

Historical insight on the Topknot Pigeon *Lopholaimus antarcticus* in the Illawarra rainforests through the 20th Century

Matthew Mo¹ and David R. Waterhouse²

¹NSW Department of Primary Industries, Elizabeth Macarthur Agricultural Institute, Woodbridge Road, Menangle NSW 2568, email: matthew.mo@dpi.nsw.gov.au

²Oatley Flora and Fauna Conservation Society, PO Box 52, Mortdale NSW 2223

ABSTRACT

Once seen in flocks of thousands, the 20th Century was a testing period for the Topknot Pigeon *Lopholaimus antarcticus*. Bountiful numbers of this frugivorous bird relied on large expanses of habitat to provide a steady supply of fruiting trees. The Illawarra rainforests, already ravaged by clearing in the 1800's, was reduced to what is today less than five percent of its original area. In response, the super-flocks became scarce in the early part of the 20th Century. While they were able to adapt by feeding off paddock rainforest trees, another trial came in the form of extensive shooting for their meat. This paper describes the relationship of people with the Topknot Pigeon in the Illawarra through eyewitness accounts from the last century. There is a particular focus on the persevering culture of shooting and the endeavours to eliminate this.

Key words: flock size, frugivorous bird, game meat, habitat fragmentation, historical notes, shooting

DOI: <http://dx.doi.org/10.7882/AZ.2015.003>

Introduction

In the early 20th Century, flocks of Topknot Pigeons *Lopholaimus antarcticus* (Fig. 1) in their thousands were not uncommon (Crome and Shields 1992). Their gregarious nature (Frith 1957) is in stark contrast to most other large rainforest pigeons, for example, the Wonga Pigeon *Leucosarcia melanoleuca* and Brown Cuckoo-dove *Macropygia amboinensis*, which are often solitary or in small groups (Favaloro 1931; Pizzey *et al.* 2007). They were consequently referred to as “Flock Pigeons” (J. Smith, pers. comm). To some, their bountiful numbers may have reduced their perceived value.

Today, flocks of hundreds of Topknot Pigeons in the Illawarra are a mere memory, let alone thousands. As early as the 19th Century, the Illawarra rainforests were recognised as an important stronghold for the Topknot Pigeon (Gould 1848). This geographical region is a significant portion of the species' distribution, being the southern limit of where resources allowed for sizeable flocks (Pizzey *et al.* 2007; Waterhouse 2001). Since Gould's (1848) time, the Illawarra has been subject to substantial landscape changes, including the clearing of rainforests and their fragmentation (Strom 1977).

This paper examines the relationship between Topknot Pigeons and the development of the Illawarra through the 20th Century. In particular, we describe eyewitness accounts of the decline of thousand-strong flocks, the culture of shooting pigeons for food and the efforts by some to abolish it.

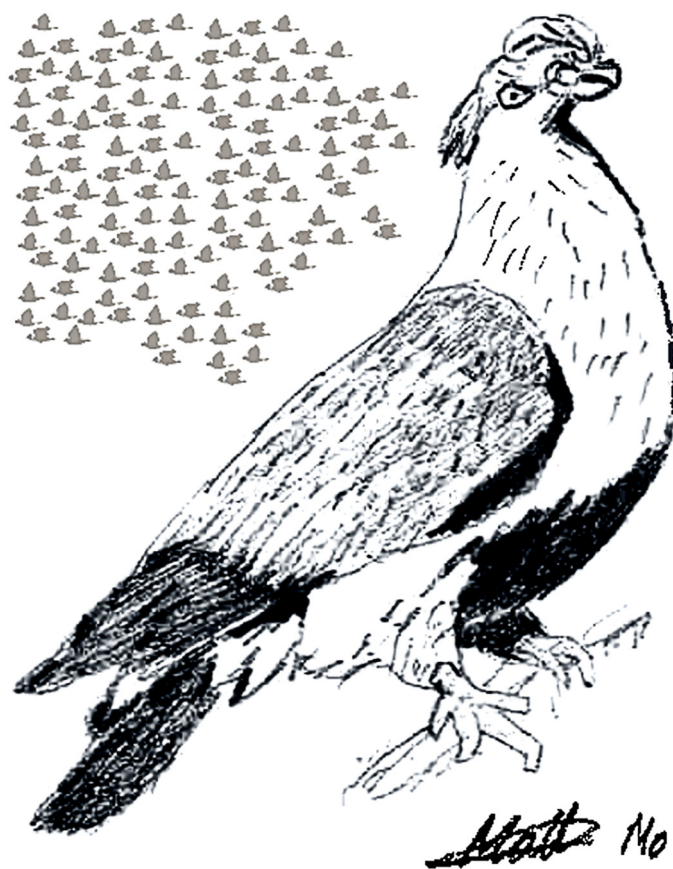


Figure 1. The Topknot Pigeon, a frugivorous bird that lives in nomadic flocks – once numbering in the thousands. Illustration, M. Mo.

Correspondents and their background

Historical insights were collected in informal interviews conducted during one of the author's (DRW) field study on the diet of the Topknot Pigeon (Waterhouse 2001). The most extensive insights were collected from Joe Smith, whose knowledge extended back to the 1910's, and Darren Roso, whose knowledge encompassed the 1970's and 1980's. Joe Smith, a dairy farmer, was interviewed on 19 March 1989. He was 76 years old at the time and had lived all his life on the northeastern slope of Stockyard Mountain near Albion Park, south of Wollongong. From the detailed nature of his insights, we are prompted to believe that Smith was himself a shooter, although no personal claims of pigeon hunting were made.

Darren Roso, a seasonal ranger with the NSW National Parks and Wildlife Service, was interviewed on 14 January 1989. In his 20's at the time of communication, he lived on a small acreage near Albion Park, south of Wollongong. The bulk of information collected from this interview was based on experiences around his home in the 1970's and 1980's. We made contact with Roso again while preparing this paper, thereby collecting further insight on the decline of pigeon hunting through the 1990's.

Additional information was provided by Albert Ring, who lived in the Illawarra from the early 1900's, and David Walsh, whose knowledge traces back to the 1920's. Ring, an ex-Mount Kembla miner, was interviewed on 17 February 1990. He was 83 years old at the time and lived most of his life on his small farm off Mount Keira Road.

Walsh, a former warden of the Mount Keira Scout Camp, was in his early seventies when he was interviewed in 1989.

Table 1. The maximum flock sizes observed by six authors working in different locations across the Topknot Pigeon's distribution.

| Publication | Time of study | Locality concerned | Maximum flock size reported |
|-----------------|---------------|---------------------------------------|-----------------------------|
| Gilbert 1936 | 1910's-1930's | Tambourine Mt, QLD to Bulli, NSW | 300 |
| Favaloro 1931 | 1930 | Macpherson Range, S.E. QLD | "... several hundred" |
| Crome 1975 | 1970-1973 | Lacey's Creek-Mission Beach area, QLD | 20 |
| Innis 1989 | 1979-1984 | Jimna & Conondales Ranges, S.E. QLD | 198 |
| Waterhouse 2001 | 1988-1992 | Illawarra rainforests | 130 |

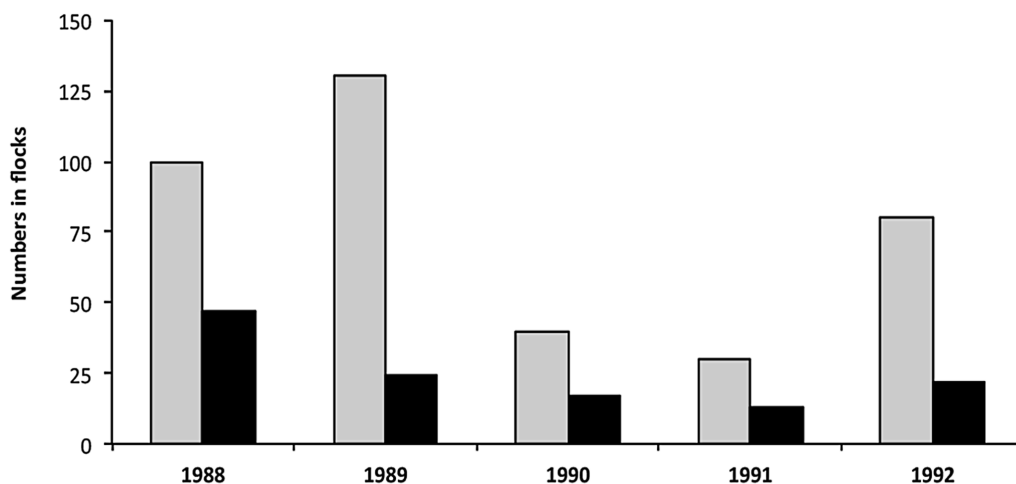


Figure 2. A comparison between maximum flock sizes (black) and mean flock sizes (grey) recorded by Waterhouse (2001).

His knowledge extends back to 1941, when he first took residence at the scout camp. Strom (1977) credits Walsh for the conservation of the Mount Keira rainforest area.

Habitat loss and the decline of the super-flocks

Prior to scientific examination, the most outstanding aspect of the Topknot Pigeon's ecology had been its substantial flock sizes. In the 1800's, an average flock numbered up to 5000 (Gould 1848; Crome and Shields 1992). By the turn of the century, the decline of the super-flocks was occurring in many parts of its distribution (Gilbert 1936), which extends over most of the Queensland and New South Wales (NSW) coastline (Pizzey *et al.* 2007).

Table 1 shows the maximum flock sizes reported by five authors in their studies in different geographical regions. Even as early as the 1910's, large flocks were in the range of hundreds, rather than thousands. Gilbert (1936) was unable to locate a flock greater than 300, comparing his experiences to that of Gould (1848) who described them as particularly abundant. Joe Smith recalled smaller flocks of 20 to 30 birds in the Illawarra rainforests in the 1920's, although Favaloro (1931) was still able to encounter flocks of hundreds a decade later in the Macpherson Range, Queensland. It should be noted that the Topknot Pigeon has apparently always been more abundant in the northern part of its range (Gilbert 1936). They can still be seen in flocks of hundreds at one locality north of Lismore (H. Recher, pers. comm).

Flock sizes reported in literature dwindled substantially in the latter half of the century, despite the inclusion of studies from Queensland (Crome 1975; Innis 1989). The



Figure 3. A remnant Cabbage Tree Palm *Livistona australis* in an open paddock cleared for dairy farming. The height of the tree gives an indication of the height of the former rainforest. Photo, A. Fox.

Topknot Pigeon was the rarest of seven fruit pigeons studied by Crome (1975) between 1970 and 1973 in the Lacey's Creek and Mission Beach area of northern Queensland. By 1989 in the Illawarra, Joe Smith was only seeing large flocks in the vicinity of 50 birds. He stated that a flock of 100 was unusual by this time, supported by Waterhouse's (2001) highest count of 130 across a five-year study period in the Illawarra rainforests. Figure 2 compares maximum with mean flock sizes, showing that the largest flocks (>75 birds) were unusual occurrences (Waterhouse 2001).

Declines in bird populations along the east coast of Australia have long been attributed to habitat loss (Howe *et al.* 1981; Keast 1995). Rainforest species are believed to be more susceptible than species from other habitats (Diamond 1973; Willis 1974; Leck 1979). In a NSW context, remnant rainforest covers less than half of its original range (Goldstein 1977). Clearing of rainforest in the Illawarra was severe in the early 1800's, and by 1931, Strom (1977) had already seen much of the Illawarra rainforests reduced to small fragments. First, sections of

rainforest were clear-felled for timber, which opened up the land to agriculture, mainly dairy farming (Fig. 3), and then urban sprawl. Today, only about five percent of its historical area remains (Angel *et al.* 1985).

The link between the extensive clearing of rainforest and the reduction of flock sizes is not formally validated by data. However, it is logical to suppose that a nomadic gregarious bird with a diet comprising of seasonal rainforest fruits (Frith 1957) would require broad expanses of habitat to maintain high densities. Historically, the Illawarra boasted an extensive combination of lowland rainforest on the coastal plain and warm-temperate rainforest on the escarpment slopes (Strom 1977). Gould (1848) associated the abundance of the Topknot Pigeon in the region with the year-round availability of fruiting trees, possibly a function of such habitat diversity. It now seems the dwindled Illawarra rainforests (Mills 1988; Dunstan and Fox 1996) are unable to produce substantial quantities of fruit over winter, especially considering many trees do not fruit reliably each year (Waterhouse 2001). By the 1980's, sightings of Topknot pigeons in rainforest remnants less than 1 ha in size were rare (Howe *et al.* 1981).

Exploitation of paddock trees by Topknot Pigeons

In the midst of losing natural habitat, these frugivorous birds did show some adaptability to a changed landscape. Joe Smith observed Topknot Pigeons feeding in fruiting trees on his Stockyard Mountain property between the 1910's and 1980's. The open paddocks contained Moreton Bay Figs *Ficus macrophylla*, one of which was planted in the 1910's, and a single Deciduous Fig *F. henneana*. Topknot Pigeons, Satin Bowerbirds *Chlamydera violaceus*, and Grey-headed Flying Foxes *Pteropus poliocephalus* were his most poignant memories of visitors to both species of fig. Close by at Albion Park, Darren Roso also observed isolated Moreton Bay Figs being used as feed trees. Topknot Pigeons were mainly present in peri-urban areas from October to March.

According to Smith, there was some investment by private landholders toward replanting rainforest tree species, though this was not necessarily motivated out of concern for biodiversity. Fig trees were valued as a source of shade for livestock, according to Smith. Soil would be placed in the hollow section of old stumps that were aged or burnout. Fig seedlings were subsequently planted, with the stump providing protection from being consumed by cattle. Seedlings or rooted cuttings were presumably obtained from nearby rainforest gullies. Smith noticed that Topknot Pigeons frequently visited these trees when in fruit. At the time, it had been surprising to see them feeding in a non-forested area. On several occasions, Smith also found them roosting in taller trees near the fruiting tree. Likewise, Roso confirmed that Topknot Pigeons had roosted in a tall White-topped Box *Eucalyptus quadrangulata* on his acreage.

Both Smith and Roso noticed an apparent absence of Topknot Pigeons in the peri-urban areas in the last five years prior to their interviews, essentially the mid- and late 1980's.

A persevering culture of shooting

The shooting of Topknot Pigeons has a history tracing back to the early European explorers who hunted them for food (D. Davis, pers. comm). They were an obvious target being a large bird, up to 46 cm in length (Pizzey *et al.* 2007), and occurring in bountiful flocks, reassuring that a shot fired into a flock could at least yield one kill. Many authors in the 20th Century drew reference to large numbers being shot, (e.g. Gilbert 1936; Frith 1952). Frith (1952) noted that higher rates of shooting were observed in coastal rainforest pockets than areas of the hinterland that were less accessible, possibly a pattern that occurred in the Illawarra rainforests.

Smith remembered his brother and other local men shooting Topknot Pigeons from the 1910's to 1930's. He recalled in 1918, a Stevens single-barreled shotgun being purchased for only twenty-five shillings – a relatively small investment for a regular supply of game meat. Onwards into the 1970's and 1980's, shooting was an established cultural component of the Albion Park community, according to Darren Roso and Albert Ring.

Roso provided insight of the community of shooters in Albion Park. They were of Italian and German descent and aged 50 years or older. There had also been several generations of Anglo-Celtic Australians in the district who had hunted the Topknot Pigeons. Shooting parties typically took 25 birds apiece, sometimes killing a hundred between them. In addition, many birds were wounded. Roso had the opportunity to examine some shot birds before they were collected and found that about a quarter of casualties were immature animals.

Insight into the shooters' methods

Joe Smith gave extensive details of how hunting parties were organised. Typically four or five people were involved, positioning themselves in the rainforest at different fruiting trees before dawn. In his experience, Topknot Pigeons in the Illawarra customarily fed in the early morning, echoing Frith's (1952) observations from northern NSW, where feeding consistently ended before 1000 h. One person would approach the pigeons in their first feed tree and commence firing, frightening the survivors who would circle in the air, then settle at another fruiting tree to resume feeding. In this way, other shooters who could be up to 200 to 400 m away would have the same opportunity. Smith likened the arrangement to that of duck shooters targeting their quarry in different dams in western NSW.

Alternatively, the shooters had prior familiarity with each fruiting tree, which were identified through a numbering system. Like in the above arrangement, shooters would be fixed at each feed tree. David Walsh, a repressor of shooting activity, described how a sentry carrying a whistle would be positioned on a ridge and watch the flocks fly into the vicinity. The sentry had a clear view over the canopy quite similar to one Frith (1957) used to survey Topknot Pigeons at his study site. The sentry would indicate to the shooters which tree the pigeons were settling upon by sounding a particular number of notes through the whistle. For example, three whistle

blasts would denote the birds were ascending upon "Tree 3". When the pigeons were shot at, they would fly up and hover in the air as a flock. They soon settled into another tree, which the sentry would again direct the party by sounding the corresponding number of notes.

The pigeons were easily located in a number of ways. Feeding activity is boisterous, with up to eight birds targeting the same clump of fruits, frantically beating their wings for balance (Gould 1848; Frith 1952). The sound of them feeding would have been audible to shooters several hundred metres away. Even their defecation could also be heard from a far distance, especially when the pigeons had fed on fruits with large seeds (e.g. Cabbage Tree Palm *Livistona australis*) (Waterhouse 2001). To Frith (1952), the sound of excreted seeds pelting onto the undergrowth resembled pistol shots. The Topknot Pigeon's sitting trees typically accumulated thick layers of droppings and excreted seeds at the base, sometimes several cms deep (Frith 1952). Hence, even when the birds had moved on, they left noticeable clues for the shooters.

Smith recalled one particular individual with his own personal method. In the 1920's, this man would survey the trees on the ridgetop for the pigeons with a telescope from the verandah of the old Commercial Hotel in Albion Park. If they were present, he would wait on the top of the ridge before dawn the next day and shoot the birds as they flew over in flocks. According to Smith's communication with this man, these techniques were adapted from surveillance and hunting methods used by the local indigenous people in pre-settlement times. Unlike today, this ridgetop was relatively clear in the 1920's, except for some thistles and native raspberries.

From Smith, we also have some technical insight. Two birds could be killed with one shot and a third if the shooter had a double-barreled shotgun with which to release a second shot as the startled flock dispersed. The most efficient single shots Smith had witnessed killed and wounded five to nine birds. He described the Topknot Pigeons as "tough, not always easy to kill". A shooting distance of 20 m from a flock was considered ideal. Number 2 shot, a heavier shot, with full choke was used for pigeons elevated high off the ground. Birds on a low perch or in trees growing in a gully with the shooter at a more level position were targeted with number 4 shot with modified choke. For close targets, number 6 shot could be applied.

The Topknot Pigeon as food

One perspective that we obtained from Joe Smith's account was that the Topknot Pigeon, while perhaps a significant target for its large size and gregarious nature, was only one of many avian species targeted for game meat. He particularly recalled bowerbirds and parrots also being collected.

Despite the use of shotguns, casualties rarely sustained more than 10 pellets and these were removed before cooking. A similar reference to pigeons being used in pies from overseas is found in Berton (2001). Smith provided a brief description of how the pigeons were prepared – after being plucked in like manner as for a chicken, their meat was used as the main ingredient for the filling in an

oven-baked pie. The wing and breast muscles were quite large compared to the Domestic Pigeon *Columba livia domestica*. Generally, one or two birds could feed a single adult in one sitting.

The taste of Topknot Pigeon meat was variable. According to Albert Ring, it tasted good if the birds had been feeding on figs, but had a tougher taste if they had fed on the fruit of the Cabbage Tree Palm, which he referred to as “marbles”. Smith compared the taste to domestic figs, but reflected Ring’s comment of inconsistency based on recent feeding pattern. Smith mostly described the colour and texture as “red and stringy”, but said the thigh meat was white and often tender and sweet. In comparison, he found the Wonga Pigeon to have white flesh and contain more meat.

Roso interpreted the taste to be similar to Camphor Laurel *Cinnamomum camphora*, an invasive weed. Elsewhere, such as on the NSW North Coast bioregion, the fruit of this exotic tree has been identified as an important component of the winter diet (Date and Recher 1988; Recher *et al.* 1995; Date *et al.* 1996). Innis (1989) documented Topknot Pigeons dispersing from the rainforest in search of Camphor Laurel during the mid- to late dry season in southeastern Queensland, following on from Frith (1982).

Endeavours to prevent further hunting

At the beginning of the 20th Century, all species of pigeons were protected in NSW under the Birds Protection Act 1901. Under this legislation, any persons found to have willfully killed or injured any species listed in the schedule were liable to a penalty up to five pounds. This act was repealed by the Birds and Animal Protection Act 1918, which aimed to amalgamate the objectives of both the Birds Protection Act 1901 and the Native Animals Protection Act 1903. Although the penalty for killing a scheduled species was elevated fourfold, the schedule was less exhaustive than its predecessors. Pigeons ceased to be protected species for a period of 30 years until the introduction of the Fauna Protection Act 1948.

Although pigeons were not protected between 1918 and 1948, two correspondents recalled witnessing authorities taking measures against hunting in the Illawarra rainforests within this period. According to Joe Smith, in the 1920’s, a policeman would occasionally ride up a ridge on horseback and ask anyone present if they had heard any shooting. The policeman rarely obtained any information and most shooters apparently ascertained his movements before setting off to hunt. Albert Ring remembers another policeman, based in the suburb of Figtree in the 1930’s, who would check on shooters and was successful in arresting some. Although Smith and Ring both attributed these incidents to authorities targeting pigeon shooters, it is more likely that these policemen were actually patrolling for offences committed against the few species that were listed under the Birds and Animal Protection Act 1918. Although our examination of the legislation shows that killing the Topknot Pigeon was legal at this time, perhaps some of these shooters may not have been aware of the legality of shooting.

Native pigeons have been protected under NSW legislation since the introduction of the Fauna Protection Act 1948, now superseded by the National Parks and Wildlife Act 1974. In spite of this, a culture of hunting had apparently continued for at least a further 30 years. David Walsh, as the scout camp warden, personally prevented “a lot of shooting” in the 1950’s and 1960’s by confrontation. By the 1980’s, Ring was noticing shooters using rifles with silencers, which may represent an increasing fear of prosecution. According to Roso, the hunting of rainforest pigeons in the Illawarra had largely died out sometime in the 1990’s, however we do not have corroboration from other sources to verify this. He links the demise of shooting to pressure brought upon by younger generations of immigrants and the reduction in numbers of the Topknot Pigeon and other target species.

Smith drew our attention to another obstacle for shooters, which was birthed in 1910. In this year, *Lantana camara* was said to have been introduced to the Illawarra by a Kiama resident identified as Gray. The first major spread occurred in the mid-1920’s, before which large figs in the rainforest could be easily approached. By the 1980’s, sections of the invasive plant had become so extensive, shooters experienced difficulty reaching the base of fruiting trees. Their attention was diverted to feed trees either planted in open paddocks or at the edges of the rainforest where there were few *Lantana* thickets.

Darren Roso had been informed that Topknot Pigeons were very wary in the early part of the 20th Century, both in the forested or modified areas. Their shyness was believed to be in response to extensive shooting. By the 1970’s, he had started to witness them feeding in the urban environment and not dispersing when people were present. The same observations were repeated by Waterhouse (2001) in the 1990’s. This reduced sensitivity to human activity may be an indication of a decline in shooting during this era.

Concluding thought

Fauna conservation is sometimes simplified as a matter of whether species remain present or become absent. However, it is important to consider that the state of a common animal we see today may not have always been that way. The Topknot Pigeon represents an extant species that is not listed by any system as threatened, but can no longer be seen in its former glory in many parts of its range. Their abundance in NSW did not significantly improve between 1977-1981 and 1998-2002 according to data analysis of the Atlas of Australian Birds (Barrett *et al.* 2007). While extensive shooting occurred for much of the 20th Century (Frith 1982; Date *et al.* 1996), the depletion of these activities into this century may alleviate pressure on Topknot Pigeon populations. Although the loss of former habitat (Strom 1977) may be a permanent fixture in the Illawarra, there is a significant feeding opportunity in the proliferation of native and exotic feed trees. Date *et al.* (1991, 1996) found that population recovery in the NSW North Coast bioregion was closely associated with the spread of Camphor Laurel. However, we suggest significant restoration of rainforest areas is likely to be needed for the revival of the super-flocks.

Acknowledgements

Upmost respect is given to Joe Smith, Darren Roso, Albert Ring and David Walsh whose insights are the basis of this paper. We are glad to publish their part in Australian

ornithological history. Useful comments by Harry Recher, Brad Law and an anonymous reviewer improved the manuscript.

References

- Angel, J., Raymond, A. and Richie, R. (eds.) 1985. *Discovering New South Wales Rainforests*. Total Environment Centre and Rainforest Publishing, Sydney.
- Barrett, G.W., Silcocks, A.F., Cunningham, R., Oliver, D.L., Weston, M.A. and Baker, J. 2007. Comparison of atlas data to determine the conservation status of bird species in New South Wales, with an emphasis on woodland-dependent species. *Australian Zoologist* 34: 37-77. <http://dx.doi.org/10.7882/AZ.2007.003>
- Berton, P. 2001. *The Great Depression: 1929-1939*. Anchor Canada, Toronto.
- Crome, E.H.J. 1975. The ecology of fruit pigeons in tropical northern Queensland. *Australian Wildlife Research* 2: 155-185. <http://dx.doi.org/10.1071/WR9750155>
- Crome, E.H.J. and Shields, J. 1992. *Parrots and Pigeons of Australia*. Angus and Robertson, Sydney.
- Date, E.M., Ford, H.A. and Recher, H.F. 1991. Frugivorous pigeons, stepping stones and weeds in northern New South Wales. Pp. 241-245 in *Nature Conservation 2: The Role of Corridors*, edited by D.A. Saunders and R.J. Hobbs. Surrey Beatty & Sons, Chipping Norton, NSW.
- Date, E.M. and Recher, H.F. 1988. The role of rainforest remnants in nature conservation. Pp. 26-30 in *Rainforest Remnants*, edited by S. Phillips. NSW National Parks and Wildlife Service, Lismore.
- Date, E.M., Recher, H.F., Ford, H.A. and Stewart, D.A. 1996. Conservation biology of rainforest pigeons in northern New South Wales. *Pacific Conservation Biology* 2: 299-308.
- Diamond, J.M. 1973. Distributional ecology of New Guinea birds. *Science (Washington D.C.)* 179: 759-769.
- Dunstan, C. and Fox, B. 1996. The effects of fragmentation and disturbance of rainforest on ground-dwelling small mammals on the Robertson Plateau, New South Wales, Australia. *Journal of Biogeography* 23(2): 187-201. <http://dx.doi.org/10.1046/j.1365-2699.1996.d01-220.x>
- Favaloro, N.J. 1931. Notes on a trip to the Macpherson Range, south-eastern Queensland. *Emu* 31(1): 48-59. <http://dx.doi.org/10.1071/MU931048>
- Frith, H.J. 1952. Notes on the pigeons of the Richmond River, NSW. *Emu* 52: 89-99. <http://dx.doi.org/10.1071/MU952089>
- Frith, H.J. 1957. Food habits of the Topknot Pigeon. *Emu* 57: 341-345. <http://dx.doi.org/10.1071/MU957341>
- Frith, H.J. 1982. *Pigeons and Doves of Australia*. Rigby, Brisbane.
- Gilbert, P.A. 1936. The Topknot Pigeon. *Emu* 35: 301-312. <http://dx.doi.org/10.1071/MU935301>
- Goldstein, W. 1977. Postscript – management implications. Pp. 99-103 in *Parks and Wildlife Vol. 2 No. 1 – Rain Forests*, edited by W. Goldstein and A. Fox. NSW National Parks and Wildlife Service, Sydney.
- Gould, J. 1848. *The Birds of Australia. Volume 5*. Gould, London.
- Howe, R.W., Howe, T.D. and Ford, H.A. 1981. Bird distributions on small rainforest remnants in New South Wales. *Australian Wildlife Research* 8: 637-651. <http://dx.doi.org/10.1071/WR9810637>
- Innis, G.J. 1989. Feeding ecology of fruit pigeons in subtropical rainforests of south-eastern Queensland. *Australian Wildlife Research* 16: 365-394. <http://dx.doi.org/10.1071/WR9890365>
- Keast, A. 1995. Habitat loss and species loss: the birds of Sydney 50 years ago and now. *Australian Zoologist* 30(1): 3-25. <http://dx.doi.org/10.7882/AZ.1995.002>
- Leck, C.F. 1979. Avian extinctions in an isolated tropical wet-forest preserve, Ecuador. *Auk* 96: 343-352.
- Mills, K. 1988. The clearing of the Illawarra rainforests: problems in reconstructing pre-European vegetation patterns. *Australian Geographer* 19(2): 230-240. <http://dx.doi.org/10.1080/00049188808702962>
- Pizzey, G., Knight, F. and Menkhorst, P. 2007. *The Field Guide to the Birds of Australia*. 8th edition. Harper Collins, Sydney.
- Recher, H.F., Date, E.M. and Ford, H.A. 1995. *The Biology and Management of Rainforest Pigeons in New South Wales*. Species Management Report No. 16. NSW National Parks and Wildlife Service, Sydney.
- Strom, A. 1977. On the Illawarra. Pp. 13-17 in *Parks and Wildlife Vol. 2 No. 1 – Rain Forests*, edited by W. Goldstein and A. Fox. NSW National Parks and Wildlife Service, Sydney.
- Waterhouse, D.R. 2001. Observations on the diet of the Topknot Pigeon *Lopholaimus antarcticus* in the Illawarra rainforest, New South Wales. *Corella* 25(2): 32-28.
- Willis, E.O. 1974. Populations and local extinctions of birds on Barro Colorado Island, Panama. *Ecological Monographs* 44: 153-169. <http://dx.doi.org/10.2307/1942309>