

## Order COLUMBIFORMES

Large homogeneous group of arboreal and terrestrial birds. The names pigeon and dove synonymous, though dove usually used for smaller species and pigeon for larger species, but distinction not consistently followed, and both sometimes used as alternative names for same bird. One extant family; dodos (Raphidae) and solitaires (Raphidae or Pezophapidae) extinct. Order monophyletic and easily distinguished, but affinities unclear. Columbiformes share a number of characters with Charadriiformes (shorebirds) including: schizognathous palate and schizorhinal nostrils; presence of small basipterygoid processes, tracheo-bronchial syrinx and usually diastataxic wings. However, differ in rigid vertebral column, large hindtoe, general biology, behaviour and type of young (see below). Also have anatomical similarities with Pteroclidiformes (sandgrouse), including structure of feathers, skull, shape of humeral head, sternum, pelvis and pectoral musculature. However, sandgrouse differ in several important ways: do not produce crop-milk, have large functional caecum and different syrinx. Sandgrouse often placed in Columbiformes (e.g. Bock 1994); or pigeons, sandgrouse and shorebirds combined in single order (e.g. Fjeldså 1977). However, studies of egg-white proteins (Sibley & Ahlquist 1972), composition of lipid oil-gland secretion (Jacob 1978) and DNA-DNA hybridization (Sibley & Ahlquist 1990) show no close affinities between pigeons and doves and other living birds; similarities to sandgrouse and shorebirds assumed to be convergence or retention of primitive characters. Best treated as discrete order Columbiformes (Sibley & Ahlquist 1990; BWP).

General features, moult, breeding and biology discussed below.

## Family COLUMBIDAE pigeons and doves

Small to very large; from *Geopelia cuneata* (19–21.5 cm, 23–37 kg) to *Goura victoria* (70–80 cm, 1.7–2.9 kg). About 310 species in c. 40 genera (including 15 monotypic genera, and 14 genera with fewer than five species) (Campbell & Lack 1985; Sibley & Monroe 1990; Goodwin; BWP). Major genera include: (1) *Columba* (typical pigeons) with 54 species; (2) *Ptilinopus* (fruit-doves), 51 species; (3) *Ducula* (imperial-pigeons), 36 species; (4) *Treron* (green pigeons), 22 species; (5) *Gallinula* (Old World quail-doves), 19 species; (6) *Geotrygon* (American quail-doves), 15 species; (7) *Streptopelia* (turtle-doves and collared-doves), 15 species; (8) *Leptopila* (doves), 11 species; (9) *Macropygia* (cuckoo-doves), ten species. Family homogeneous, and attempts to group the 40–43 genera unsatisfactory. Bock (1994) recognized five subfamilies; none was recognized by BWP; most useful arrangement perhaps informal one of Goodwin (1967; Sibley & Ahlquist 1990; Goodwin).

Cosmopolitan, except Arctic and Antarctic. In HANZAB region, 32 species in 15 genera (28 breeding, two vagrant, two extinct): *Columba* (3 species: endemic *C. leucomela*; introduced *C. livia*; *C. vitiensis*, extinct HANZAB region); *Streptopelia* (3; introduced); *Macropygia* (1); *Chalcophaps* (1); *Phaps* (3; genus endemic); *Ocyphaps* (monotypic; endemic); *Geophaps* (3; genus endemic); *Petrophassa* (2; genus endemic); *Geopelia* (3); *Leucosarcia* (monotypic; endemic); *Gallinula* (1; extinct); *Ptilinopus* (4); *Ducula* (4); *Lopholaimus* (monotypic; endemic); *Hemiphaga* (monotypic; endemic).

Relationships within genera of HANZAB region complex; many have affinities with species in Indonesia, New Guinea and surrounding islands; others endemic (see Christides & Boles 1994; Frith). Many taxonomic problems involving pigeons and doves of HANZAB region unresolved, e.g. (1) whether or not Aust. species of *Geopelia*, *Macropygia* and *Ducula* should be combined with similar allopatric congeners of New Guinea and Indonesia; (2) which genera to recognize in the *Petrophassa*–*Geophaps*–*Ocyphaps* assemblage; (3) whether Chatham Island Pigeon *Hemiphaga (novaeseelandiae) chathamensis* merits species status. Taxonomic treatment here follows Christides & Boles (1994) and NZCL.

Bodies generally plump and compact, with small heads and short necks. In most species, males larger than females. Have 37–39 vertebrae (including fused pelvis and pygostyle). Wings usually broad, with rounded tips. Eleven primaries; p1 reduced. Ten to 15 secondaries, including tertials; most species diastataxic, some eutaxic. Remiges rigid, causing loud and characteristic clapping sound when bird flies away (also in display). Flight strong and direct; cannot soar, but most will glide, especially in display. Tail of most long and broad, with square or slightly rounded tip; very long and pointed in some species; 12–14, sometimes 16, rectrices (up to 18 in crowned pigeons *Goura* and pheasant pigeon *Otidiphaps*). In many species, juvenile rectrices (and, less so, remiges) narrower than in adults; in *Ptilinopus*, wing of juveniles shorter and more pointed than in adults, giving different wing-formula. Bill, short, weak and superficially plover-like (except in some tropical fruit-eating genera), usually with an expanded tip; tip hard and sometimes hooked, base soft. Nostrils obliquely placed under a thin operculum in cere at base of bill.



Tarsi usually short, with small hexagonal or rounded scales at sides and rear. Feet of perching type, with three front toes and large functional hindtoe. Oil gland absent or rudimentary, unfeathered; powder-down used for plumage maintenance. Caeca, absent or rudimentary; crop, large and bilobed, resulting in asymmetric extrinsic muscles on tracheo-bronchial syrinx; two carotids. During breeding, glandular lining of crop of both sexes produces nutritious secretion, crop-milk, for feeding small young. Gizzard, heavily muscled; intestines, long and narrow in most species, but not in some frugivorous species, in which stomach only rubs pulp or pericarp off fruits (rather than grinding seeds), and seeds pass intact through short, wide gut. No gall bladder or supra-orbital salt-glands.

Feathers unique, with dense plumulaceous bases and strong and broad shafts that taper abruptly to thin point. Inserted loosely in skin and readily lost. No aftershafts, though remiges, rectrices and their coverts might have small aftertufts. Primaries variously emarginated, particularly on one or more of p8–p10; emarginations possibly involved in sound production (see Crested Pigeon *Ocyphaps lophotes*). Have little down, restricted to lateral apteria of body and pelvic apterium. Feathers of body have downy barbs at base and basal edges. Growing feathers (down, semi-plumes and downy portions of most contour feathers) shed fine white powder, which is used when preening and maintenance of feathers. Molt powder-producing feathers more often than other contour feathers and powder supplied nearly continuously. Most powder produced on flanks, especially in front of thigh and in front of and behind tail (Lucas & Stettenheim 1972).

Plumage usually shades of brown, grey and cream, but brilliantly coloured in many species (e.g. some fruit-pigeons) with bright greens, reds, oranges, yellows, pinks, golds, blues and purples; iridescence often present in feathers of wings, tail, head, neck and upperparts. Several species crested (e.g. in Aust., *Ocyphaps lophotes*, *Geophaps plumifera*), have coloured facial skin or orbital rings (e.g. *Geophaps scripta*) or enlarged ceres, which may form caruncles (e.g. *Lopholaimus antarcticus*). In most, sexes differ only slightly in appearance, with males somewhat brighter or more patterned; in others, sexes alike or differ markedly. Bare parts often coloured. Bill, black, brown, yellow, white, grey, green, or blue; tip and base often of different colours. Iris, red, orange, yellow, green or brown. Legs and feet, red, pink or purple. Undergo a complete post-breeding (pre-basic) moult each cycle, with no pre-breeding (pre-alternate) moult and so lack an alternate plumage. Primaries moult outwards; often very slowly, replacing only one feather at a time, though some can have more than one active wave of moult in wing. Arrested and suspended moult of primaries occurs in most, possibly all, Aust. species. Young altricial, nidicolous and wholly dependent on parents for food. Blind at hatching; sparsely covered in yellow, brown or grey down, usually thickest on upperparts. Young develop rapidly, and in some (e.g. *Ptilinopus superbus*) leave nest when remiges only half grown. Juvenile plumage distinct; usually duller, with dark subterminal bands and pale edges to contour feathers; usually held only briefly. Adult plumage attained in complete post-juvenile (first pre-basic) moult, which starts 1–3 months after hatching; post-juvenile moult of head, body and wing-coverts takes 3–6 months, of remiges and rectrices, 4–14 months.

Occur in most habitats; from arid and semi-arid zones to tropical rainforest. Found singly, in pairs or small flocks; some species in large flocks (e.g. Flock Bronzewing *Phaps histrionica* of Aust.). Some species sedentary, many are nomadic; a few undertake regular migration. Many species arboreal (fruit-doves of HANZAB region); others at least partly arboreal (e.g. *Phaps*, *Geopelia*, *Streptopelia*, *Macropygia*, *Columba*); but few strictly terrestrial (e.g. *Geophaps*, *Pterophassa*).

Diet mainly fruit or seeds or both; some also eat flowers, shoots, young leaves and invertebrates (e.g. *Hemiphaga novaeseelandiae*). Feed in trees, on ground, or both. Arboreal species usually cling, hang, and clamber among slender branches, and have large distensible gapes for swallowing large fruit. Terrestrial species do not scratch for food; glean while slowly moving, with sideway flicking movements of bill. Swallow food whole; cannot bite, chew or dehusk food. Grasp items in bill and tug. All species must drink and do so characteristically by inserting bill and sucking up continuous draught of liquid (Goodwin).

Movements vary. In Aust., migratory (e.g. Pied Imperial-Pigeon *Ducula bicolor*) to irruptive and dispersive (e.g. Flock Bronzewing *Phaps histrionica*), resident (Banded Fruit-Dove *Ptilinopus cinctus*) and even sedentary (e.g. Bar-shouldered Dove *Geopelia humeralis* and New Zealand Pigeon *Hemiphaga novaeseelandiae*). Movements of many species poorly known (e.g. Squatter Pigeon *Geophaps scripta*). Some species move to temporarily suitable habitat (e.g. Flock Bronzewing), while many rainforest pigeons move to temporarily available supplies of food (e.g. Brown Cuckoo-Dove *Macropygia amboinensis*). Introduced species non-migratory (e.g. Spotted Turtle-Dove *Streptopelia chinensis*), even mostly sedentary (e.g. Laughing Turtle-Dove *Streptopelia senegalensis*). One species, Rock Dove (Feral Pigeon) *Columba livia*, has been focus of much research on biological basis of homing and navigation; also widely kept and raced for sport.

All except green pigeons (*Tetron*) of Africa and Asia, which whistle, give a variety of soft cooing calls. *Lopholaimus* unique in being nearly silent, giving only low grunts and squeaks. Commonest call generally Advertising Call. For general discussion of calls, see Goodwin.

Social organization of Aust. pigeons little studied in wild. During non-breeding season, many species loosely gregarious, moving in small groups, though some (e.g. Flock Bronzewing) can congregate in thousands. Larger numbers often associated with water or abundant food. Some species, such as Wonga Pigeon, solitary. Usually





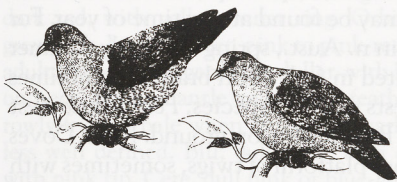
**Figure 1** Bowing Displays; high and low points shown unless stated: (a) Rock Dove *Columba livia*, sexual form; (b) Rock Dove, assertive form (low point); (c) White-headed Pigeon *Columba leucomela* (figure on extreme right shows bird mandibulating at end of display); (d) Brown Cuckoo-Dove *Macropygia amboinensis*; (e) Emerald Dove *Chalcophaps indica*, Bobbing Display, a type of Bowing Display; (f) Common Bronzewing *Phaps chalcoptera* (low point); (g) Crested Pigeon *Ocyphaps lophotes*; (h) Spinifex Pigeon *Geophaps plumifera* (male, at low point); (i) Chestnut-quilled Rock-Pigeon *Petrophassa rufipennis*; (j) Diamond Dove *Geopelia cuneata*; (k) Wonga Pigeon *Leucosarcia melanoleuca* (low point); (l) Banded Fruit-Dove *Ptilinopus cinctus*; (m) Pied Imperial-Pigeon *Ducula bicolor*; (n) Topknot Pigeon *Lopholaimus antarcticus*.



monogamous, pairing at least for duration of nesting cycle; mostly breed as single pairs but some form colonies (e.g. Pied Imperial-Pigeon, Flock Pigeon).

Postures and displays of all Aust. pigeons have been studied and described by Frith (1977; Frith). Not all displays illustrated in Frith have been reproduced here but many of the common displays and postures are shown in Figures 1 to 10. In these, illustrations are usually presented for only one species in each genus. Some other displays, usually particular to a species, are illustrated within the species accounts. The term bronze-winged pigeons (in the texts and in Frith), refers to all species of Aust. pigeons with iridescent panels in the wing (i.e. *Phaps*, *Ocyphaps*, *Geophaps* and *Petrophassa*).

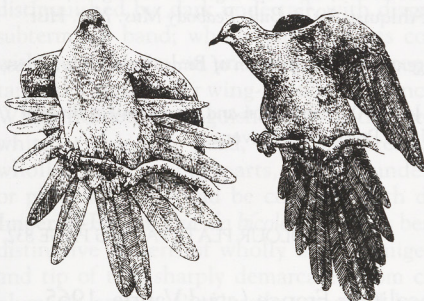
Displays used in threat and courtship often similar. Bowing Display and Display Flight two most common displays. Bowing Display (= Bow Coo) (see Fig. 1): Bird usually faces bird to which it is displaying, lowers head and calls, then raises head; in many species, tail is spread. Usually seen in sexual or aggressive circumstances. Most, possibly all, have postures that are homologous in appearance to a bow and often quite uniform within genera (see Frith). Display Flight (Fig. 10): Bird ascends in flight, often audibly beating wings then, at apex of ascent, spreads wings and tail and glides down. May be performed during normal flight or may start from, and return to, perch. In Aust., not recorded in *Ptilinopus*, *Geophaps*, *Petrophassa*, *Leucosarcia*, *Chalcophaps*, and Common and Flock Bronzewings and Bar-shouldered Dove. In species accounts, Display Flight placed under heading 'Aerial activity' because the function of display not studied in Aust. forms; assumed to advertise presence of sexually active male.



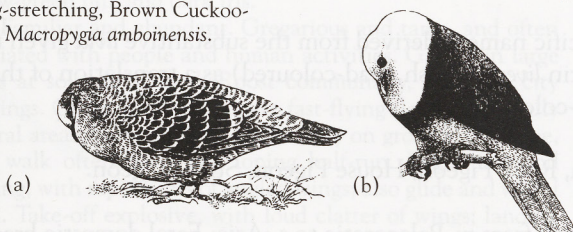
**Figure 2** Tail-raising Advertising Display of Emerald Dove *Chalcophaps indica* (left – high point, right – low point).



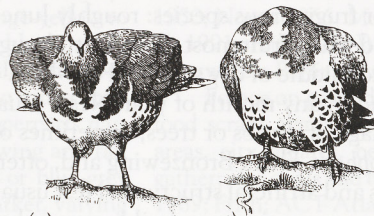
**Figure 4** Wing-raising, Bar-shouldered Dove *Geopelia humeralis*.



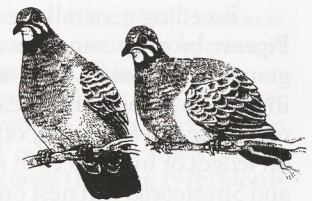
**Figure 7** Mantling and Wing-stretching, Brown Cuckoo-Dove *Macropygia amboinensis*.



**Figure 9** Advertising Call Posture: (a) Common Bronzewing *Phaps chalcoptera*; (b) Banded Fruit-Dove *Ptilinopus cinctus*.

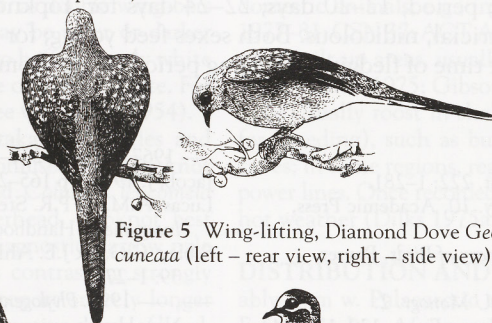


(a)

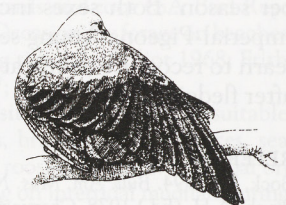


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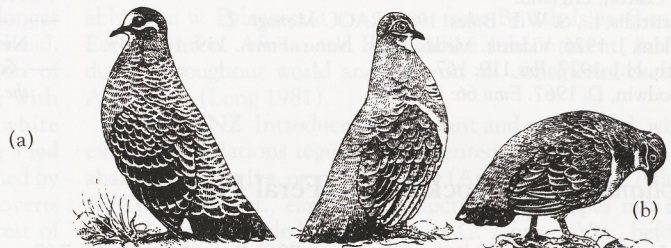
**Figure 3** Advertising Display: (a) Wonga Pigeon *Leucosarcia melanoleuca* (left – high point, centre – low point, right – rear view); (b) Squatter Pigeon *Geophaps scripta* (high and low points).



**Figure 5** Wing-lifting, Diamond Dove *Geopelia cuneata* (left – rear view, right – side view).



**Figure 6** Mantling, Wompoo Pigeon *Ptilinopus magnificus*.



**Figure 8** Post-copulatory Parade: (a) Common Bronzewing *Phaps chalcoptera*; (b) Partridge Pigeon *Geophaps smithii* (high and low points).



**Figure 10** Display Flight, Rock Dove *Columba livia*.



Other displays include: other Advertising Displays (Figs 2, 3) and Advertising Call Posture (special posture when giving Advertising Call; see Fig. 9). Parade (Fig. 8), usually seen at times of sexual excitement, and often given as a post-copulatory display. Jump, seen in sexually excited or aggressive birds and often associated with Parade. Driving (an avicultural term), where male moves mate away from other males. Preening-Behind-the-Wing, assumed to be sexual. Nest Calling is a posture adopted by male seeking suitable nesting site, as he calls to female. Nodding, function unknown. Wing-stretching (sometimes called Mantling; see Figs 6, 7), a comfort behaviour but possibly also used in sexual circumstances. Wing-lifting (Fig. 5) seen in aggression and alarm but function not known. Wing-raising (Fig. 4), a defensive-threat display also seen in sexual and alarm behaviour. (For latter three, involving raising of wings, terminology, as suggested by Frith, has not been strictly used in literature, which sometimes leads to confusion as to which displays are being described.) Allopreening occurs throughout sexual cycle, at nest and elsewhere. Courtship feeding (sometimes called Billing), commonly associated with copulation.

When roosting, pigeons do not tuck head behind wing, but draw it into body; sometimes one leg drawn up into feathers of belly. When loafing, may also squat or lie down. Bathe by wading into shallow water and immersing themselves; Flock Bronzewings will alight directly on water to drink, and possibly to bathe. Most also bathe in rain, often crouching, leaning to one side, and raising and fully extending wing, exposing underwing to rain; plumage often ruffled. Sunning posture similar to that when bathing in rain; may only partly open one or both wings and partly or fully spread tail. For more details on behaviour, particularly relationship between behavioural characters and taxonomy of family, see Frith, Frith (1977), Goodwin and Goodwin (1967).

Breeding generally seasonal. For frugivorous species: roughly June–Feb. in Aust., Sept.–Apr. for New Zealand Pigeon; broadly coincides with period when fruit most abundant, though nests may be found at any time of year. For granivorous species, generally early to middle of dry season (Feb.–Mar. to July) in n. Aust., spring and early summer in s. Aust., though nests can be found in any month of year. Nests usually situated in fork or on branch, sometimes on tangle of vegetation; often in foliage of shrubs or trees, sometimes on old nests of other species; *Petrophassa* nest on ledges or in crevices in rocks; *Geophaps*, Flock Bronzewing and, often, Brush Bronzewing on ground. Rock Doves and *Streptopelia* will nest on buildings and artificial structures. Nest usually a flimsy platform of twigs, sometimes with tendrils of vines, rootlets or grass; some species may build more substantial nests. Ground-nesting species make scrape, usually lined with vegetation. Males usually collect material and females build. Most frugivorous species lay one egg per clutch; granivorous species, two. Eggs usually white, sometimes cream, and unmarked; may have pink tinge when fresh. Eggs laid on successive days, sometimes 2 days apart. Some species may lay more than one clutch per season. Both sexes incubate; period, 12–20 days; 22–24 days for Topknot Pigeons and 26–28 days for Pied Imperial-Pigeons. Young semi-altricial, nidicolous. Both sexes feed young; for first few days, on crop-milk. Parents learn to recognize young at about time of fledging. Fledging period ranges from 11 to 35 days. Young sometimes fed after fledging.

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*Columba risoria* Linnaeus, 1758, *Syst. Nat.*, ed. 10(1): 165 — India.

The specific name is from the Medieval Latin *risorie*, laughing (from Latin *risor*, laughter, mocker).

OTHER ENGLISH NAMES Ring Dove.

The specific name of this bird is problematical and the use of *risoria* not wholly satisfactory (AOU 1983; Goodwin). The Barbary Dove is a domesticated form of either the African Collared-Dove *Streptopelia roseogrisea* or Eurasian Collared-Dove, *S. decaocto* (which are sometimes considered conspecific) (AOU 1983). The specific name *roseogrisea* is also sometimes used for Barbary Dove (e.g. NZCL). For full descriptions of African and Eurasian Collared-Doves, see BWP, Urban *et al.* (1986), and Goodwin; for further discussion of '*risoria*', see Goodwin.

**FIELD IDENTIFICATION** Length 29–30 cm; wingspan 45–50 cm; weight c. 150 g. Large dove. Similar in size and shape to Spotted Turtle-Dove *Streptopelia chinensis*, but slightly smaller and slimmer, with proportionately longer wings and shorter, square-ended tail. Adult distinctive: creamy buff with diagnostic black half-collar on hindneck; juvenile duller, without half-collar. Sexes alike. No seasonal variation. Juvenile distinct.

**Description Adult** Body, sandy buff or cream-buff, paler on head and neck, and grading to pale cream or white on chin, throat, vent and undertail-coverts; flanks, pale grey. Diagnostic narrow black half-collar, with white upper edge, on lower hindneck and sides of neck. Centre of uppertail, as rest of upperparts; rest of tail, pale grey-brown, with diffuse white tips that broaden outwards to form obvious white corners to tail. Undertail, grey-black at base (partly concealed by undertail-coverts) contrasting with broad white tip and white outer web of outermost rectrix. Upperwing: secondary coverts mostly sandy or cream-buff as upperparts; secondaries and outer secondary coverts, pale cream-buff, with grey tinge; primaries and primary coverts slightly darker than rest of wing, buff-brown, tinged grey when fresh, and with narrow creamy tips to primaries when fresh. Underwing: coverts, pale grey or white, contrasting with pale sandy-buff remiges. In fresh plumage, head, foreneck and breast tinged pink. Plumage subject to much

bleaching, giving patchy appearance above. Bill, purple-black. Iris, dark red (rarely orange). Orbital ring, light grey. Legs and feet, purple-red. **Juvenile** Similar to adult, differing by: lack half-collar; plumage duller; and scapulars and inner upperwing-coverts often have contrasting narrow pale fringes (though sometimes little or no difference). Bill, dull pink. Iris, legs and feet, dull grey. Bare parts change to adult colour by end of post-juvenile moult.

**Similar species** None; all plumages much paler than Spotted Turtle-Dove, and black half-collar of adult diagnostic.

**Gregarious.** Usually in pairs or small groups in urban parks and gardens where tall trees plentiful; also open country with trees. Tame and confiding. Spend much time feeding on ground. Gait free, with mincing walk accompanied by movement of tail and bobbing of head; occasionally break into half-run. Flight fast and direct, with frequent bursts of clipped wing-beats and looping falls, glides and dives; actions include characteristic shooting acceleration when leaving cover or in alarm. Advertising call mellow *koo-kerroo* or *koo-kooroo*, repeated; also utter high-pitched jeering laugh *heh-heh-heh*.

**HABITAT** Poorly known. In A'asia, feral populations or escapees mainly occur in urban areas and regional towns, in parks, gardens and other areas with trees and bushes, such as golf courses and plant nurseries (McGill 1948; Stidolph 1974,



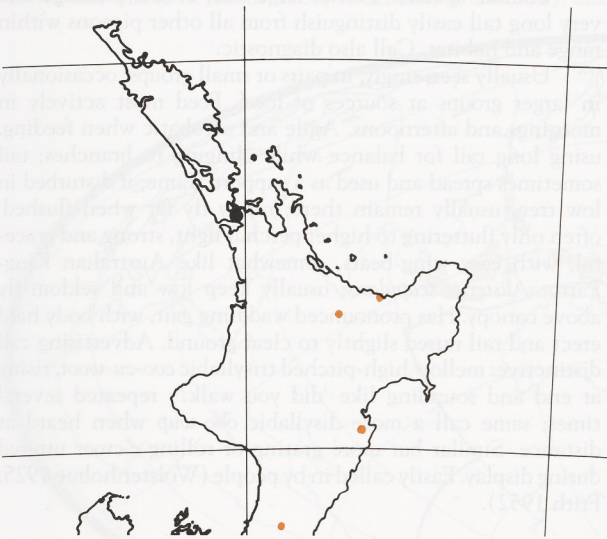
1977; Stidolph 1978; Sharrock 1981; Paton & Barrington 1985; CSN). Recorded nesting in gardens and near houses, including in hedges and beneath a verandah (Stidolph 1974; Hoskin 1991; CSN 39). Mostly feed on ground in parks and gardens; may become tame and enter buildings to feed (Stidolph 1974; Paton & Barrington 1985; Goodwin; CSN 23). Usually loaf on powerlines (Stidolph 1974; CSN 34, 39) or in trees (Stidolph 1978).

**DISTRIBUTION AND POPULATION** Introduced to Aust. and NZ, though viability of any population not certain. For other introductions of collared doves, see Long (1981).

**Aust.** First recorded suburban Sydney in Aug. 1946 (McGill 1948); no longer present. Feral population of c. 15 birds found Wattle Grove, near Perth, WA, in 1975; extirpated by Agriculture Protection Board (Long 1981). Aviary escapes apparently developing feral population in Darwin, NT (CCNT); breeding recorded Fannie Bay in 1975 (H.A.F. Thompson & D.K. Goodfellow). Isolated aviary escapes can occur anywhere near human settlement (e.g. former RAOU Headquarters at Moonee Ponds, Vic.) (McGill 1948; Reynolds 1979; Paton & Barrington 1985; Long 1988; Veerman 1991; NSW Bird Rep. 1985) and pairs sometimes recorded breeding (Jack 1963; Sharrock 1981; Paton & Barrington 1985).

**NZ** Many imported and released, from about 1862 till at least 1920s; acclimatization societies in Canterbury, Nelson and possibly Auckland began importing Doves in mid-1860s. Wild birds said to have occurred Christchurch and Dunedin in 1920s but populations now gone (Thomson 1922; Long 1981). Feral populations have become established at Whaketane (Falla *et al.* 1981; CSN); at Masterton, since c. 1971 (Stidolph 1974, 1977); and at Rotorua, since c. 1978 (NZCL). Also, pair said to be resident at Mangere; and two colonies said to be well established at Havelock North (CSN). Isolated aviary escapes could occur anywhere near settled areas (CSN).

Escapees often seen with Spotted Turtle-Doves (CSN). Feral populations rarely flourish away from artificial supplies of food, and may rely on continued releases to maintain populations (Goodwin).



**MOVEMENTS** Almost no information from wild birds in HANZAB region. In NZ, a pair said to be resident at Mangere (CSN 33–35); since introduction, constant inhabitant of Masterton area (Stidolph 1974, 1977).

**FOOD** Seeds, fruit and scraps; taken from ground, usually in open habitats. Feral and semi-feral populations usually survive only by access to artificial sources of food (Goodwin; NZRD). No detailed studies in HANZAB area. Observed eating berries of *Acmena smithii* (Myrtaceae) (Paton & Barrington 1985) and *Coprosma* (Rubiaceae) (CSN 23).

**SOCIAL ORGANIZATION** Only established in NZ where few details of birds in wild. Studied in captivity in Aust. by Davies (1974a,b); some breeding notes in Anon. (1974). Better known extraliminally (e.g. Lehmann 1964; Davies 1965, 1970); see BWP and Urban *et al.* (1986) for details of African and Eurasian Collared-Doves. In NZ, often recorded singly (e.g. CSN 32, 33, 34, 35, 38, 39, 41), but colonies mentioned in literature (e.g. CSN 39); Stidolph (1974) observed up to 12 coming to food. One small group noted spending much time perching in tree and preening (Stidolph 1978).

**SOCIAL BEHAVIOUR** Feral populations in NZ poorly known (see Social Organization). Detailed extralimital studies, especially of Bowing Display, by Davies (1965, 1970). In NZ, said to be exceptionally confiding (Stidolph 1974). In steady or heavy rain observed standing almost vertically (normal posture when perched more or less horizontal) thereby shedding raindrops more easily; occasionally shook (Stidolph 1978). Stidolph (1974) refers to young soliciting food.

**VOICE** No information for HANZAB region. Following from Goodwin. For more details, including sonagrams, see BWP. Sonagrams in Davies (1965). **NON-VOCAL SOUNDS:** Wing-clap during Display Flight (BWP).

**Adult ADVERTISING CALL:** Mellow *ku*, *k'roo* (*wa*) or *ku*, *kuroo*(*wa*) where *wa* is apparent inspiration, audible at close quarters, and *u* is as in *put* and *oo* as in *boot*. Cooing of female softer, with the trilling *rr* perhaps more pronounced. **DISPLAY CALL** and **NEST CALL** similar to Advertising Call. **EXCITEMENT CALL:** High-pitched jeering laugh *heh-heh-heh*; used in aggressive circumstances.

**BREEDING** Virtually unknown in HANZAB region; some information from NZRD but source unknown and probably based on extralimital observations; studied in captivity in Aust. by Davies (1974a).

**Season** In NZ, nested spring 1990 (CSN 39, 1992); dependent young out of nest, mid-Oct.; nest with egg, early Oct.; collecting twigs in garden, mid-Jan. (Stidolph 1974). In Aust.: successful breeding, Jan., NT (H.A.F. Thompson & D.K. Goodfellow); a juvenile with two adults, and a nest with one dead nestling found in SA in late Feb. (Paton & Barrington 1985). In captivity: breeding starts abruptly in July, peaks in Aug., with activity declining thereafter and reaching a low level by Mar., though a few eggs continued to be laid till June (Davies 1974a). **Site** In NZ, in Akeake plant in garden (Stidolph 1974); in *Casuarina* hedge (CSN 39, 1992). No information for Aust. **Nest, Materials** Said to be shallow platform of twigs (NZRD). **Eggs** Said to lay two white eggs (NZRD). **Laying** In captivity, median interval between pairing and laying of first egg, 12 days in Aug., 8 days in Nov., 9 days in Jan. and c. 60 days in Mar. (Davies 1974a). **Incubation** For one pair in captivity: male incubated between c. 07:00 and 16:00, female for rest of time (Anon. 1974). **INCUBATION PERIOD:** 14 days (Anon. 1974).

**Young** Semi-altricial, nidicolous. Hatch in yellow down; first quills appear at 4 days. Parents sit tight for first 3 days; stand over young on hot days (Anon. 1974). **Fledging to**



**maturity** In captivity, leave nest before fully feathered; do not go back to nest to roost (Anon. 1974). **Success** Nest blown down by strong winds a day or so after laying (Stidolph 1974).

**PLUMAGES** Insufficient material in Aust. or NZ museums for complete text on Plumages and related matters. For full descriptions of African and Eurasian Collared-Doves see BWP, and Urban *et al.* (1986); for discussion of *risoria*, see Goodwin.

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Barbary Dove *Streptopelia 'risoria'* (page 864)  
 1 Adult; 2 Juvenile; 3, 4 Adult

Rock Dove *Columba livia* (page 838)  
 5 Adult, ancestral type; 6 Adult, dark variant; 7 Juvenile; 8, 9 Adult, ancestral type