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## AGEING, SEXING AND PLUMAGE OF THE AUSTRALIAN KOEL *Eudynamys cyanocephala*

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Detailed descriptions of the juvenile, immature and adult plumages are given based on information from captive birds and museum specimens. Young birds can be sexed by the wing coverts over the patagium, which are black in males and black with buff or white tips in females.

### INTRODUCTION

The Australian Koel *Eudynamys cyanocephala* in most modern texts (e.g. Condon 1975) is considered to be a subspecies of the Common Koel *E. scolopacea*. I prefer to follow White and Bruce (1986) and consider that the differences in the plumage colours of the females, juveniles and immatures and in the host strategies warrant specific rank. The hosts of *scolopacea* are corvids *Corvus* spp. which are capable of raising the young Koel nestling as well as their own. The Koel nestling does not oust the host nestlings but actually mimics them in that the nestling (juvenile) plumage is blackish like that of their hosts (Ali and Ripley 1969). The hosts of *cyanocephala*, on the other hand, are mainly large honeyeaters such as friarbirds *Philemon*, wattlebirds *Anthochaera*, orioles *Oriolus*, Figbirds *Sphecotheres viridis* and Magpie-larks *Grallina cyanoleuca*. When using these hosts, the nestling Koel throws out the host's eggs or nestlings. There are several species of *Corvus* available as hosts in Australia so if the Australian Koel and the Common Koel were the same, they would

be expected to parasitize the same type of hosts and for their nestlings to behave in the same way.

There are no published detailed plumage descriptions of the Australian Koel other than of the adult male; descriptions of the adult female are incomplete or misleading. This may be partly because, until recently, there have been very few specimens of young birds in museum collections. The reason that there are more now, at least from Sydney, is that in the last 20 years the Red Wattlebirds *Anthochaera carunculata* have been nesting in Sydney suburbs and the Koels have followed to parasitize them (C. N. Smithers, pers. comm.). In the southern Sydney suburbs, the Little Wattlebird *A. chrysoptera*, which has always nested round Sydney, has also in the last 20 years become an important host (J. Francis, pers. comm.). Young birds just out of the nest are frequently hit by vehicles or caught and injured by cats. If injured they may be taken to a zoo or wildlife rehabilitators, or if dead to a museum. Slater *et al.* (1989) illustrated a juvenile Koel, but not the intermediate plumage before obtaining adult plumage.

## METHODS

This work is based on observations of adult and young Koels in cages at Taronga Zoological Park, Sydney. Observations were made, when possible, at weekly intervals in 1986 and 1987, except for the period May–August 1986. Notes were made and photographs were taken of the birds for comparison of the various stages, and museum skins were studied to help elucidate the various states of plumage. The birds, being captive, could not migrate, allowing their various plumage changes to be followed. Four young Koels were followed in detail through a year. These had fallen from nests, or been injured and brought to the Zoo. Unfortunately, all four were males, so no young females were observed through to adult plumage. From the examination of fresh dead specimens and skins in the Australian Museum, it appears that females change their plumage in a similar manner to males.

Two young males in 1986 were placed in Cage 81, a fairly large aviary of irregular shape (sides 6.2 m and 13.8 m, ends 6.2 m and 4.2 m); the height was 2.3 m. Two adult female Koels were already in the aviary with several other birds, such as bronzedwing pigeons *Phaps*. These birds were observed from inside or outside the cage with the aid of Zeiss Jena Deltintem 8 × 30 binoculars, which can focus down to 2 m. The Koels were kept under observation until July 1988. The other two young males, from the 1986–87 breeding season, were placed in Cage 91, a slightly smaller aviary than 81 (10 m long, 3.2 m wide and 2.4 m high). Both aviaries contained bushes giving good cover. The birds were caught weekly, and notes and photographs taken until they were released in November 1987.

## RESULTS

### PLUMAGES

In many of the plumage stages, a colour change occurs as the buff sections of the feathers turn paler as they become worn back.

#### Hatchling

Bare, with no down feathers; able to make faint squeaks.

#### Nestling

By the end of Day 4, traces of feathers are visible beneath the skin on the wings and tail. On Day 5, the eyes begin to open, and the feather tracts are obvious on the brow, wing and tail. On Days 7–9, the feathers emerge from the pins, up to 6 mm in length, and the bird is well covered. From this the full juvenile plumage develops (E. S. Hoskin, pers. comm.).

**Upperparts.** *Head* — buff, centre of crown soon obtaining dark immature feathers, so that immature plumage begins to appear before nestling has fledged: *side of face* — initially bare, but black feathers soon emerging, producing a black stripe through eyes and down sides of neck.

**Underparts.** White with narrow brown bars.  
**Wings and tail** — buff with narrow brown bars.

#### Juvenile

Male and female are similar in plumage. The feathers of the rump, uppertail coverts and underparts are loose and fluffy.

**Upperparts.** *Forehead and crown* — pale yellowish buff; *ear coverts and stripe through eye and down sides of neck* — black; *nape* — buff wearing to white, with dark brown bases to feathers; *mantle* — feathers dark brown with broad buff tips; *back* — buff wearing to white, with brown bars; *scapulars* — buff with brown bars, proportion of buff to brown variable, tips wearing back to white; *rump* — pale buff wearing back to dirty white with pale brown bars; *uppertail coverts* — brownish buff.

**Underparts.** *Chin* — feathers white, some with a narrow brown bar; *breast* — whitish with 2–3 brown bars; *belly* — soft, whitish with three brown bars; *undertail coverts* — soft, loose, whitish tinged buff with narrow brown bars.

**Wing.** The wing pattern varies between individual birds. *Primaries, secondaries and tertials* — dark brown, barred with light brown and buff on outer webs and pale whitish on inner webs, tips of feathers buff becoming white with wear; *lesser and median coverts* — buff with dark brown bars, showing individual variation in width of bars and darkness and width of buff. In the male, the lesser coverts on the patagium between the humerus and radius/ulna form a patch of black feathers, which are similar to the adult feathers. In the female, these feathers are dark brown with buff tips, which wear back to white.

**Tail.** Broadly barred with buff to deep buff and brown; bars curved on each web.

### Immature or intermediate plumage

The immature plumage of both sexes is generally similar to that of the adult female.

#### MALE

**Upperparts.** *Forehead* — buff with dark brown bases to the feathers; *crown* — dark blackish with buff tips to feathers; *face from base of bill down sides of neck* — new feathers buff wearing to white to form a white line, below which develops a black malar stripe; *nape and mantle* — dark blackish brown with broad buff tips to feathers, which wear back to white; *scapulars* — dark blackish with buff tips to feathers, which wear back to white; *back* — blackish with white tips to feathers; *rump* — dark brown feathers with whitish buff tips and four spots of buff towards the base; *uppertail coverts* — buff with brown bars.

**Underparts.** The underparts of the young male occur in two forms, one of which is similar to the underparts of some adult females. *Chin* — black; *throat* — (a) black with the centre buff and black, (b) black with centre black with rufous tips to the feathers; *breast* — (a) black with deep buff tips and other feathers buff or white with brown bars, (b) deep rufous similar to an adult female breast, the rufous or buff wearing back to white with narrow black bars underneath the rufous; *belly* — rufous or buff covering black and white bars and wears back to give just black and white bars; *undertail coverts* — pale buff with narrow brown bars.

**Wing.** *Primaries and secondaries* — still juvenile; *lesser coverts* — the juvenile buff coverts on the bend or 'shoulder' soon moult into the blue-black adult type feathers forming a bar across the 'shoulder' and the patagium area acquires more adult type blue-black feathers; *median and rest of coverts* — still juvenile.

#### FEMALE

**Head and upperparts** — similar to immature male, new adult-type black body feathers are like those of male but have white tips; *bar across 'shoulder' of the wing* — black tipped with buff or white tinged with buff, which wears back to white; *underparts* — similar to those of adult female (see description), but brown barring narrow. *Rest of the wings and coverts* — still juvenile.

#### Adult

#### MALE

All blue-black.

#### FEMALE

The plumage of the adult female is very variable in detail, particularly on the head and underparts.

**Upperparts.** *Head* — usually black on the forehead, crown, eye stripe and nape. Variations from this all black condition are (a) a few feathers with narrow buff centres almost forming streaks on the crown and forehead, (b) many long, narrow buff streaks in centre of black feathers, and (c) feathers with large amount of buff in centre and slight black edging, giving a yellowish buff appearance to the crown (Fig. 1C,D,E). The buff feathers of the adult female are not juvenile or immature plumage as the birds moult into the same type of plumage each year (observed over three seasons of annual moult at Taronga Zoo). Instead of the buff being at the tip, as in a juvenile or immature feather (Fig. 1F), it is along the centre shaft surrounded by a fringe of black reaching the edge. *From the base of the bill down each side of the neck* — as in the immature, a narrow light to medium buff stripe, which wears back to white. Below this is usually a broad black malar stripe along the sides of the chin, but in birds with buff streaks in the crown, this stripe may have buff and white streaked feathers edged with black. *Rest of upperparts, wings and tail* — black becoming brown, with white spots on the body feathers and white barring on the wings, tail and scapulars. The size of the spots may vary, birds in which these are small, having larger areas of blackish brown.

**Underparts.** *Chin* — variable, (a) all black, joining malar stripe; or (b) black at sides and in centre, feathers with one web black and one web buff or with spot fringed with black; the light buff wears back to become white, giving a black and white streaked appearance (Fig. 1A,B); or (c) birds with buff on crown also have more buff under chin wearing back to white. *Throat and breast* — when fresh (a) light to deep buff, light buff soon wearing off to reveal white plumage with black bars; or (b) deep rufous-buff, not wearing as quickly, but bases of feathers also white with black bars. *Belly* — when fresh, fringed buff with white and black barring underneath. Individuals can be recognized in the field by either having narrow or broad bands. There is much individual variation, and individual birds can be recognized in the field.

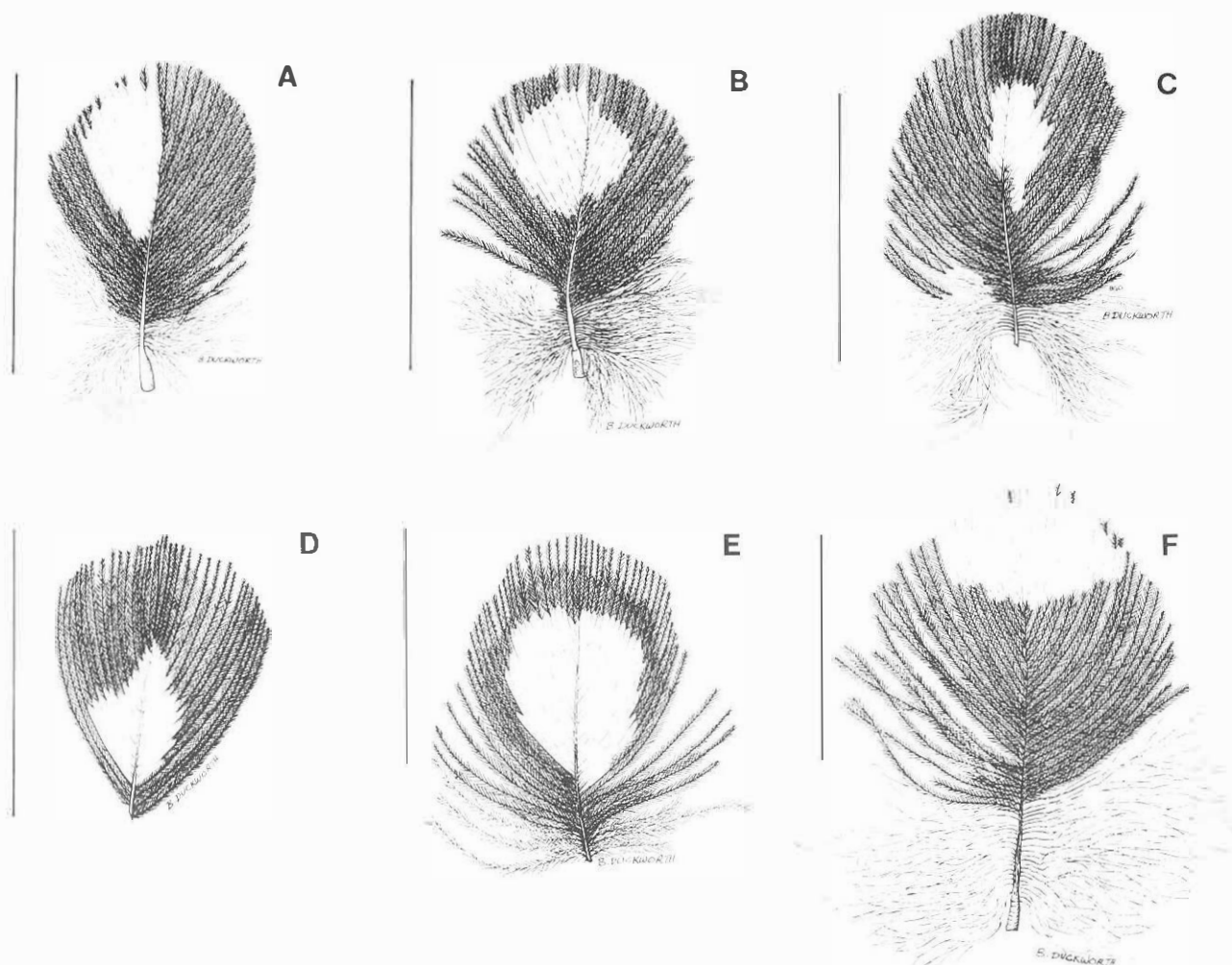


Figure 1. A, B: Adult chin feathers of some females; C, D, E: Adult crown feathers of some females; F: Juvenile or immature buff tipped feather.

## SEXING

A juvenile-plumaged bird is readily sexed by the lesser coverts on the patagium, which are black in the male and black with buff or white tips in the female. This can only be readily seen when the wing is spread; it is not obvious in museum study skins or when the wing is folded (Fig. 2A,B). The buff juvenile lesser coverts on the 'shoulder' are soon moulted and replaced by blue-black adult-type feathers in the male or white-tipped black feathers in the female. In both sexes these new lesser coverts form a bar or patch across the 'shoulder' (Fig. 2C,D).

## MOULT

A young bird may leave the nest in full juvenile plumage, apart from for a few new immature mantle feathers, and remain in this plumage until the wing and tail feathers are fully emerged. Alternatively, the moult into immature plumage may start before the bird has left the nest. In the young male, where it is more obvious, the juvenile feathers are followed by the immature plumage, with some parts of the body moulting directly into blue-black adult-type plumage. Soon after the young has left the nest, and before the wing and tail feathers have fully emerged from

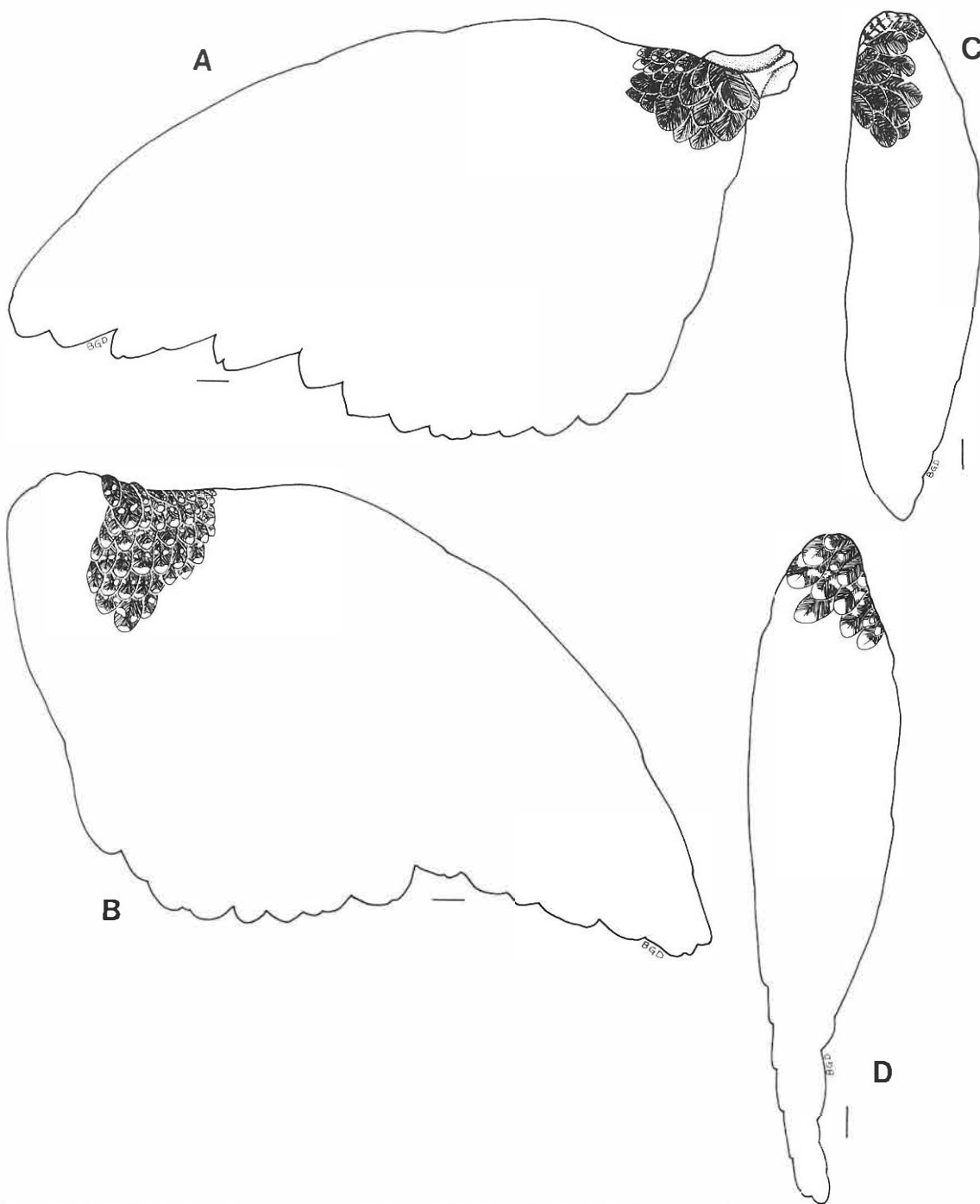


Figure 2. A: Male black patch on patagium; B: Female black patch with white tips on patagium; C: Male black on 'shoulder' of wing; D: Female black with buff to white tips on 'shoulder' of wing.

TABLE 1

Approximate age from hatching when following characters first appear in Australian Koels.

CHARACTER	WEEKS	MONTHS
Lesser covert bar of adult-type feathers on 'shoulder'	6	1.5
Wings and tail fully emerged (juvenile feathers)	7	1.75
Underparts completely in immature plumage	9	2.25
Iris from brown to orange	14	3.5
Iris from brown to red	21	5.0
Bill colour from brown to bone	26	6.0
Tail, acquiring new adult blue-black feathers	21	5.0
All feathers adult	30	7.0
Wing, primaries getting new adult feathers	21	5.0
Full adult plumage, except for odd unmoulted secondaries and body feathers	43	10.0

their sheaths, these changes may have started. Although the underparts of the young male develop a full immature plumage, the upperparts do not; the blue-black adult-type feathers have already started to appear before the immature plumage is complete.

### AGEING

The duration of the Koel's nestling period apparently depends on the host birds. When the hosts are the large honeyeaters or the Magpie-lark, the time is about 19 days (Brooker and Brooker 1989; Gallivan 1989; Gosper 1984). In Queensland, however, at Pleystowe Sugar Mill near Mackay, where the hosts are Figbirds, it is 28 days (Crouther and Crouther 1984). John Pierre (pers. comm.) observed a Koel in a Figbird nest near Brisbane from hatching to leaving the nest and it took only 19–20 days. The biggest influence on the rate of development of a nestling is the amount of food it receives (Skutch 1976). It appears that in the Pleystowe Sugar Mill area the diet the Figbirds give their own offspring is sufficient for these to develop normally, but is insufficient for the Koel nestling to develop and leave the nest at the usual time of 19 days. The amount of food received by the Koel nestling from the host parents or other birds feeding it in answer to its begging calls may perhaps influence the rate at which the fledgling moults from

juvenile plumage into the immature and adult-type plumages. If so, only rough estimates of age can be made. The time estimates in Table 1 are taken from observations of the young male birds at the Zoo. All developed at much the same rate, except the second young male put into Cage 91 in February. He appeared to be about the same age as or slightly older than the first bird, but seemed/was perhaps suppressed by the first bird, and further development was very slow. Whereas the other three birds were in almost complete blue-black adult plumage by September, this bird had added few blue-black adult feathers. The old immature feathers were very worn and brown with their white tips worn off, and only the odd new blue-black feather emerged before this bird was released in November.

### First-year breeding female

This cannot be distinguished from a second-year adult, except that it may retain several unmoulted juvenile flight feathers, usually secondaries. These feathers are easily recognized as they are shorter, very worn and barred with light and dark brown barring. There also may be some very worn juvenile tail feathers or an unmoulted immature scapular. The lesser coverts that moult early from juvenile into adult-type feathers are slightly brown and the white tips are very abraded, sometimes almost completely worn off with only a crescent edge of white still present.

### First-year male

First-year males should be in full blue-black adult plumage by the time they arrive in Australia for breeding. If the moult is not completed before breeding, it is suspended until after the breeding season, when the complete moult takes place, as observed in Zoo birds. Some first-year birds arrive in the south with some retained juvenile flight or tail feathers and varying amounts of immature body feathers. These immature feathers can be recognized because they are dark brown with broad yellow-buff tips or yellowish buff to whitish with black bars. This condition was seen in the young males in Cage 81 in Taronga Zoo in 1986. The moult into the blue-black feathers of the adult was completed by October. Unmoulted feathers were not readily seen unless the birds were handled. By December, there were still unmoulted flight and body feathers, which were

not replaced until the complete moult in March. That this is not an artifact of being confined in a cage is shown by specimens of wild birds in similar plumage from Wollongong, south of Sydney, in December 1985, and from Wide Bay, Queensland, in November 1867.

Birds in the hand or in good light in the field may be recognized as first-year birds by the lesser coverts, even if there are no obvious unmoulted flight feathers or body feathers. The lesser coverts on the 'shoulder' moult directly from the juvenile feathers into the blue-black feathers of the adult plumage. By the breeding season they have worn to a dark brown, forming a brown patch on the 'shoulder', surrounded by later acquired blue-black feathers. The second-year moult appears to take place during February-April. All feathers are replaced during this period, so by the breeding season in October are blue-black and still fresh.

Although specimens examined by dissection show that females breed in their first year, it is not certain that first-year males do so. The two birds examined showed only rather small and greyish testes, when it would have been expected that they be much larger and white. Perhaps these are the males which call throughout the day and night and sometimes get shot by irate householders whose sleep is being interrupted. A first-year bird received at the Museum seemed to have suffered this fate.

#### IOC Standing Committee on Applied Ornithology

The International Ornithological Congress set up the Standing Committee on Applied Ornithology at the Ottawa Congress in 1986. The Committee was allowed to settle its own terms of reference, and it concentrated at first on making recommendations for symposia topics concerned with applied ornithology for the IOC in New Zealand. 'Applied ornithology' is understood as meaning a practical study of areas where birds cause problems to human interests: bird conservation, which is also applied ornithology, is being left to other bodies. The Committee was re-appointed in 1990 and has decided to concentrate on two tasks: to advise the IOC on topics, and to improve communication between applied scientists and pure scientists in areas of applied ornithology.

The Committee now has four Working Groups, with the following chairmen:

Bird hazards to aircraft: Mr Luit Buurma, Luchtmachtstaf ALBV, Postbus 20 703, 2500 ES's Gravenhage, The Netherlands.

Bird damage to agriculture: Dr Richard Dolbeer, USDA/APHIS/ADC, Denver Wildlife Research Center, 6100 Columbus Avenue, Sandusky, Ohio 44870, USA.

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Birds as indicators of Environmental Change: Dr R. W. Furness, Applied Ornithology Unit, University of Glasgow, Glasgow G12 8QQ, UK.

Diseases transmitted by birds to people and livestock: Dr John Cooper, Faculty of Veterinary Medicine, Sokoine University of Agriculture, P.O. Box 1387, Morogoro, Tanzania.

We would each welcome, in the fields for which we are respectively responsible, information on current and recent work, especially written but unpublished papers and current research projects. We would include information of this kind in reports which we will write on these four areas. These reports will be presented at the 1994 IOC and published in the 1994 IOC Proceedings. Meanwhile, we will provide at least one interim report, summarizing all the information we receive, and distribute it to everyone contributing information used in it, and to the members of the Standing Committee. We stress that we are interested not only in your own research, but in all research which you can tell us about, in any of the above areas. Our aim is to make more widely available, to people working in these fields, much of the useful unpublished information which does not appear in conventional ornithological journals.