd.
Various dates, CC (QFSFS).

ca. 26°52', 152°42'; *ca.* 460 m.
Several sites in Bellthorpe SF *ca.* 25 km W of Beerwah, various dates, CC (QFSFS).

26°47', 152°53'; 420 m, Mary Cairncross Park, 4 km SE of Maleny.
2 January 1985, CC (QFSFS).

D'Aguilar Range

6 at 4 of 13 sites in Byron SF *ca.* 25 km W of Caboolture. Successful sites were at:
27°03', 152°42'; *ca.* 350 m, *ca.* 6 km N of Mt Mee FS.
27°05', 152°42'; 360 m, *ca.* 2 km N of Mt Mee FS.
27°06', 152°43'; 300 m, *ca.* 2.5 km ESE of Mt Mee FS.
19 November 1983, Rod Wallace, Greg Nye, Bob Inglis (QOSIMFS).
27°18', 152°45'; 700 m, 2.5 km N of The Summit, Mt Glorious.
27°20', 152°46'; *ca.* 650 m. Maiala NP.
Various dates since October 1980, CC.

6 at 4 of 16 sites between Tenison Woods Mountain and Mt Nebo.
19 November 1983, GR and Glen Ingram (QOSIMFS).

Mt Tamborine

27°55', 153°11'; 450 m, Joalah NP.
Various dates since 19 October 1980. CC, M. Olsen.

Same locality and also:
27°55', 153°12'; *ca.* 450 m, Palm Grove NP.
27°56', 153°11'; *ca.* 500 m, Witches Falls NP.
27°57', 153°12'; *ca.* 500 m, E escarpment of Mt Tamborine.
13 at 4 of 6 sites at N end of Darlington Range, 19 November 1983, Lloyd Nielsen and local bird observers (QOSIMFS).

McPherson Range

28°12', 153°11'; 750 m, Binna Burra.
19 November 1983, Anita Smyth and Tony Palliser (QOSIMFS).

28°12', 153°07'; *ca.* 750 m.
5 at 4 of 10 sites along 5 km of road N from O'Reilly's Guest House, 20 December 1983, CC (QFSFS).

28°14', 153°30'; *ca.* 150 m, Bilambil Heights.
20 November 1983, Marie Johnson (QOSIMFS).

Mt Warning

28°24', 153°17'; *ca.* 400 m, Mt Warning NP.
Various dates since 22 September 1982. John Izzard.
At least 11 at 6 of 7 sites around Breakfast Creek car park, 18 November 1983, David Arthur Stewart (QOSIMFS).

Tweed Range

28°23', 153°03'; *ca.* 700 m, Brindle Creek, 17 km NNE of Wiangarie.
9 sites, various dates since 16 February 1980, Glenn Holmes.

28°24', 153°02'; *ca.* 600 m, Sheepstation Creek 14 km NNE of Wiangarie.
November 1988, Harry Hines.

28°29', 153°08'; *ca.* 600 m, Leycester Creek, 5 km NNW of Lillian Rock.
29 January 1983, Glenn Holmes.

Richmond Range

28°27', 152°44'; *ca.* 750 m, 3 sites 4 km E of Glassy Mtn.

28°29', 152°40'; *ca.* 600 m, 2 sites 3 km W of Dome Mtn.

28°30', 152°41'; *ca.* 450 m, 4 sites 5 km S of Dome Mtn.
Since 1980, David Milledge.

28°29', 152°46'; *ca.* 650 m, Sherwood Lookout, 7 km SW of Grevillea.
1988, Stephen Debus.

ca. 28°30', 152°40'; *ca.* 650 m, 4 sites, 2 & 5 km SW of Dome Mtn.
November 1988, Harry Hines.

Nightcap Range

28°31', 153°15'; *ca.* 250 m, Perch Creek, 4 km SSW of Midginbil.
David Milledge.

28°32', 153°17'; *ca.* 400 m, Grier's Scrub, 10 km NE of Nimbin.
2 November 1982, Glenn Holmes.
Second site, David Milledge.

28°34', 153°24'; *ca.* 200 m, 'Nemarotu', 10 km W of Mullumbimby.
August 1980, David Arthur Stewart.
28°35', 153°18'; *ca.* 200 m, 22 sites *ca.* 3 km N of Terrania Creek.
Various dates since January 1980, David Milledge.
ca. 28°37', 153°22'; *ca.* 150 to 400 m, Whian Whian SF.
About 20 sites:
N to Lost Valley (1 km N of Peates Mtn.),
E to Wanganui Gorge (5 km NW of Goonengerry),
S to Boomerang Falls (3 km NE of Dorroughby),
W to Big Scrub Flora Reserve (2 km E of Whian Whian).
David Milledge, Glenn Holmes, Sandy Gilmore.

Great Table Mountain
ca. 28°38', 152°29'; *ca.* 600 m, 11 km W of Old Bonalbo.
3 sites on upper Yabbra and Little Haystack Creeks, November 1988, Harry Hines.

Lismore
28°48', 153°17'; *ca.* 50 m, Wilson Park, Lismore.
Since late 1985, Glenn Holmes.

Negative Localities

At the following localities, tapes of Plumed Frogmouth calls have been played in apparently suitable vegetation without any response being detected.

ca. 16°35', 145°17'; Mt Lewis.
Various dates since November 1983, Hans Beste (QOSIMFS).

ca. 19°00', 146°12'; Paluma, Mt Spec.
19 November 1983, Andree Griffin, Cliff and Dawn Frith (QOSIMFS).

ca. 21°08', 148°30'; Eungella.
Late 1983, V. Hansen (QOSIMFS)
Several sites 1985, W. Longmore.

24°26', 151°05'; Kroombit Tops.
24 November 1983, Bill and Helen Horton, Bill McDonald (QOSIMFS).

ca. 25°23', 153°08'; Fraser Island.
Several sites about Lake Allom and Central Station, November 1989, John Kehl, CC.

ca. 26°23', 152°56'; Several sites between Cooran and Tewantin.
19 November 1983, John McCabe (QOSIMFS).
Various dates, Jim Porter.

26°52', 151°35'; Bunya Mts.
5 sites, 19 November 1983, John Moverly, Sue Mathews (QOSIMFS).

27°23', 152°11'; Ravensbourne NP.
4 sites, 18 November 1983, Pat McConnell, Terry Reis (QOSIMFS).

ca. 26°25',152°35'; *ca.* 20 sites in Araucarian Vine Forests in SF 256 and SF 435 W of Imbil and SW of Amamoor.
Various dates, CC (QFSFS).

ca. 26°38', 152°25'; Jimna Range, mainly N and W of Jimna.
ca. 15 sites in Araucarian Vine Forests, various dates, CC (QFSFS).

27°59', 152°23'; Goomburra SF.
6 sites, 19 November 1983, Pat McConnell, Terry Reis (QOSIMFS).

28°01', 152°37'; Mt French.
19 November 1983, Barry Jahnke (QOSIMFS).

28°03', 152°23'; Cunningham's Gap.
19 November 1983, Peter and Leith Woodall (QOSIMFS).
21 December 1983, CC (QFSFS).

28°13', 153°16'; Springbrook area.
18 November 1983, Bill and Helen Horton, Sybil Mainwaring (QOSIMFS).

ca. 28°19', 152°25'; Acacia Plateau, *ca.* 13 km ENE of Killarney.
November 1988. Harry Hines.

ca. 28°20', 152°53'; Lever's Plateau.
June 1986, Jack Pettigrew, Alex Colly.

ca. 28°29', 152°24'; Tooloom Scrub, 15 km W of Urbenville.
November 1988, Harry Hines.

ca. 28°47', 152°44'; Cambridge Plateau, 20 km NE of Tabulam.
November 1988, Harry Hines.

ca. 28°54', 152°44'; Mallanganee Flora Reserve, 17 km E of Tabulam.
November 1988, Harry Hines.

ca. 30°15', 153°06'; Bruxner Park, 8 km NW of Coffs Harbour.
1985, CC, Anita Smyth.

ca. 30°22', 152°44'; Dorrigo NP, 3 km SE of Dorrigo.
1985, CC, Anita Smyth.

ca. 32°04', 151°34'; Gloucester Tops.
14 January 1984, David James (QOSIMFS).

DISCUSSION

Until 1980, 135 years after it was first described, the southern subspecies of the Marbled Frogmouth was only definitely known from a few widely separated localities in south-east Queensland and north-east New South Wales. Since 1980, it has been recorded at over 250 sites in 18 different localities. Through information presented here we now know that the distribution extends north to the Many Peaks Range, west to the Burnett Range, and south to Lismore; to within 1.5 km of the coast at Cooloola and as far as 104 km inland at Great Table Mountain. The range of *plumiferus* is closely tied to the distribution of warm, moist, subtropical rainforests which fall into the categories of Notophyll Vine Forest (NVF) and Complex Notophyll Vine Forest (CNVF). All of the post-1980 *plumiferus* localities in Queensland lie within the distributional range of these forests, as defined by Young & McDonald (1987).

Plumed Frogmouths can be found in other vegetation types. In the vicinity of the Conondale Ranges, they are frequently found in Araucarian Vine Forests (Araucarian Notophyll Vine Forest and Araucarian Microphyll Vine Forest and Thicket of Young & McDonald 1987). They have twice been located in 20 year-old monocultures of Hoop Pine. However, their apparent absence from Araucarian Vine Forests farther to the north and west leaves little doubt that these drier forests are not favoured habitats, and suggests that the species occurs in them only as a result of dispersal away from the preferred, wetter forests. The lack of records from the higher and cooler areas of CNVF along the Great Dividing and McPherson Ranges suggests that the species' stronghold lies in the warmer, lowland forests. The wet tropical rainforests north of Ingham and south of Cooktown have a long history of ornithological research, yet Marbled Frogmouths are unknown from this area (Schodde & Mason 1980).

Notophyll Vine Forest is widely distributed in south-east Queensland and north-east New South Wales, but mostly in small, isolated patches in gullies. It is most extensive in the Conondale Ranges, where the topography, high rainfall and low nutrient soils have produced larger contiguous areas than are known elsewhere (P.A.R. Young pers. comm.). Because this vegetation type is mainly associated with poor soils and gullies, NVF has suffered less destruction than other types of rainforest.

Most patches of NVF are fragmented and isolated. However, prior to European settlement, NVF in the area extending from the Conondale Ranges to Cooloola was largely connected by strips along the lowland rivers (P.A.R. Young pers. comm.).

Complex Notophyll Vine Forest of the warmer types favoured by Plumed Frogmouths used to cover substantial areas in the lowlands of south-east Queensland and north-east New South Wales, but these have nearly all been cleared, mostly for agriculture and grazing. Extensive areas used to be located in the Big Scrub around Lismore, in the Gold and Sunshine Coast hinterlands, and on the Maleny Plateau; but now only small fragments remain (W.J.F. McDonald pers. comm.). It is likely that these cleared forests once formed the core areas of the Plumed Frogmouth's distribution, and that their destruction has left the species much rarer than it once was.

More *plumiferus* have been located in the Conondale Ranges than anywhere else, with over 130 sites known. While this is partly a result of more thorough censusing in the Conondales, it also reflects the extent of NVF in that area. Other extensive tracts of NVF are to be found in the eastern McPherson Ranges, the Tweed and Nightcap Ranges and at Mount Warning (M. Olsen pers. comm.). However, in the McPherson and Tweed Ranges, NVF is largely confined to the valleys and is difficult to access due to the precipitous nature of the country (M. Olsen pers. comm.). This is probably why the Nightcap Range has produced over 40 sites for *plumiferus*, while the McPherson and Tweed Ranges have yielded less than 20 between them. There are likely to be far more Plumed Frogmouths in this region than current records suggest.

It is puzzling that *plumiferus* went unrecorded for so long in areas close to major population centres. Today there is much more awareness of nocturnal wildlife than was apparent 20 years ago, and observers are more mobile. It is nevertheless surprising that such distinctive calls went unnoticed in the past. They may have been heard but not identified. The bird's secretive nature would have made it hard to discover the origin of the strange calls, which are quite unlike those of the other frogmouth species with which observers were perhaps more familiar. An analogous case might be that of the Sooty Owl *Tyto tenebricosa* which was also rarely reported until the 1980s, despite its unmistakable calls. It is now known to be widespread in eastern Australia, and is frequently encountered by those seeking it (pers. obs.). It is probable that the recent elucidation of the Plumed Frogmouth's status has resulted from a greater community interest in nocturnal wildlife, rather than from any change in the status of the bird itself.

There is good reason not to be complacent about the future of rare, rainforest fauna. The recent disappearance of two species of frogs, *Rheobatrachus silus* and *Taudactylus diurnus* highlights the dangers. In

the early 1970s, both frogs were common in rainforest in certain parts of south-east Queensland. They became harder to find in the mid 1970s and have not been recorded at all since 1979. Despite interest in possible medical uses for *Rheobatrachus*, the disappearance of these two species was not fully appreciated until as late as 1983 (pers. obs.). While the fate of these frogs remains a matter for conjecture, their plight illustrates how rapidly populations can change, even in rainforest. Plumed Frogmouths are much more common than they were thought to be, but that says little about their long-term security.

The known distribution of *P.o. plumiferus* extends over four degrees of latitude along a coastal strip just over 100 km wide, at various altitudes ranging from 50 m to 800 m ASL. Within that range, it is mostly restricted to tiny fragments of forest. Though not in any immediate danger of extinction, it must still be regarded as one of the rarest birds in Australia. Considering its small overall population, restricted range and specialised habitat requirements, *P.o. plumiferus* will require careful monitoring if its survival is to be ensured. Garnett (1992) assessed it as rare rather than vulnerable, and concluded that research is needed on ecological requirements and density, possibly using radio-transmitters. Such work is currently being undertaken by QFS staff.

ACKNOWLEDGEMENTS

The contribution of the many people who took part in the QOSI survey was central to the success of this project. Glen Ingram's assistance in organising the survey is especially acknowledged. In addition, several people contributed records from areas not covered in the original QOSI project. Their names appear in the body of the text. Particular thanks are due to Harry Hines, Glenn Holmes and David Milledge, all of whom went to considerable lengths to document their own records so they could be included here. Bill McDonald, Peter Young and Mike Olsen also contributed a great deal through communicating their knowledge of rainforest plants and plant associations. John Kehl read earlier drafts and suggested many improvements.

REFERENCES

FLEAY, D. 1981. *Looking at Animals*. Brisbane: Boolarong Publications.

GARNETT, S. (Ed.) 1992. Threatened and Extinct Birds of Australia. *RAOU Report* 82.

McGILL, A.R. 1978. An Assessment of Known Information on the Plumed Frogmouth. *Australian Birds* 12(3): 37–40.

MILLEDGE, D.R. 1983. The Marbled Frogmouth *Podargus ocellatus plumiferus* in the Nightcap Range, north-eastern N.S.W. *Emu* 83: 43–44.

ROBERTS, G.J. & INGRAM, G.J. 1978. Marbled Frogmouth in the Conondale Range, south-east Queensland. *Emu* 78: 41–43.

SCHODDE, R. & MASON, I.J. 1980. *Nocturnal Birds of Australia.* Melbourne: Landsdowne.

YOUNG, P.A.R & McDONALD, W.J.F. 1987. The distribution, composition and status of the rainforests of southern Queensland. In *The Rainforest Legacy*, Volume 1, Special Australian Heritage Publication Series Number 7(1). Canberra: Australian Govt Publishing Service.

CHRIS CORBEN, c/- Queensland Forest Service, P.O. Box 631, Indooroopilly, Q 4068.
GREG ROBERTS, c/- John Fairfax Group, P.O. Box 1152, Brisbane, Q 4001.

NON-TRADITIONAL NESTING MATERIAL USED BY THE SILVEREYE

MERVYN D. COBCROFT

On 28 September 1992, I found an abandoned, upset nest of a Silvereye *Zosterops lateralis* on the front footpath of my Ipswich residence (27°38'S, 152°45'E). It contained the usual clutch of three oval, pale blue eggs expected of this species (Beruldsen 1980). The eggs were unbroken and fresh, measuring 16 mm by 12.5 mm.

The bird had selected a Jacaranda Tree *Jacaranda mimosifolia* as its nesting site despite heavy plantings of native shrubs, which extend under the canopy of the tree and in close proximity to the nest's original position. This choice had led to the nest's downfall, for the Jacaranda was in the process of shedding the stalks of its spent leaves prior to its annual flowering. The added weight of bird, nest and eggs, together with blustery weather, had undoubtedly hastened the process.

The nest had been constructed between two adjacent primary stalks (petioles) of the Jacaranda's compound leaves. These had been approximately 80 mm apart and, because the petioles leave the branch at an angle, the attachment to the proximal one (closer to the tree's centre) began at 78 mm from the branch, while that to the distal began at 20 mm. The attachments were each about 40 mm long. The nest's external diameter was a more or less uniform 80 mm, external depth 60 mm, while the cup was a regular 45 mm, both across and deep.

The type of nesting material selected is especially noteworthy. The attachment to the stalks had been achieved with several lengths of white cotton thread on both sides with a small quantity of white matted spider's web (including one egg-sac) on the distal side. The bulk of the nest consisted of a mixture of the secondary or leaf-bearing stalks (petiolules) minus leaves of the Jacaranda, and threadlike fibres from a nearby Fan Palm *Washingtonia* sp.. There was no other lining to the cup. The external surface of the nest had been decorated with small, shredded strips of a Paperbark Tree *Melaleuca* sp., some matted, mostly gold-coloured spider's web, long thin strips of greenish and white plastic, and a small ball of darker green man-made fibre derived from carpet pile.

DISCUSSION

The classic descriptions of the nest and eggs of the Silvereye were given by Campbell (1901) and North (1906–9). These have been reiterated by numerous authors including Beruldsen (1980). The present nest and eggs conform to the measurements given by these authors. Campbell (1901) describes the nest as "cup-shaped, neat but somewhat slight, composed of

fine grass, matted outwardly with coccoons (green and white coloured), occasionally green moss is added; inside lined with very fine grass and a few rootlets...[even] horsehair". North's description includes "thinly coated with fine green moss, or with spider's webs and egg-bags".

Interestingly, the present Silvereye adopted mostly non-traditional materials despite my attempts to convert the garden to a more "natural" setting by replacing exotics with Australian native plants. This selection of a non-native tree as a nest-site proved disastrous. The Jacaranda is a native of South America while the Fan Palm hails from Central America. This latter plant is often referred to as the Cotton Palm because of the long, cottony threads which dangle from the outer margins of its palmate leaves. The strips of plastic (derived from mail wrappers and windows of business envelopes) are a non-biodegradable component of shredded office paper which had been recycled as garden mulch. The nest-builder had ignored clear plastic which is a far more frequent contaminant of such shredded material. Vacuum cleaner gleanings, including carpet pile and spun cotton, are typically emptied as dust into the garden. Only the spider's webs and the paperbark are "natural". The golden spider web is from the egg-sacs of Golden Orb Weavers *Nephila* sp. which are found in abundance in the Ipswich area.

ACKNOWLEDGEMENTS

I wish to thank Mr David Le Good, gardening correspondent of *The Queensland Times* for his help with the botanical component of this paper.

REFERENCES

BERULDSEN, G.R. 1980. *A Field Guide to the Nests and Eggs of Australian Birds*. Adelaide: Rigby.

CAMPBELL, A.J. 1901. *Nests and Eggs of Australian Birds*. Sheffield: Pawson & Brailsford.

NORTH, A.J. 1906–9. *Nests and Eggs of Birds Found Breeding in Australia and Tasmania*. Volume 2. Sydney: White.

MERVYN D. COBCROFT, Box 470, Ipswich, Q 4305.

MUSEUM SPECIMENS OF THE RED GOSHAWK *ERYTHROTRIORCHIS RADIATUS*. II. MORPHOLOGY, BIOLOGY AND CONSERVATION STATUS IN EASTERN AUSTRALIA

S.J.S. DEBUS, I.A.W. McALLAN and D.A. MEAD

SUMMARY

Biological data derived from a catalogue of 48 museum specimens of the Red Goshawk *Erythrotriorchis radiatus* and associated literature are presented, to supplement previously published data on the species in Queensland. The Red Goshawk's past and present status in the south-east of its range are contrasted, suggesting the need for active conservation of the species in Queensland and New South Wales.

INTRODUCTION

The endemic Red Goshawk *Erythrotriorchis radiatus* is classified nationally as vulnerable, and its status is of particular concern in the south-east of its range (Aumann & Baker-Gabb 1991; Garnett 1992a,b; Debus 1991a, 1993). This situation prompted a survey of Red Goshawk specimens in the world's museums (Debus, McAllan & Mead 1993). This paper presents our conclusions from the resulting catalogue of specimens and associated literature. We also update field characters and biological data previously reported (Debus & Czechura 1988a,b), and review the species' conservation status in Queensland.

METHODS

Our methods concerning specimens, and abbreviations used for museums, are as previously reported (Debus *et al.* 1993). We also collated Queensland sight records of Red Goshawks for the years 1988–92 inclusive, from the literature and unpublished notes of colleagues (sources: Britton 1990a,b, 1991, 1992; Giffard 1991a,b; Mitchell 1991; Smith 1991; Tilly 1991; Beruldsen 1992; Hobson 1992 and pers. comm.; Kay & Whittle 1992; Whittle 1992; Venables 1993; and T. Aumann, T. Brickhill, D. Charley, L. Conole, M. Crouther, G. Czechura, S. Garnett, L. Joseph, D. Rogers pers. comm.). Some records were reported by more than one source, therefore care was taken not to double-count records. One record was defined as one bird at one locality in one year (a pair = two records etc.). Details of unpublished records are presented in Appendix 1.

RESULTS

Historical status in eastern Australia

As previously reported (Debus *et al.* 1993), we traced a total of 46 specimens in collections (22 in Australian and 24 in overseas museums), plus an

illustrative or photographic record of another two (BMNH and QM), plus literature records of a further two that we could not trace (?Bourke specimen, formerly in the BMNH; Dawson River male, formerly in the AM). This gives at least 48, possibly 50, Red Goshawk specimens collected. Of these, 29–31 were collected pre-1900, 14 between 1900 and 1950, and five post-1950. More than half (60%) were collected before 1900, and 90% before 1950. A third came from south-east Queensland and north-east New South Wales last century. The regional breakdown is as follows.

New South Wales: 6–7, all pre-1900.
South-east Queensland: 10–11, all pre-1900.
North-east Queensland: 11; nine pre-1910, two post-1950.
Gulf of Carpentaria: five; four pre-1950, one post-1950.
Top End, Northern Territory: eight; three pre-1900, three 1900–1950, two post-1950.
Kimberley, Western Australia: four, all pre-1950.
Unknown provenance: four, all pre-1900.

The decline in the practice of shooting specimens for museum collections partly explains the lower numbers of Red Goshawk specimens acquired over time. Nevertheless, the number of early specimens from New South Wales and south-east Queensland (16–18) suggests that last century the species was much more numerous in this part of its range than it is today. Some of the specimens were adults or adult pairs, which together with breeding records (White in Mathews 1915–16; Favaloro 1981; Debus 1991a) show that it was a breeding resident in this region. Furthermore, the total number of specimens suggests that it was at least as common in northern Australia, if not more so, than the other endemics – the Square-tailed Kite *Lophoictinia isura* and Black-breasted Buzzard *Hamirostra melanosternon* – although behavioural and other differences may affect collection rates. Taking the number of specimens of all three species from Australian collections plus the BMNH and AMNH, there were 38 Red Goshawks versus 24 Square-tailed Kites and 14 Buzzards from within the range of the Red Goshawk. However, this may relate partly to the relative ease with which the species could be collected, the demand for specimens, and the breeding distribution of these species within the Red Goshawk's range. The Red Goshawk is confiding around the nest (Aumann & Baker-Gabb 1991, SJSD pers. obs.), whereas the Buzzard is wary (Debus & Czechura 1992), and it does seem that Red Goshawk specimens were particularly in demand: they are large, handsome hunting hawks with massive feet and claws, and would have looked impressive in the collections of 19th century natural historians. Square-tailed Kites apparently do not breed (during which activity birds were often collected) in northern parts of the Red Goshawk's range (e.g. Debus & Czechura 1989). It is certainly clear that Red Goshawks were relatively easily obtained by the early collectors, from Sydney and the north coast rivers of NSW; Brisbane, Dawson River and other parts of south-east Queensland; and the Cairns-Cooktown region.

For comparison with the BMNH Red Goshawk specimens (six skins plus an illustrative record), in the BMNH there are also 22 Brown Goshawks *Accipiter fasciatus didimus*, 19 *A.f. fasciatus* from Queensland, and 38 Grey Goshawks *Accipiter novaehollandiae* from Queensland and "north-east Australia" (including 21 of the uncommon white morph, mostly from Queensland; DAM). In the AMNH there are eight Red Goshawks, versus 89 Brown Goshawks (mostly *didimus*) and 31 Grey Goshawks from northern Australia (from Condon & Amadon 1954). Similarly, there are five Red Goshawks in the AM versus 33 Brown Goshawks and 23 Grey Goshawks from within the Red Goshawk's range (SJSD). This suggests that, historically, the Red Goshawk was much less numerous than the large accipiters. However, in the Kimberley region Red Goshawks may be more common than Grey Goshawks (T. Aumann *in litt.*).

The museum data (locality details in Debus *et al.* 1993) suggest that, historically, the Red Goshawk's core range in eastern Australia was the well-watered coastal and subcoastal fringe. However, it also occurred and bred inland to about the Great Dividing Range in suitable riverine habitat.

Current status in Queensland

Records of the Red Goshawk in Queensland to the end of 1987 were summarised by Debus & Czechura (1988b, Figure 1a-d; to which should be added a sighting at Kuranda on 12.5.83: E. Finley pers. comm.). Records since 1987 were therefore collated. Using the regions defined by Britton (1991), the number of records 1988–92 (total 37) is as follows: North-east Queensland 15; Mid-east Queensland 7; South-east Queensland 15. This is only an average of seven records per year for the entire State, but includes pairs on Cape York and near Cooktown, near Mackay, on the rugged escarpment east of Toowoomba, and in the rugged Brisbane hinterland. The low total for Mid-east Queensland may reflect the small size of this region and the distribution and density of observers, but may also suggest fragmentation of the Red Goshawk's distribution. All recent localities are coastal or near-coastal, suggesting withdrawal from its former inland range. There has been no published record of confirmed breeding since 1980 (the record in Debus & Czechura 1988b, Figure 1d, being for nest-building only), but there were two active nests on Cape York Peninsula in recent years (S. Garnett, D. Rogers pers. comm.) and a pair with a juvenile near Mackay in February 1992 (M. Crouther *in litt.*). In addition, or perhaps including some of the above, J. Young (*in litt.*) is aware of five contemporary breeding pairs on Cape York and a lesser number of pairs in the Cairns region (all North-east Queensland; details withheld). It appears that North-east Queensland north of 20°S, and Cape York Peninsula in particular, is now the main stronghold of the species in the State. However, there is continued circumstantial evidence of breeding in South-east Queensland: of the sightings reported by Hobson (1992), the male of a pair on 30 May 1990 was performing a unilateral agility display-flight about the conspicuously

perched female (as described by Aumann & Baker-Gabb 1991), and a female on 3 February 1991, carrying a Grey Teal *Anas gracilis*, was a juvenile on plumage characters (R. Hobson *in litt.*). Nevertheless, there have been no breeding records in inland southern Queensland since the original observations by J.B. White (Mathews 1915–16) and the Barnard brothers (North 1911), and clutches collected before 1915 (Favaloro 1981). This suggests a contraction of the goshawk's southern breeding range.

Records of the Red Goshawk for New South Wales to 1990 were summarised by Debus (1991a). The most recent sightings concerned a pair in the Northern Rivers region, *c.* 100 km from the Queensland border, in spring 1988 and only a single adult at this site in spring 1989. There were no records in 1990, and the only known pair in NSW had evidently disappeared by that year (Debus 1992). Subsequently, the only record was of a single adult seen on two or three occasions in 1991, also in the Northern Rivers region (D. Roach per R. Moffatt, D. Charley *in litt.*). If the causal factors continue to operate, it seems only a matter of time before the pattern of northward withdrawal crosses the border, and the Red Goshawk also becomes locally extirpated as a breeding species in the Brisbane region.

Other aspects of biology

This paper enables us to make additions and amendments to previous review papers on the Red Goshawk (Debus & Czechura 1988a,b), particularly through the inclusion of data overlooked or accidentally omitted from Figure 1a and Tables 1 and 3 of the latter paper.

Field characters: J.B. White (in Mathews 1915–16, Appendix to Vol. 5) accurately described sexual size dimorphism, and sexual dichromatism in adult plumage; he described a feathered nestling as similar in plumage to the adults, but brighter and with a white tail tip. He also described the Red Goshawk's rapid, easy and direct flight as falcon-like, and noted its long wings and "somewhat square" tail. He observed the birds soaring in circles to great heights. Recently, Brickhill (1991) has described the plumage of two fledglings.

Morphology: White (in Mathews 1915–16) gave the following for south-east Queensland: two adult female wing spans 53 inches (1346 mm) and 54 inches (1372 mm); one adult female weight "a little over 3 lbs" (at least 1370 g); male wing span 45 1/2 inches (1156 mm). An adult male from the Top End (NT) weighed 640 g and had a wing span of 1012 mm (NTM 4840, per S.A. Parker). Together with a male of 630 g and a female of 1110 g, both from the Top End (Aumann & Baker-Gabb 1991), these data confirm that the Red Goshawk is extremely sexually dimorphic in body size. They also suggest a clinal increase in size from north to south.

Diet: a nest with a downy nestling in south-east Queensland contained the remains of a Sulphur-crested Cockatoo *Cacatua galerita* (White in Mathews 1915–16). The stomach of AMNH 534015 (juvenile/immature male, north-east Queensland) contained a bird and insects (per tag).

Breeding distribution: J.B. White's records for south-east Queensland (in Mathews 1915–16) increase to 19 (14 before 1920) the number of acceptable historical breeding records; in fact his were the first records of nests. Addition of the Bettington (AM) and Harvey (MV) eggs from Debus *et al.* (1993) increases this to 21 historical breeding records, and 15 before 1920. H.L. White's (1917a,b) record of a bird building a nest on Maria Island (Top End, NT, grid block 14°S/135°E) on 12 April 1916 was also omitted from breeding records in Debus & Czechura (1988b, Figure 1a). The recent breeding record for the southern Kimberley (Debus & Czechura 1988b, Figure 1d) should be deleted as erroneous: the birds were misidentified Whistling Kites *Haliastur sphenurus* (D. Baker-Gabb, T. Aumann pers. comm.).

Breeding biology: White's notes (in Mathews 1915–16) provide additional data on nest sites and habitat, nesting chronology, brood size and breeding behaviour for south-east Queensland. A nest in the top of an "immense" riparian gum (*Eucalyptus* sp.) contained a single half-grown nestling on 11 November 1870; after the female was shot, the male successfully reared the young. Another (old, refurbished) nest in riparian habitat contained a downy nestling on 12 November 1873. These records further reinforce the view that, in subcoastal and inland habitats, the Red Goshawk always nests in tall riparian trees beside or within a few hundred metres of permanent water. The dates suggest laying in about early to mid September at these two nests in south-east Queensland (from incubation and nestling periods in Aumann & Baker-Gabb 1991). The additional clutch (AM O.61260) from Darwin (NT) provides a further case of eggs in May in the Top End. Cupper & Cupper (1981, and repeated by Debus & Czechura 1988b, Table 3) gave a nest tree on Cape York Peninsula as a bloodwood *Eucalyptus gummifera*. In Queensland *E. gummifera* is restricted to the south-east, therefore the nest tree would have been one of the other bloodwoods such as *E. polycarpa* or perhaps *E. intermedia* (cf. Chippendale & Wolf 1981). The Cuppers' photographs suggest *E. intermedia*, a possible northerly range extension for this eucalypt.

DISCUSSION

Museum specimens, morphology and biology

Our comments here relate mainly to the specimens listed in Debus *et al.* (1993). A breakdown of Red Goshawk specimens by age and sex (Table 1) does not suggest that a particular age or sex class was any more susceptible to collection than any other. Contrary to expectation, it does not appear that

females were more vulnerable than males, or juvenile/immature birds more vulnerable than adults (although there may be more juvenile/immature specimens than in a random sample of the population, cf. Mooney & Hunt 1983). This apparent anomaly is explained by the confiding nature of adults near the nest, unusual for a raptor (see Aumann & Baker-Gabb 1991). Virtually all of the Barnards', J.B. White's and G.F. Hill's adult specimens were shot at the nest (see Hill 1911; North 1911; Barnard 1914; Mathews 1915–16, Appendix; Debus *et al.* 1993).

TABLE 1

Age and sex of museum specimens of the Red Goshawk, from the criteria of Aumann & Baker-Gabb (1991) and specimens listed by Debus, McAllan & Mead (1993).

Age	Male	Female	Total
Adult	13	11	24
Juvenile/immature	8	12	20
Unknown	2	2	4
Total	23	25	48

The Red Goshawk's colour pattern, plumage classes and plumage development (see Aumann & Baker-Gabb 1991, Debus *et al.* 1993) parallel those of the Square-tailed Kite: in progression from juvenile to adult the latter also loses rufous on the head and upperparts and complete dorsal barring on the central rectrices, and acquires a pale face, heavier streaks on the underparts, and bolder barring on the undersides of the outer primaries (our pers. obs. and examination of skins). This may be further evidence that the two species, along with other Australasian endemic raptor genera, form a related group or clade (see Debus 1991b).

Museum data on soft-part colours generally confirm those previously reported (Debus & Czechura 1988a, Aumann & Baker-Gabb 1991). However, we found yellow eyes in some adult males (see Debus *et al.* 1993). Kennedy (1990) persisted with partly erroneous information on the Red Goshawk's soft-part colours (cere, orbit), despite prior publication of colour photographs and a review of these and other characters of the Red Goshawk (Cupper & Cupper 1981, Hollands 1984, Debus & Czechura 1988a). Perhaps more remarkable are Hoser's (1991) erroneous conclusions on the Red Goshawk's morphology, biology and population size. As well as

muddling its age criteria, he resurrected a discredited myth on supposed clutches of three eggs (cf. Favaloro 1981, Debus & Czechura 1988b). His conclusions on its preferred diet must be amended from "waterbirds and cockatoos" to "parrots, pigeons and kookaburras" (i.e. primarily birds of the forest and woodland canopy), and its world population from "thousands" to "hundreds" (cf. Aumann & Baker-Gabb 1991). Hoser's book, in particular, illustrates how misinformation can enter the public perception of endangered species, and perhaps thereby influence conservation policy to the detriment of some species. This book misleadingly lists the Peregrine Falcon *Falco peregrinus* as endangered in Australia, but does not list the Square-tailed Kite, Grey Falcon *Falco hypoleucos* or threatened owls (cf. Garnett 1992a). There is a clear need for such "popular" books to be more accurate and authoritative, even on seemingly trivial matters such as morphology, through better research of source material.

The QNPWS/QM Red Goshawk specimen from Cape York Peninsula, which was collected for identification in 1979 (see Debus *et al.* 1993), raises several issues: (a) the training and identification ability of fieldworkers; (b) the appropriateness of collecting specimens if proper records, or the specimens themselves, cannot be kept; (c) the appropriateness of killing rare species for any reason. The standard reference to birds in Queensland considered the Red Goshawk's status as "formerly uncommon, now rare" (Storr 1973), and other works have commented on its rarity (Brown & Amadon 1968, Slater 1970, Morris 1976). The QM did not then have, and still does not have, a Red Goshawk specimen. If a contemporary specimen of a rare and declining species had to be collected, and that is debatable, then it should have been lodged in a museum, with a record of its measurements, weight and soft parts as in fresh condition, and full use should have been made of the carcass (e.g. stomach contents recorded/preserved, and skeleton and tissues retained). There are so many Red Goshawk specimens in Australian and other museums, some collected since 1960, that further collecting for museum skins only, or even for biochemical studies, is unwarranted. Note also Aumann & Baker-Gabb's (1991) recommendations regarding specimen material. Instead, every effort should be made to salvage specimens killed accidentally or found dead.

Conservation status in Queensland

As suggested by the number of specimens, the Red Goshawk was formerly more numerous in eastern Australia south of about 20°S, but is now absent or rare there (see Debus & Czechura 1988b; Debus 1991a, 1993; Debus *et al.* 1993). The number of specimens taken seems excessive, but we do not attribute its decline primarily to shooting, although the collection of so many breeding adults may have had some impact. It is probably no coincidence that the south-eastern part of its range, north to 20°S, is >70% cleared (locally >90% cleared) on a regional or shire basis (J.A. Duggin unpubl. data). This refers to coastal and subcoastal, formerly forested or

wooded areas, and the impact on high-quality Red Goshawk habitat (e.g. fertile floodplains or valley floors) may have been even greater than these figures suggest. White's breeding records (in Mathews 1915-16) reinforce the view (of Aumann & Baker-Gabb 1991, and others) that destruction of tall (>20 m) riparian eucalypts, and other habitat loss, has been a major factor in the goshawk's decline in eastern Australia. However, there is a glimmer of hope: the Red Goshawk still occurs in some remote, densely wooded areas of south-east Queensland, where it sometimes preys on exotic mammals such as the Brown Hare *Lepus capensis* (see Hobson 1992).

Notwithstanding the above, there is no cause for complacency over the scale of habitat destruction or the amount of habitat left in Queensland. Modern arboricides, if used in "blanket" fashion on woodlands, could cause massive habitat destruction on an unprecedented scale. Furthermore, the Red Goshawk's core range in Queensland, the coastal and subcoastal fringe, is the most heavily settled part and is under threat from increasing urbanisation and other development. Two cases exemplify the continual pressure to clear its habitat. A recreation reserve near Cooktown in an area of *Eucalyptus polycarpa* forest, potential breeding habitat near which a pair of Red Goshawks had been seen, was in 1991 under threat from large-scale clearing (C. Giffard *in litt.* 13.6.91). A submission was made by local residents to the Cook Shire Council and the Queensland Government in an attempt to have the area converted to an environmental park, specifically citing the findings and recommendations of Aumann & Baker-Gabb (1991). At the time of writing (October 1992), QNPWS was investigating the reserve proposal, but was deferring any decision to acquire the land pending a valuation by the Lands Department (D. McFarland *in litt.* 14.10.92). Similarly, the Shoalwater Bay military area is one of the few contemporary breeding sites known for the Red Goshawk in eastern Queensland (see Debus & Czechura 1988b, Figure 1 and Table 3), but recently has been subject to sand-mining leases. Strip-mining, where it removes forest, has the potential to affect breeding Red Goshawks adversely.

Circumstantial evidence suggests that pesticides may have contributed to the Red Goshawk's decline in eastern Australia, a concern already expressed by Hoser (1991) and Garnett (1992a). All other Australian diurnal raptor species that prey primarily on free-flying birds have had their average eggshell thickness significantly reduced by DDT; sites of heavy pesticide use, and associated shell thinning, fall within the Red Goshawk's range (see Olsen *et al.* 1993). With a diet consisting partly of granivorous pigeons and parrots, it seems inevitable that the Red Goshawk has been similarly affected in the Kimberley (Ord River), Atherton region and south-east Queensland/northern New South Wales, where DDT applications were among the heaviest in Australia. Most of its recorded prey species in Queensland (Debus & Czechura 1988b, Table 1) are likely to be carrying pesticide loads. Furthermore, eggshell thinning in the rare

Grey Falcon in remote, uncontaminated areas suggests that such raptors are in contact with contaminated prey during annual movements of predator or prey. Overseas, average eggshell thinning of >15% is sufficient to cause local breeding failure in raptors, and >19% is sufficient to render local raptor populations non self-sustaining (see Olsen *et al.* 1993). Average eggshell thinning of >15% has been detected in five other raptor species at sites in coastal eastern Queensland and northern New South Wales, and average eggshell thinning of >19% has been detected in two bird-eating falcons at sites in north-east and south-east Queensland (Olsen *et al.* 1993). These data offer a partial explanation for the Red Goshawk's decline in the Cairns region since the 1970s (F.T. Morris *in litt.*), its decline in the south-east of its range (this study), and its absence from some areas of apparently suitable habitat in the south-east (e.g. Hollands 1984). Furthermore, the region from which the Red Goshawk has all but disappeared coincides with a region of intensive DDT use (cf. Olsen *et al.* 1993, Figure 3). In Australia DDT use ceased in 1989 after a peak in 1973; its breakdown in tropical climates is more rapid than in temperate climates (Olsen *et al.* 1983). The Red Goshawk's recovery from any DDT-induced population decline will therefore be slowest in the south, other factors such as habitat availability permitting.

No Red Goshawk clutches collected since 1946 (the date of DDT introduction) were available for measurement to confirm a reduction in shell thickness. Paradoxically, evidence for eggshell thinning in this species can only come from clandestine egg collections made illegally since 1946. Such collections do exist, including Red Goshawk eggs stolen from south-east Queensland around the late 1970s (G. Roberts pers. comm.). The egg thieves' one redeeming act would be to volunteer (anonymously if preferred) the Ratcliffe thickness index carefully measured for each egg (see Olsen *et al.* 1993 for method) or, better still, surrender the eggs to a museum. This would elucidate the role of DDT in the Red Goshawk's decline. However, it is likely that the decline started before 1946, particularly in New South Wales as suggested by the specimen data.

Under the IUCN categories, the Red Goshawk's national classification is "vulnerable" (Aumann & Baker Gabb 1991; Garnett 1992a,b). It is "endangered" (probably "critical") in New South Wales (Debus 1993), and its historical versus current status suggests that it is probably "endangered" in Queensland south of 20°S. Under the NSW National Parks and Wildlife Act, the equivalent category for the goshawk is "threatened", i.e. more at risk than "rare and vulnerable" (the only two categories recognised). Its current status in southern Queensland and northern New South Wales is therefore of grave concern. Aumann & Baker-Gabb (1991) and Garnett (1992b) have made recommendations relating to the Queensland situation south of 15°S, and these should be followed as a matter of urgency.

Although the Red Goshawk's biology has not been investigated as thoroughly in Queensland as in the Northern Territory and Kimberley, data from Queensland have been summarised by Debus & Czechura (1988b) and this paper, and sufficient is known for appropriate action. Garnett (1992b) has estimated the cost of remedial action in eastern Australia: two staff for one year [or equivalent, i.e. 24 staff months] to locate breeding territories. Given that administration is by two States (NSW and Qld), and that the geographical area is large, it may be appropriate to divide this into one member of staff in NSW and two in Queensland (covering Brisbane to Mackay and Mackay to Cairns, respectively), for four months each in the breeding seasons (August-November) of two consecutive years. In addition to Garnett's (1992b) recommendations, we suggest that once breeding territories are located and the habitat secured in Queensland and NSW, further study and monitoring should be undertaken. This should include monitoring of pesticide residues in sympatric bird-eating raptors, their eggs and major avian prey species (Aumann & Baker-Gabb 1991), in order to infer the role of DDT in the Red Goshawk's decline. Bird observers can assist by reporting Red Goshawk sightings to the Queensland Museum (Mr G.V. Czechura), Queensland National Parks & Wildlife Service (Dr D. McFarland, Moggill office), the authors of this paper (Debus, McAllan), or an appropriate QOSI officer (Conservation Officer or compiler of the annual bird reports). Locality details of pairs or nests should not be publicised, and bird observers should be alert to egg collectors attempting to locate nests. Furthermore, bird observers should refrain from activities or disclosures which may disturb breeding Red Goshawks or draw attention to their location. Finally, if the Red Goshawk's decline in the south of its range is partly attributable to DDT then there may be a case for a reintroduction program in southern Queensland and northern New South Wales, if suitable unoccupied habitat remains. The feasibility and appropriateness of such deserves investigation, particularly in NSW where, without intervention, the species seems doomed.

ACKNOWLEDGEMENTS

The assistance of museum curators and other colleagues, previously acknowledged, continues to be appreciated. We thank Tom Aumann, Tess Brickhill, David Charley, Lawrie Conole, Marion Crouther, Greg Czechura, Eric Finley, Charles Giffard, Rod Hobson, Leo Joseph, Bob Moffatt, David Roach and Danny Rogers for providing Red Goshawk sight records, and Dr David McFarland (QNPWS) and Greg Roberts for providing information. Also, Peggy Mitchell for supplying unusual sighting reports from the Bird Observers Club of Australia. Dr J.A. Duggin (Department of Ecosystem Management, University of New England) kindly permitted his unpublished data on land clearance to be quoted. Tom Aumann, Dr David Baker-Gabb, Greg Czechura and Dr Hugh Ford commented helpfully on a draft.

REFERENCES

AUMANN, T. & BAKER-GABB, D.J. 1991. The Ecology and Status of the Red Goshawk in Northern Australia. *RAOU Report* 75.

BARNARD, H.G. 1914. Northern Territory birds. *Emu* 14: 39–57.

BERULDSEN, G. 1992. Members' sightings. *Qld Ornithol. Soc. Newsl.* 23(3): 8.

BRICKHILL, T. 1991. An observation of fledgling Red Goshawks. *Aust. Bird Watcher* 14: 32–33.

BRITTON, P.L. 1990a. The Queensland Ornithological Society Bird Report, 1988. *Sunbird* 20:18–32.

BRITTON, P.L. 1990b. The Queensland Ornithological Society Bird Report, 1989. *Sunbird* 20: 64–82.

BRITTON, P.L. 1991. The Queensland Ornithological Society Bird Report, 1990. *Sunbird* 21: 65–89.

BRITTON, P.L. 1992. The Queensland Ornithological Society Bird Report, 1991. *Sunbird* 22: 51–83.

BROWN, L. & AMADON, D. 1968. *Eagles, Hawks and Falcon of the World.* London: Country Life.

CHIPPENDALE, G.M. & WOLF, L. 1981. *The Natural Distribution of* Eucalyptus *in Australia*. Canberra: Australian National Parks & Wildlife Service.

CONDON, H.T. & AMADON, D. 1954. Taxonomic notes on Australian hawks. *Rec. S. Aust. Museum* 11: 189–246.

CUPPER, J. & CUPPER, L. 1981. *Hawks in Focus*. Mildura: Jaclin.

DEBUS, S.J.S. 1991a. An annotated list of New South Wales records of the Red Goshawk. *Aust. Birds* 24: 72–89.

DEBUS, S. 1991b. Relationships of the Red Goshawk. *Australasian Raptor Assoc. News* 12: 46–52.

DEBUS, S.J.S. 1992. A survey of diurnal raptors in north-east New South Wales, 1987–1990. *Aust. Birds* 25: 67–77.

DEBUS, S.J.S. 1993. The status of the Red Goshawk *Erythrotriorchis radiatus* in New South Wales. In Olsen, P.D. (Ed.), *Australian Raptor Studies*. Melbourne: Australasian Raptor Assoc., RAOU.

DEBUS, S.J.S. & CZECHURA, G.V. 1988a. Field identification of the Red Goshawk *Erythrotriorchis radiatus*. *Aust. Bird Watcher* 12: 154–159.

DEBUS, S.J.S. & CZECHURA, G.V. 1988b. The Red Goshawk *Erythrotriorchis radiatus*: a review. *Aust. Bird Watcher* 12: 175–199.

DEBUS, S.J.S. & CZECHURA, G.V. 1989. The Square-tailed Kite *Lophoictinia isura*: a review. *Aust. Bird Watcher* 13: 81–97.

DEBUS, S.J.S. & CZECHURA, G.V. 1992. The Black-breasted Buzzard *Hamirostra melanosternon*: a review. *Aust. Bird Watcher* 14: 243–257.

DEBUS, S.J.S., McALLAN, I.A.W. & MEAD, D.A. 1993. Museum specimens of the Red Goshawk *Erythrotriorchis radiatus*. I. Annotated list of specimens. *Sunbird* 23: 5–28.

FAVALORO, N.J. 1981. The Red Goshawk. *Aust. Bird Watcher* 9: 44–53.

GARNETT, S. 1992a. Threatened and Extinct Birds of Australia. *RAOU Report* 82.

GARNETT, S. 1992b. *The Action Plan for Australian Birds*. Canberra: Australian National Parks & Wildlife Service.

GIFFARD, C. 1991a. Observations of the Red Goshawk. *Australasian Raptor Assoc. News* 12: 8–9.

GIFFARD, C. 1991b. A further Red Goshawk sighting in north Queensland. *Australasian Raptor Assoc. News* 12: 73.

HILL, G.F. 1911. Field notes on the birds of Kimberley, north-west Australia. *Emu* 10: 258–290.

HOBSON, R.G. 1992. The Red Goshawk *Erythrotriorchis radiatus* in the Lockyer Valley, se Qld. *Australasian Raptor Assoc. News* 13: 12–13.

HOLLANDS, D. 1984. *Eagles, Hawks and Falcons of Australia*. Melbourne: Nelson.

HOSER, R.T. 1991. *Endangered Animals of Australia*. Sydney: Pierson & Co.

KAY, J. & WHITTLE, T. 1992. A great place. *Qld Ornithol. Soc. Newsl.* 23(9): 4.

KENNEDY, M. 1990. *Australia's Endangered Species*. Sydney: Ausworld.

MATHEWS, G.M. 1915–16. *The Birds of Australia*, vol. 5. London: Witherby.

MITCHELL, P. 1991. Unusual Sighting Reports Series 90. *Bird Observer* 713: 98.

MOONEY, N. & HUNT, M. 1983. Raptor mortality in Tasmania. *Australasian Raptor Assoc. News* 4(2): 7–8.

MORRIS, F.T. 1976. *Birds of Prey of Australia, A Field Guide*. Melbourne: Lansdowne.

NORTH, A.J. 1911. *Nests and Eggs of Birds Found Breeding in Australia and Tasmania*, vol. 3. Sydney: Aust. Museum.

OLSEN, P., FULLER, P. & MARPLES, T.G. 1993. Pesticide-related eggshell thinning in Australian raptors. *Emu* 93: 1–11.

SLATER, P. 1970. *Field Guide to Australian Birds, Vol. 1, Non-Passerines*. Adelaide: Rigby.

SMITH, L.E. 1991. Aerial display of the Red Goshawk *Erythrotriorchis radiatus*. *Aust. Bird Watcher* 14: 147–148.

STORR, G.M. 1973. List of Queensland birds. *Spec. Publ. West. Aust. Museum* no. 5.

TILLY, J. 1991. Members' sightings. *Qld Ornithol. Soc. Newsl.* 22(3): 8.

VENABLES, I. 1993. Members' sightings. *Qld Ornithol. Soc. Newsl.* 24(1): 8.

WHITE, H.L. 1917a. North Australian birds. *Emu* 16: 117–158.

WHITE, H.L. 1917b. North Australian birds [part 2]. *Emu* 16: 205–231.

WHITTLE, J. 1992. Members' sightings. *Qld Ornithol. Soc. Newsl.* 23(3): 8.

APPENDIX 1

Details of unpublished records of the Red Goshawk in Queensland, 1988-92 inclusive.

Region	Locality	Comments
NEQ	Cape York	Pair with active nest in recent years (J. Young per D. Rogers)
NEQ	Lakefield NP	One seen 16.6.1991 (D. Charley), one October 1992 (S. Garnett)
NEQ	N of Laura	One seen December 1991 (L. Joseph)
NEQ	Atherton	One seen on Atherton Tableland early 1992 (T. Aumann)
NEQ	Julatten	One seen August 1992 (L. Conole)
NEQ	Cape York	Pair with active nest 1992 (?) (per S. Garnett)
MEQ	Mackay	Rugged hinterland: pair with dependent juvenile February 1992 (M. Crouther)
MEQ	Mackay	Rugged hinterland: different pair (100 km away) seen 29.11.92 (T. Brickhill)
SEQ	Coastal reserve	One seen in riparian habitat October 1990 (G. Czechura)
SEQ	Brisbane	Rugged hinterland: 1-2 seen June 1991, May 1992 (G. Czechura)
SEQ	N. Sunshine Coast	One seen October 1991 (G. Czechura)
SEQ	Withcott	One seen 14.3.92 (R. Hobson)
SEQ	Monduran Dam	One seen September 1992 (G. Czechura)

ADDENDA AND CORRIGENDA

Since publication of Part I of this paper (Debus *et al.* 1993), Dr Mary LeCroy of the American Museum of Natural History kindly responded with additional information. This requires amendments to our text on some AMNH specimens.

AMNH 536050: the annotation *Circus a. assimilis* is apparently not in Mathews' handwriting, and is probably a later misidentification.

AMNH 534013: this specimen was twice in Rothschild's possession; Mathews acquired it from Rothschild on 14 February 1910 and Rothschild later purchased the Mathews collection. The original Rothschild label says "Cardwell", the Mathews label says "Cedar Bay" and Hartert's list of

Mathews' types says "Cedar Bay, received from Meek", but the locality of collection is still unresolved. Meek (Rothschild's collector) collected at Cedar Bay in 1893 (see also Greenway 1973: 281).

AMNH 216399: acquired by the AMNH from Rothschild in 1927.

Staatliches Museum für Tierkunde, Dresden (Germany): although H.C. Robinson did collect in north Queensland, he was also a dealer in bird specimens. The date of collection, 19 August 1899, is probably correct, for Robinson acquired many of E. Olive's specimens (Whittell 1954).

AMNH 534015: there is only a Rothschild label, no Mathews label. Much of Olive's material went to H.C. Robinson before Mathews started collecting (Whittell 1954), including a Red Goshawk skin (Rothschild ms, in AMNH). The two Olive skins probably went directly from Robinson to Rothschild before Robinson's collection went to Mathews.

AMNH 534014: the other Olive specimen, sexed by the collector as female but label amended to male by "EH" (i.e. Ernst Hartert).

AMNH 534012: carries a yellow Mathews "Figured" label; his description (1916, *Austral Avian Record* 3: 57) states "Figured and described in my 'Birds of Australia', vol. V, pl. 240, p. 88".

AMNH 9761: this specimen was from the Prince Maximilian of Wied-Neuwied Collection, one of the first collections purchased and catalogued after the AMNH was founded in 1869. It was never part of the Rothschild Collection. It is not known how the specimen was acquired by the prince.

S.J.S. DEBUS, Zoology Department, University of New England, Armidale, N.S.W. 2351.
I.A.W. McALLAN, 46 Yeramba Street, Turramurra, N.S.W. 2074.
D.A. MEAD, 38 Manor Road, Wendover, Aylesbury, Bucks HP22 6HN, England.

INSECTIVORY IN THE FIGBIRD *SPHECOTHERES VIRIDIS*

R.W. JOHNSON

The diet of the Figbird *Sphecotheres viridis* is usually described as consisting largely or wholly of various fruits, notably figs *Ficus* spp. (e.g. Blakers *et al.* 1984, Chapman 1976). This is reflected in the common name. Vieillot (1816), when describing the type specimen collected at Kupang, Timor, named the genus *Sphecotheres*, which means "wasp hunter" (Macdonald 1987). Unfortunately, Vieillot did not give an explanation for this description.

In a review of the diet of Australian birds, Barker & Vestjens (1991) list only two references to non-plant food material for the Figbird (subspecies *vieilloti*). These are a record of "insects", from 1881, and a remarkable capture of a young Eastern Blue-tongued Lizard *Tiliqua scincoides* (for more details see Tester 1973). Subsequently, Chafer (1992) described Figbird predation of Christmas Beetles (Coleoptera) at Primbee, NSW (34°30'S, 150°53'E), and noted several references in the literature to insectivory in this species. He suggested that this is a secondary feeding strategy employed when fruit is in short supply, when insects are locally superabundant, or when protein is required for nestlings. The present note documents two incidences of Figbird predation of locally abundant insects.

On 20 January 1989, at Townsville, Qld (19°16'S, 146°49'E), two Figbirds were seen to feed on flying alates of the Green Tree Ant *Oecophylla smaragdina* which were emerging from nests in *Bougainvillea* shrubs. The Figbirds showed unexpected skill in capturing alates on the wing. Rainbow Bee-eaters *Merops ornatus*, Common Mynahs *Acridotheres tristis* and House Sparrows *Passer domesticus* accompanied the Figbirds in taking flying ants.

In April 1991, a flock of Figbirds was observed feeding on caterpillars (Lepidoptera) infesting a Poinciana Tree *Delonix regia* at Murwillumbah, NSW (28°20'S, 153°24'E). Most caterpillars were taken by foliage gleaning. Some were snatched from foliage by hovering birds, while others which were suspended on silk threads were taken in the air or from the ground. The flock visited the tree for three days, the visits apparently ceasing when the supply of caterpillars was exhausted. On one occasion a Figbird was seen to drive away a Noisy Miner *Manorina melanocephala* which attempted to feed in the tree. G. Riordan (pers. comm.) has observed similar behaviour in Poinciana trees at his home in nearby Terranora, describing it as an annual event.

These observations, and those of Chafer, suggest that the Figbird is a capable predator of insects, employing a variety of hunting techniques. The importance of insects in the diet of the Figbird may be underestimated.

Although many frugivores and nectarivores feed insects to their young, the Murwillumbah observations occurred outside the main breeding period for the Figbird in this area (Pratt 1968, Simpson & Day 1989). Furthermore, Woodall (1980) detailed numerous fruits and no insects being fed to nestlings, while Crouther & Crouther (1984) recorded only one instance of an insect in nestling diets.

Predation of caterpillars and ants may represent an opportunistic exploitation of an abundant and easily captured food source. The ability to exploit such food sources may be a strategy for dealing with an irregular supply of fruits, and thus provide an alternative to migration or nomadism. Pratt (1968) found that Figbirds banded at Murwillumbah were mostly sedentary. Previous descriptions of the diet of the Figbird are possibly biased by the inclusion of observations at fruit trees, where the species is often present in conspicuously large and noisy flocks. Such sites would be very useful to collectors; see, for example, Gould's (1972) account of Macgillivray's collection of specimens of *S. flaviventris* (syn. *S. viridis*, Ford 1975). The gut contents of such specimens would reflect the collection site.

It has been suggested to me (and inferred by Macdonald) that the genus was so named in the belief that the bird was feeding on wasps associated with figs. While this may be the case, it is interesting to speculate on the possibility that the early specimens from Kupang were seen to feed on *Oecophylla* alates. This ant is widespread in Indonesia and these large alates could be confused with wasps. Interestingly, Coates (1990) states that Figbirds feed on flying ants in Papua New Guinea, where *Oecophylla* also occurs, but he does not identify the species involved.

ACKNOWLEDGEMENTS

I thank P. White of the RAOU and W. Boles of The Australian Museum for their assistance with reference material.

REFERENCES

BARKER, R.D. & VESTJENS, W.J.M. 1991. *The Food of Australian Birds. 2. Passerines*. Lyneham: CSIRO.

BLAKERS, M., DAVIES, S.J.J.F. & REILLY, P.N. 1984. *The Atlas of Australian Birds*. Melbourne: Melbourne University Press.

CHAFER, C.J. 1992. Notes on the distribution of and insectivory in the Figbird *Sphecotheres viridis* in the Illawarra and Shoalhaven Regions of New South Wales. *Aust. Bird Watcher* 14: 282–285.

CHAPMAN, G. 1976. Figbird. In *Reader's Digest Complete Book of Australian Birds*, p. 458. Sydney: Reader's Digest.

CROUTHER, M.M. & CROUTHER, M.J. 1984. Observations on the breeding of Figbirds and Common Koels. *Corella* 8: 89–92.

COATES, B.J. 1990. *The Birds of Papua New Guinea including the Bismarck Archipelago and Bougainville.* Vol. 2 *(Passerines).* Alderley: Dove Publications.

FORD, J. 1975. Systematics and hybridization of Figbirds *Sphecotheres. Emu* 75: 163–171.

GOULD, J. 1972. *Handbook to the Birds of Australia* (reprint). Melbourne: Lansdowne.

MACDONALD, J.D. 1987. *The Illustrated Dictionary of Australian Birds by Common Name.* Sydney: Reed.

PRATT, E.K. 1968. Notes on the Southern Figbird. *Aust. Bird Bander* 6: 56–57.

SIMPSON, K. & DAY, N. 1989. *Field Guide to the Birds of Australia* (2nd edn). South Yarra: Viking O'Neill.

TESTER, D. 1973. Honeyeaters and reptiles. *Birds* (Sydney) 7: 79.

VIEILLOT, L.P. 1816. *Analyse d'une Nouvelle Onithologie Elementaire.* Paris: A. Belin.

WOODALL, P.F. 1980. Communal breeding in the Figbird. *Sunbird* 11: 73–75.

R.W. JOHNSON, Box 90, University of Queensland Gatton College, Lawes, Q 4343.

INSTRUCTIONS TO AUTHORS

The Sunbird is published quarterly by the Queensland Ornithological Society to further the knowledge of birds in Queensland and adjacent northern regions of Australia.

Papers are invited from non-members as well as members on all aspects of ornithology, e.g. life history, taxonomy, distribution, behaviour, and ecology. Articles may take the form of major articles on specific birds, birds in specific areas or habitats, or short notes on either birds themselves or the literature on birds, such as reviews of books or comments on published articles.

Submission of a paper implies that the results reported have not been published and are not being considered for publication elsewhere. The editor reserves the right to submit records of rare birds to the Records Appraisal Committee of the Royal Australasian Ornithologists Union.

Manuscripts can be supplied on floppy disk (IBM or MACINTOSH systems using plain text 'ASCII format') or in typed form on paper. When typed, the manuscript should be double-spaced and two copies sent. Papers longer than four typed A4 pages should have a summary. If needed, help may be given to authors to find relevant literature. Common names, scientific names and order of names should follow 'Recommended English Names for Australian Birds', in *The Emu* Volume 77, Supplement, 1978. Intending authors should consult recent issues of *The Sunbird* to see acceptable forms of contributions.

References should be listed in alphabetical order at the end of papers in the following styles; titles of journals will be abbreviated as in the *World List of Scientific Periodicals:*

FLEAY, D.H. 1937. Nesting habits of the brush turkey. *Emu* 36: 153-163.

FRITH, H.J. (Ed.). 1976. Mallee fowl. In *Complete Book of Australian Birds*, pp. 136-137. Sydney: Reader's Digest.

SERVENTY, D., SERVENTY, V.N. & WARHAM, J. 1971. *The Handbook of Australian Sea-birds*. Sydney: Reed.

SLATER, P. 1970. *A Field Guide to Australian Birds. Non-Passerines.* Adelaide: Rigby.

Tables and Figures should be numbered with Arabic numerals. Drawings and diagrams should be in Indian Ink on cartridge paper or tracing cloth. If authors cannot arrange suitable drawings, the editor may arrange the drawing of figures and diagrams. Authors may submit photographs (preferably black and white) with their manuscripts.

Reprints are not supplied gratis. Authors may order reprints within one month after publication.

Manuscripts should be sent to:

The Editor, The Sunbird, Queensland Ornithological Society Inc.,
P.O. Box 97, St. Lucia, Queensland, 4067.