

Order PSITTACIFORMES

Distinctive, familiar, and often strikingly coloured birds, with characteristic shape and structure. Often highly conspicuous. Small to large, ranging in size from tiny pygmy-parrots *Micrositta* of New Guinea, the Moluccas and the Solomon Is (c. 9 cm in length and weighing 10–18 g) to large macaws of South America (up to c. 1 m in total length including tail, and weighing up to 1.7 kg), large cockatoos (e.g. Red-tailed Black-Cockatoo *Calyptorhynchus banksii*; up to 60 cm in total length including tail, and weighing up to 870 g), and flightless Kakapo *Strigops habroptilus* of NZ (up to 64 cm in total length, including tail, and weighing up to 2 kg). Third largest non-passerine order. Roughly 329–356 species in 76–93 genera, distributed on all continents except Antarctica; most are tropical; distributed widely in s. hemisphere, including some subantarctic islands of HANZAB region; in n. hemisphere occur as far N as Safed Koh Mts in e. Afghanistan (Slaty-headed Parakeet *Psittacula himalayana*). Greatest morphological and ecological diversity in A'asia and probably originated in A'asian sector of Gondwana, radiating from subtropical rainforests (Homerger 1991; see also Forshaw & Cooper 1989). In HANZAB region, 60 species in 27 genera. Appear to lack close living relatives, and nearest allies difficult to determine. Suggested that nearest allies are Columbiformes (pigeons) (Burton 1974; Forshaw & Cooper 1989), but this rejected by others (Sibley & Ahlquist 1990). Recent DNA–DNA hybridization studies suggest they should be placed between cuckoos and swifts (see Collar 1997; Rowley 1997). Other groups suggested as close allies include hawks, owls and piciforms (see Sibley & Ahlquist 1990). Recent works (e.g. Forshaw & Cooper 1989; Collar 1997; Rowley 1997) recognize three main groups: (1) cockatoos; (2) lorries and lorikeets; and (3) parrots. However, taxonomic level of each varies: some (e.g. Forshaw & Cooper 1989) classify each at same level, but others (e.g. Collar 1997) group parrots with lorries and lorikeets. On basis of biochemical (Christidis *et al.* 1991a) and chromosomal (Christidis *et al.* 1991b) studies, cockatoos were found to form a monophyletic lineage separate from all other Australo-Papuan parrots and lorries. As such, Christides & Boles (1994) recognized two distinct families within Aust.: Cacatuidae (cockatoos) and Psittacidae, including the Loriinae (thus, parrots and lorikeets); an arrangement also supported by morphological and behavioural studies (Brereton & Immelmann 1962; Smith 1975; Homerger 1991). This arrangement followed here; both families represented in HANZAB region. Relationships between extralimital groups have not been examined closely and are in need of review. In recent works, extralimital subfamilies or tribes have been grouped with Aust. Psittacidae (Forshaw 1989; Collar 1997); that treatment has been followed here. The most widespread alternative taxonomy places all cockatoos and parrots in a single family, Psittacidae (e.g. Sibley *et al.* 1988; Forshaw & Cooper 1989; Sibley & Ahlquist 1990; Sibley & Monroe 1990; Peters). Many alternative taxonomies have been proposed; for reviews see Smith (1975), Sibley & Ahlquist (1990), and Schodde & Mason (1997); for discussion of Aust. taxa, also see alternative treatment of Wells & Wellington (1992).

Structure rather homogeneous. Bill distinctive: upper mandible downcurved, usually extending well beyond tip of lower mandible; lower mandible upcurved, and usually broad with rather square tip that fits neatly into inside of upper mandible. Usually have prominent cere. Rostrum movable, with hinge-like articulation at skull. Palate, desmognathous. Nares, holorhinal, impervious, always in cere. Basipterygoid process absent. Head usually large in proportion to body, and neck rather short; 13–15, usually 14, cervical vertebrae. Pelvic muscle formula, *AXY*. Sternum fenestrated or indented. Tongue, thick and muscular, tactile, grooved; moved by hyoid apparatus with large median foramen in entoglossum; tongue brush-tipped in some species (notably lorikeets in HANZAB region; see below). Feet, zygodactylous, with Type 1 flexor tendons (cf. Piciformes and Cuculiformes, which zygodactylous but with Type 6 flexor tendons). Crop present; no caeca. Oil-gland tufted or absent. Furcula weak or absent in some. Syrinx with three pairs of intrinsic muscles. Wings vary in shape from broad with rounded tip to narrow with pointed tip. Ten primaries; 10–14 secondaries; diastataxic. Tail short to very long; *Prioniturus* have ornate, projecting racket-shaped central rectrices. Usually 12 rectrices. Aftershafts, short and downy. Legs, short and strong; tarsus short, with small granulate scales or papillae; middle toe longer than tarsus. Orbital ring usually complete. Whole body covered in down. Powder downs present; especially in uropygial region. Young ptilopaedic.

Adult plumage often brightly coloured (especially in Psittacidae), though also white, grey and black (especially in Cacatuidae); coarse in texture; and arranged in diffuse tracts. Bare parts mostly dull colours, but some species have brightly coloured bills, irides, lores and facial skin. Sexes alike (e.g. Rainbow Lorikeet *Trichoglossus haematodus*) or highly dimorphic (e.g. Eclectus Parrot *Eclectus roratus*).

Adults undergo a post-breeding (pre-basic) moult each cycle; usually complete, but some species can arrest moult before it is finished. Adult pre-breeding moults not reported (Forshaw & Cooper 1989). Usually moult once a year, but some possibly take longer than a year to finish; in HANZAB region, timing varies (see Family introductions). Moult of primaries of adults usually centrifugal, from mid-primaries, but starting position varies. Moult of secondaries of adults often starts from s10 at about time moult of primaries starts, and replaced outward to finish with s1, but

sequence also often irregular (see Forshaw & Cooper 1989). Molt of tail usually starts after molt of primaries well advanced, but usually finishes before last primary shed; sequence irregular (see Forshaw & Cooper 1989). Young altricial; blind at hatching, covered by sparse pale down. Juvenile plumage often similar to, or slightly duller than, adult plumage, but remiges and rectrices usually more pointed than adults. Rate of maturation and attainment of adult plumage and bare parts varies greatly; slow in some species. Sequence of plumages to adult and timing of moults varies greatly. Post-juvenile (first pre-basic) molt typically partial, but some possibly compete (e.g. Nestorinae). Some species have one or more immature plumages.

Worldwide, occur in wide variety of habitats, from dense rainforest to open, treeless grassed plains, though predominantly, and with greatest diversity, in tropical rainforests (Forshaw & Cooper 1981). In HANZAB region, widespread throughout alpine, tropical, temperate, semi-arid and arid zones; occur in most habitats, from coasts to high altitudes, including above treeline in alpine zones.

No species of Cacatuidae can be regarded as completely migratory (Rowley 1997), though some populations of some species undertake regular movements and considered partly migratory. Other Cacatuidae are resident, sedentary, or dispersive. Worldwide, Psittacidae considered resident, dispersive, nomadic or irruptive (Collar 1997); only two species considered migratory; at least one other species is partly migratory (Collar 1997; see Psittacidae below). Few species of Psittacidae are considered sedentary, usually island forms, and some of these occur in HANZAB region.

Herbivorous. Most feed on seeds and fruits, supplemented by a wide range of other food, such as flowers, nectar, pollen and leaves. Many species include small quantities of invertebrates, mostly insects and insect larvae, in their diet; almost all eat some seed, which always husked before swallowing (Forshaw & Cooper 1981; Campbell & Lack 1985). Specialization evident in some groups (see Family accounts below). Feed arboreally and terrestrially; in HANZAB region, c. 35% of species feed mainly arboreally, c. 35% feed mainly on ground, and the rest feed both arboreally and terrestrially. Of those considered primarily arboreal or terrestrial, about a third of species within those categories occasionally feed on other substrates. When feeding in trees or shrubs, agile and acrobatic, and clamber actively through outer branches and foliage, stretching to reach food, and often hanging upside down; use both bill and feet; while climbing among foliage of trees, often use bill to grasp branches and then clamber up or across from previous position. On ground, equally active, picking up fallen seeds or fruits from ground, or taking them directly from flowering or seeding heads; when food beyond reach, will stretch up to reach, or stand on stalks of plants, felling them to ground; many also use bill to dig up underground roots, corms or bulbs, or scratch soil with feet (Forshaw & Cooper 1981; also see species accounts). Many use bill to tear away or crush hard seed capsules, such as those of *Eucalyptus* and casuarina, and extract seeds from them; bill also used by some to tear open trunks of trees and branches for wood-boring insect larvae. Many use feet to manipulate food and to bring food to bill (Smith 1971; Forshaw & Cooper 1981); some show preference for use of particular foot, usually left (Forshaw & Cooper 1981; Joseph 1989; Magrath 1994). In HANZAB region, Glossy Black-Cockatoos *Calyptorhynchus lathami* exclusively or predominantly left footed (Joseph 1989; Magrath 1994; Pepper 1996), Yellow-tailed *Calyptorhynchus funereus* and Red-tailed Black-Cockatoos, Gang-gang *Callocephalon fimbriatum* and Palm *Probosciger aterrimus* Cockatoos predominantly left footed; while Eastern *Platycercus eximius* and Pale-headed *P. adscitus* Rosellas predominantly right footed (Cannon 1977; Prendergast 1985; Joseph 1989). Drink water at least once during day; most come to drink early in morning, some in morning and late afternoon, and some throughout day depending on heat of day; most drink by scooping water in lower mandible, then tilting head back (Campbell & Lack 1985); also drink water by lapping, ladling or suck-pumping (Schodde & Mason 1997).

Usually very vocal. Calls described as squawks, screeches, squeals, shrieks, whistles, cackles, chatters, buzzes or twitters. Many calls harsh, guttural and described as strident, but other calls can be musical rolling screeches and melodic whistles or warbles, often piping in quality. Many calls loud and distinctive; sometimes raucous. In HANZAB region, exceptional calls are those produced by mechanical means by Palm Cockatoos, and remarkable Booming made by male Kakapo during displays (see those texts for details). In HANZAB region, voice not well studied, though several notable exceptions (see below and family introductions). Repertoire of calls of Budgerigar *Melopsittacus undulatus* well known from studies in captivity and in wild; otherwise, repertoires poorly known. Size of repertoire appears to vary greatly between species, though this may be more a reflection of lack of knowledge of many species. Some species have as many as 20 or more described calls. Brereton (1963a,b, 1971a,b) and Pidgeon (1981) compared repertoires of a number of Aust. species. Brereton (1971b) suggested that the information content of vocalizations low in species occurring mainly in habitats with abundant resources, and most complex when resources at intermediate levels, but again simpler with increasing scarcity of resources. Suggested that some calls of Budgerigar functionally equivalent to song of passerine birds (see account for Budgerigar); this may also be true of calls of some other parrots. Within species, variation in calls sometimes complex, with some described as grading from one to another across a wide range of intermediates; these variations generally not well understood. Individual variation often used for individual recognition within pairs, and used to recognize members within family or other groupings (e.g. *Calyptorhynchus*, Galah *Eolophus roseicapillus* and Budgerigar). Some calls sexually distinctive in many species of both families. In HANZAB region, little or no information on seasonal variation for most species. Regional

variations in repertoire and variations in call characteristics little studied in HANZAB region but rarely apparent. However, known from at least three species in HANZAB region (Australian Ringneck *Barnardius zonarius*, Red-crowned Parakeet *Cyanoramphus novaezelandiae* and Kaka *Nestor meridionalis*). Calls of young often show similarity in structure between related species. Courtney (1974, 1986, 1993, 1996, 1997a,b,c) studied development of calls in young of many species of Aust. parrots. Food-begging Calls of many young parrots change with age. Brereton & Pidgeon (1966) speculate on ontogeny of calls in Eastern Rosella and provide illustrative sonagrams. They suggest adult calls develop from simple squawk given by nestlings. In exceptional instance of Galah being reared in wild with brood of Major Mitchell's Cockatoo *Cacatua leadbeateri*, Galah adopted calls of foster parents (Rowley & Chapman 1986). Mimicry almost absent in wild (but see Palm Cockatoo), but common in many species in captivity, especially cockatoos and Budgerigar, but also Rainbow Lorikeet, *Polytelis*, Swift Parrot *Lathamus discolor*, Red-crowned Parakeet and Turquoise Parrot *Neophema pulchella*.

For discussion of Social Organization and Social Behaviour, see family accounts below.

Breeding well known for most species in HANZAB region, poorly known extraliminally. Breeding generally seasonal, though some species can breed at any time if conditions suitable. Nest mainly in hollows in trees; some species nest on ground, under rocks or vegetation, or in tunnels excavated in arboreal or terrestrial termitaria. Eggs white. Clutch-size varies; in HANZAB region, largest clutches laid by Psittacinae and most species of Platycercinae in temperate areas and tropical semi-arid areas. Incubation by female only in Psittacidae and some Cacatuidae, by both sexes in *Cacatua*, *Callocephalon*, *Eolophus* and *Nymphicus*. Young altricial, nidicolous. Naked at hatching; generally develop down within first week. Young usually fed by female at first, then by both sexes. Fledgelings usually remain with parents for some time (Forshaw & Cooper 1981).

Worldwide, at least 90 species of parrots (c. 25% of all species) considered threatened (King 1981; Collar & Andrew 1988; Collar *et al.* 1994). In the HANZAB region, the only extinct taxa are: the Paradise Parrot *Psephotus pulcherrimus* (the only species extinct on mainland Aust.), probably through combined effects of overgrazing and drought; the Norfolk Island Kaka *Nestor productus*, which was killed for food and whose habitat was largely cleared; Lord Howe I. subspecies of Red-crowned Parakeet *Cyanoramphus novaezelandiae subflavescens*, possibly killed off by hunting and trapping; and the Macquarie I. subspecies of the Red-crowned Parakeet *C.n. erythrotis*, which was extirpated by cats (Garnett 1993). However, many more species are threatened: Garnett (1993) lists another 22 taxa in Aust. that are nationally threatened; of these, seven species are endangered, five vulnerable, five rare, and five insufficiently known. In addition, of the eight species of parrots native to NZ, the Kakapo is endangered; Orange-fronted Parakeet *Cyanoramphus malherbi* is rare; Kaka, Forbes' Parakeet *C. forbesi* and Antipodes Island Parakeet vulnerable; and Yellow-crowned Parakeet *C. auriceps* and Kea *Nestor notabilis* near threatened (Taylor 1985; Collar *et al.* 1994). In temperate woodlands and grassy woodlands of s. Aust., one species of woodland-dependent parrot, the Paradise Parrot, is extinct, and six others threatened; another three species of woodland-associated parrots are also threatened (Robinson & Traill 1996).

Overall, major threatening process is extensive clearance and fragmentation of habitat, particularly in S. America (King 1981; Collar & Andrew 1988; Collar *et al.* 1994). In HANZAB region, degradation, clearance and subsequent fragmentation of natural habitats for agriculture and forestry, including collection of firewood, have adversely affected many species (e.g. Glossy Black-Cockatoo, e. population of Regent Parrot *Polytelis anthopeplus*); small and isolated remnants are often too small to support viable populations of birds. Overgrazing and altered fire-regimes also change structure of vegetation, and have reduced populations and range of several species (e.g. Golden-shouldered Parrot *Psephotus chrysopterygius*, Scarlet-chested Parrot *Neophema splendida*, Ground Parrot *Pezoporus wallicus*). In Tas., preferred feeding habitat of Swift Parrot threatened by clearfelling and woodchipping of forests of Tasmanian Blue Gum *Eucalyptus globulus*. Orange-bellied Parrots *Neophema chrysogaster* threatened by destruction of coastal saltmarsh, the main feeding habitat on mainland Aust. In some areas, removal of hollow-bearing trees causes local shortages of nesting hollows, which, in turn, then reduces opportunities to breed. In s. Aust., harvesting of forests for firewood usually removes old dead trees, which often contain hollows; as a result, the reduction in the number of hollows available for nesting has caused declines of populations of many parrots throughout range (Robinson & Traill 1996). There is little replacement of suitable hollow-bearing trees, e.g. in sw. WA, the lowest average age of nest-trees used by parrots was estimated at 275 years and 446 years for cockatoos (Mawson & Long 1994, 1997; *contra* Stoneman *et al.* 1997). Further, introduced hollow-nesting species, such as Common Starlings *Sturnus vulgaris* and Common Mynas *Acridotheres tristis*, and some introduced parrots (such as Sulphur-crested Cockatoos *Cacatua galerita* in WA and Crimson Rosellas *Platycercus elegans* in NZ and on Norfolk I.), as well as Common Brushtailed Possums *Trichosurus vulpecula* and feral honeybees *Apis mellifera*, appear to compete with some species for use of hollows; this problem exacerbated in areas where hollows in short supply as a result of changes to habitats (Smithers & Disney 1969; Dawe 1979; Saunders *et al.* 1985; Garnett 1993).

Conversely, populations of some species (e.g. Elegant Parrot *Neophema elegans*) have increased, and ranges expanded after native vegetation cleared and converted to farmland, which has created habitat of similar structure to preferred natural habitats. Other species (e.g. Rainbow Lorikeet) have experienced increases in populations and

expansion of range since the 1970s, probably resulting from greater availability of food after the establishment and maturation of native trees in parks and gardens in urban areas (Veerman 1991). In some areas, changes to habitats through establishment of agricultural production, particularly grain production, and provision of water for stock, has allowed some species, notably Galahs, Sulphur-crested Cockatoos and Little *Cacatua sanguinea* and Long-billed *C. tenuirostris* Corellas, to undergo dramatic increases in population and expansion of range, to the extent that they are considered pests in some rural areas (Saunders *et al.* 1985; Rowley 1990; Serventy & Whittell). Worldwide, some species are threatened by persecution in agricultural areas, where seen as pests to crops (e.g. Blue-winged Macaw *Ara maracana*, Hispaniolan Parakeet *Aratinga chloroptera*); the Carolina Parakeet *Conuropsis carolina* of N. America was hunted to extinction in late 19th and early 20th centuries because it was considered a pest of agriculture (Halliday 1978; Collar *et al.* 1994). In agricultural areas of sw. Vic., one of the most common causes of death of Long-billed Corellas is shooting by farmers (Emison *et al.* 1994); in WA, an open season declared on feral Sulphur-crested Cockatoos (Saunders *et al.* 1985), and several other species of parrots are also legally shot (Robinson & Brouwer 1989). In NZ, large numbers of Red-crowned Parakeets were formerly shot as pests around crops (Turbott 1967; Taylor 1985; Oliver).

Popular cage-birds. Throughout world, illegal taking of eggs or young from nests, or adults from wild populations for avicultural trade a major threat to continued survival of some species, e.g. Red-and-Blue Lory *Eos histrio*, Spix's Macaw *Cyanopsitta spixii*, Hyacinth Macaw *Anodorhynchus hyacinthinus*, Thick-billed Parrot *Rhynchopsitta pachyrhyncha*, Green-cheeked Amazon *Amazona viridigenalis* (King 1981; Collar & Andrew 1988; Ridgely 1989; Snyder *et al.* 1989; Juniper 1991; Collar *et al.* 1994). However, the effect of illegal collecting is exacerbated by threats posed by loss of habitat as described above (Collar *et al.* 1994; Forshaw). In HANZAB region, several species of cockatoos and parrots with small populations are threatened by illegal collecting for aviculture, for both local and overseas markets, e.g. Eclectus Parrot and subspecies *narethae* of Blue Bonnet *Northiella haematogaster* (Garnett 1993). In Aust., many hollows destroyed by collectors hacking holes in trees to get access to nest-hollows and eggs or young. Hollows that are not destroyed often repeatedly robbed, either in subsequent seasons or after birds re-lay in same season after theft of clutch (Forshaw). In NT, trial programme introduced to legally exploit wild populations of Red-tailed Black-Cockatoos, involving collection of eggs, nestlings and adults (Anon. 1995). Similar schemes have been proposed in other areas of Aust., involving other abundant or pest species, but have not been accepted. Extralimitally, extinction or declines in populations have also been blamed on human persecution, especially if thought to be pest of agricultural production, and including hunting (e.g. Snyder *et al.* 1989).

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Family PSITTACIDAE parrots and lories

Usually brilliantly coloured, and vary greatly in size. About 310–335 species in 70–87 genera (Schodde & Mason 1997); 46 species in 21 genera in HANZAB region. Distributed on all continents except Antarctica; most diverse in A'asia, but other centres of diversity in Old World (Africa and Indian subcontinent) and New World (S. America and s. N. America) (Smith 1975; Forshaw & Cooper 1989; Schodde & Mason 1997).

Taxonomy at subfamily level not clear at present time. Different authors have recognized 5–11 different groups within Psittacidae (see Smith 1975; Forshaw & Cooper 1989; Sibley & Ahlquist 1990; Collar 1997). Eleven infrafamilial groups have been recognized here, following Schodde & Mason (1997) for those with representatives in HANZAB region, and Collar (1997) for those wholly extralimital. The following four groups occur extraliminally: Psittrichadini (Pesquet's Parrot *Psittrichas fulgidus*, monotypic); Micropsittini (pygmy parrots, six species); Psittacini (Afrotropical parrots, 12 species); and Arini (Neotropical parrots, 148 species); these not considered further below.

Schodde & Mason (1997) recognized six infrafamilial groups in Aust. and its territories. However, since relationship between species in some of these groups is still not clear, they treated only the three more clearly defined groups as subfamilies (Nestorinae, Loriinae and Platycercinae) and considered the other three groups as unplaced tribes (Psittaculini, Cyclopsittacini and Polytelini). Another subfamily, Strigopinae, is endemic to NZ (NZCL). Collar (1997) differs slightly in which groups he treats as subfamilies and which he treats as tribes; also does not recognize Polytelini, which he includes within Psittaculini. The seven groups occurring in the HANZAB region (based on Schodde & Mason [1997] unless stated and which see for further references):

SUBFAMILY STRIGOPINAE: Monotypic Kakapo *Strigops habroptilus*; endemic to NZ. Large, flightless. Furcula cartilaginous; keel vestigial (Holyoak 1973; Smith 1975). Barred remiges and rectrices (Smith 1975). Scratch head over wing (Smith 1975).

SUBFAMILY NESTORINAE: Kakas. One genus, *Nestor*, with two species endemic to NZ, and a third isolated and extinct species on Norfolk I. Large and short-tailed, with spines extending from tips of rectrices. Remiges barred (Smith 1975). Parahyoid process joined; styohyoideus muscle reduced; left carotid superficial; tongue thick and muscular with fringe of hair-like papillae on outer edge; pigments fluorescent (Holyoak 1973).

SUBFAMILY LORIINAE: Lorikeets and lories. Small, brightly coloured, and arboreal parrots. Eleven to 13 genera, distributed across e. Indonesia, New Guinea, islands of sw. Pacific and Aust. with greatest diversity in New Guinea, where 8–10 genera occur; three genera in HANZAB region: *Glossopsitta*, *Psitteuteles*, *Trichoglossus* (Schodde & Mason 1997). Most have permanent underwing-stripes (Smith 1975; Forshaw & Cooper 1989; Courtney 1997b); present only in some juveniles of extralimital *Charmosyna* (Courtney 1997b). Parahyoid process joined; styohyoideus muscle reduced or absent; tongue has brush of papillae at tip (Holyoak 1973; Smith 1975; Forshaw & Cooper 1989). Also characterized by pointed wings and tails, dashing flight, and short intestinal tract with inelaborate crop and gizzard.

SUBFAMILY PLATYCERCINAE: Broad-tailed parrots. Diverse group of small to medium-sized parrots. About 14 genera containing 35–38 species distributed across Aust., NZ and New Caledonia and on some associated islands; 11 genera and 28 species in HANZAB region: *Barnardius*, *Cyanoramphus*, *Lathamus*, *Melopsittacus*, *Neophema*, *Neopsephotus*, *Northiella*, *Pezoporus*, *Platycercus*, *Psephotus*, *Purpureicephalus*. Underwing-stripe present in juveniles and most adult females, but usually 'deciduous' in adult males (Holyoak 1973; Courtney 1997c); permanent in *Melopsittacus* and *Pezoporus* (Courtney 1997b,c); absent in extralimital *Prosopieia* (Courtney 1997c). Characterized by crescentic auditory maetus; foss at base of zygomatic process; orbit open below (except *Melopsittacus*); parahyoid process more or less converging; tongue has shallow grooves; furcula cartilaginous (except *Lathamus*); stylohyoideus muscle often wide; left carotid often superficial; fluorescent yellow pigment in plumage; scratch head over wing (Holyoak 1973). Except for *Geopsittacus* and *Pezoporus*, all have small patch of feathers on nape with white or pale yellow bases, instead of the usual grey, and which forms a nape-spot (Smith 1975), though spot hidden unless feathers of the region are erected or worn.

Unplaced tribes: PSITTACULINI: Palaeotropic parrots. Medium-sized arboreal parrots with heavy bills. Composition uncertain; about 11 genera, distributed from India to A'asia. Two genera in Aust.: *Eclactus* and *Geoffroyus*. Both tongue and dental pad ridged or grooved. No stripe on underwing.

CYCLOPSITTICINI: Fig-parrots. Small, green, arboreal fruit-eating parrots. Five species in 1–3 genera, with distribution centred in New Guinea; single species in genus *Cyclopsitta* in HANZAB region. Have stout ridged bills; wedge-shaped tails; marked sexual dimorphism; permanent double stripes on underwing; and completely ossified orbital ring free from well-developed zygomatic processes (Smith 1975; Courtney 1997b).

POLYTELINI: Long-tailed parrots. Slender medium-sized parrots. Eight species in three genera, with distribution centred in Aust. Five species from all three genera in HANZAB region: *Alisterus*, *Aprosmictus* and *Polytelis*.

Characterized by long, attenuated pink-tipped tails (Schodde & Mason 1997); inner webs of lateral rectrices have rose-pink edging, a character not possessed by any other parrot (Courtney 1997a). Other characters include: marked sexual dimorphism; no stripe on underwing; tongue ridged or grooved; soft palate; extrinsic syringeal muscles evidently attached to lung membrane.

Generally slim bodied, with short necks and short bills. Plumage coloured by carotenoid pigments and back-scattering of light through hollow cortical cylinders in feather barbs (Dyke-texture or Tyndall-texture). All feathers of body (except nape of some groups) have grey bases. None has erectile crests, though Horned Parakeet *Eunymphicus cornutus* of New Caledonia has elongated feathers on crown forming an immovable crest (Forshaw & Cooper 1989). Maxillae attached to skull by a flexible joint. Carotid arteries paired, fused, or left carotid superficial. Syrinx bronchial, the first rings upcurved, ossified and fused (except in Nestorinae). Zonary proventriculus present. No gall bladder. See introduction to order for characters shared with Cacatuidae.

Adult plumage often bright and colourful; ground-colour commonly green, with blue, red or yellow markings. In most, sexes similar or differ only slightly in plumage; in *Eclectus*, *Psephotus* and some *Neophema*, sexual dimorphism in plumage marked. In those groups that have stripe on underwing, presence often related to age or sex. Adult bare parts vary greatly: dull greys, browns and creams in many, but can be bright red or orange in many others. In most species, males slightly larger than females. Adult post-breeding (pre-basic) moult usually complete. Moult of primaries centrifugal; usually begins from p6, but in some can begin with any primary between p5 and p8. Nestlings usually hatch with sparse covering of down; a few hatch naked or nearly naked. A second, mesoptile, down develops in many species. In most, juvenile plumage duller than that of adults (and often resembles dull version of adult females in species where sexes differ). Post-juvenile (first pre-basic) moult partial in most species. Time to attain adult plumage varies greatly between species; in some, young birds not separable from adults after a few months, in others, adult appearance not attained until c. 4 years old. Similarly, time of first breeding can vary between species, from within first year to 4 years or older.

Occur in most habitats, from arid and semi-arid zones to tropical rainforest. Some species wholly arboreal, e.g. Loriinae, Cyclopsittacini, Eclectus Parrot *Eclectus roratus*; most others at least partly arboreal; a few strictly terrestrial, e.g. Night Parrot *Pezoporus occidentalis*, Ground Parrot *P. wallicus*. Though recorded in most habitats, some are specialists: e.g. fig-parrots *Cyclopsitta* mostly restricted to tropical and subtropical rainforests; Kaka *Nestor meridionalis* mostly inhabits temperate beech, broadleaf or podocarp rainforests; and Ground Parrot mainly confined to heathland in s. and e. Aust. In contrast, rosellas *Platycercus* may occur in a wide variety of treed habitats. Most require hollows, and therefore old trees, in which to nest, and are adversely affected by the removal of hollow-bearing trees (see Introduction to Order).

Patterns of movements vary greatly: from sedentary (e.g. Ground Parrot, Kakapo *Strigops habroptilus*), resident (e.g. Australian Ringneck *Barnardius zonarius*), to highly nomadic or dispersive (e.g. Budgerigar *Melopsittacus undulatus*). Several species migratory: Swift Parrot *Lathamus discolor* and Orange-bellied Parrot *Neophema chrysogaster* breed in Tas. and most or all of population moves to mainland Aust. for non-breeding season; further, Tas. breeding population of Blue-winged Parrot *Neophema chrysostoma* also apparently mostly migratory, moving to mainland Aust. Kakapo of NZ flightless. As with Cacatuidae, movements of many species poorly known, and many types of patterns have been attributed to them (e.g. Superb Parrot *Polytelis swainsonii*), probably in ignorance of actual movements, but possibly because movements vary between years or areas. Movements of lorikeets in Aust. (Loriinae) often considered to be related to flowering of food-trees. Many other species in HANZAB region appear to move in response to rainfall; in Budgerigar, both rainfall and temperature act indirectly on control of movements and breeding by affecting production of food (Wyndham 1980, 1983). Some species might make altitudinal movements (e.g. Eastern Rosella *Platycercus eximius*). Even suggested that movements of Golden-shouldered Parrots *Psephotus chrysopterygius* possibly linked to those of Black-faced Woodswallows *Artamus cinereus* (Garnett & Crowley 1995). Major studies of movements have been carried out on some species in HANZAB region (e.g. Crimson Rosella *Platycercus elegans*), using standard leg-banding, radio-tracking, and, in case of Ground Parrot, even cotton and spool method (Jordan 1987, 1988).

Almost all are herbivorous, feeding mainly on seeds, though many also take insects and their larvae. Most gregarious. Feed on ground, in trees, or both. Drink water by lapping, ladling or suck-pumping. All (except monotypic Psitttrichadini of New Guinea) husk seeds in same way: seed held between tip of lower mandible and notch on horny palate of upper mandible (which also corrugated to improve grip); the tip of the lower mandible driven into husk, between seed and husk, which is thus removed. The seed is then split and eaten; very hard nuts are held in part of bill nearest gape, where pressure between mandibles greatest (Collar 1997). Handling of other items similar. In HANZAB region, groups show variety of adaptations and behaviour; the following based on Forshaw & Cooper (1981), Schodde & Mason (1997), Forshaw, and species accounts, unless stated. **LORIINAE:** Almost exclusively arboreal, feeding mainly on nectar and some pollen and fruit. Specialized for harvesting pollen and nectar, with: narrow and protruding bills, brush-tipped tongues (see Churchill & Christensen 1970; Hooper & Burbidge 1979), non-muscular gizzard, and compound glands arranged linearly along wall of proventriculus (Steinbacher 1934). Gizzards of lorikeets much

smaller than those of seed-eating parrots of similar body weight, and intestine substantially shorter (Richardson & Wooller 1990). Gregarious, feeding in noisy flocks that continually move from one stand of flowering trees to another. When feeding, very active, clinging to and climbing all over flowering branches. PSITTACULINI: Arboreal, mainly in canopy of rainforest trees. Feed on fruits, seeds, flowers and nectar; said to prefer rainforest fruits. Usually feed in pairs or small flocks. CYCLOPSITTICINI: Wholly arboreal, but may descend to c. 1 m from ground to feed on low branches and trunks of fig-trees. Frugivorous, eating mainly figs, though tend to extract seeds from fruit and discard pulp rather than eat fruit. Bills broad, stout and ridged. Feed in pairs or small parties. POLYTELINI: Arboreal and terrestrial, granivorous. *Alisterus* and *Aprosmictus* arboreal, feeding mainly on seeds of native trees, such as *Eucalyptus*; *Polytelis* spend more time on ground feeding on seeds of grasses and herbaceous plants. Feed in pairs or small flocks, though *Polytelis* usually feed in flocks. PLATYCERCINAE: Terrestrial and arboreal. Diet: (1) mainly seeds of grasses, herbs and trees, procured from ground or from shrubs and trees (*Barnardius*, *Neopsephotus*, *Northiella*, *Platycercus*, *Polytelis*); (2) mainly seeds of grasses and herbs obtained almost exclusively from ground (*Melopsittacus*, *Neophema*, *Pezoporus*, and *Psephotus* [except Mulga Parrot *P. varius*, which feeds both on ground and in trees]); (3) nectar (*Lathamus*); (4) leaves of grasses and sedges (*Cyanoramphus*). Some highly specialized, e.g. Red-capped Parrots *Purpurecephalus spurius* have narrow projecting bill and feed on seeds extracted from capsules of Marri *Eucalyptus callophylla*. Many also supplement main diet with flowers, nectar, or fruits, and almost all take some invertebrates. One, Antipodes Island Parakeet *Cyanoramphus unicolor*, known to take dead and nesting seabirds. Most feed in small flocks; some feed in large flocks (e.g. Budgerigar); others often feed singly or in pairs (e.g. *Platycercus*). Feeding behaviour varies widely depending on nature of food and where obtained; for details see individual species accounts. NESTORINAE: Mainly herbivorous but omnivorous, taking wide range of plant foods and invertebrates. Arboreal and terrestrial, forage at all levels from ground to canopy of trees. Use wide range of foraging methods, including gleaning, probing, digging, stripping and chiselling bark, excavating wood, and licking nectar from flowers; unlike other parrots, feed on sap by stripping bark and exposing cambium, and then lick sap from damaged surface. Feed singly, in pairs or small flocks, though Kaka more often singly. STRIGOPINAE: Mainly herbivorous, partly granivorous. Forage at all levels, including canopy of tall forest, but most foraging on or near ground. Sense of smell thought to be well developed and of importance in foraging, and at least some birds can locate foods by smell alone. Short, powerful and compressed bill, and short, broad and thick tongue adapted for browsing, crushing, grinding and extracting juices from fibrous plant tissues. Solitary.

In HANZAB region, all species gregarious to some extent with notable exception of Kakapo. In most species, flocks typically of up to c. 30 birds. However, some species in flocks of 100s and, in Budgerigars, 1000s. Most species more gregarious in non-breeding season, though even in breeding season, many species often form flocks when feeding. All monogamous, with exception of Kakapo, in which the sexes come together only at leks. Pair bonds lifelong and mates remain together year round. Co-operative breeding does not occur, with probable exception of Eclectus and Red-cheeked *Geoffroyus geoffroyi* Parrots (Psittaculini) and possibly, but rarely, Regent Parrot *Polytelis anthopeplus* (Polytelini). Only female incubates but both sexes involved with feeding of young, except in Kakapo, in which female raises young alone, and possibly Ground Parrot, in which male appears responsible for feeding of young. In most species, young generally leave natal area by 3–6 months old. Aust. lorikeets, *Polytelis*, *Eclectus*, and some *Neophema* often nest in loose colonies; others strictly solitary nesters. Generally defend only nest-hole. Most gregarious species roost communally, at least when not breeding.

Often conspicuous, vocal and active but may be hard to observe when feeding in tree-tops or on ground. All species courtship feed, except Kakapo; in some, occurs year round e.g. *Trichoglossus*. Many known to, or likely to, allopreen, except rosellas *Platycercus*, Australian Ringneck, *Cyanoramphus*, *Neosephotus*, *Neophema*, Red-winged Parrot *Aprosmictus erythropterus*, Australian King-Parrot *Alisterus scapularis*, possibly Red-cheeked Parrot, and assumed not to in Kakapo. Sexual and aggressive displays generally fairly simple, consisting of actions such as bobbing, eye-blazing, arching of wings, fanning and wagging of tail and calls. However, in *Trichoglossus* and Varied Lorikeet *Psitteuteles versicolor* (Loriinae), displays complex and performed in many social contexts; in *Trichoglossus*, displays often performed either reciprocally or in unison by both members of a pair. Other notable displays are aerial circling performed by Eclectus and Red-cheeked Parrots, and distinctive calling behaviour of Kakapo and Ground Parrot.

Calls usually described as whistles, chatterings or pipings, though some are shrieks. Calls often melodic and some are extraordinarily complex, such as Warble song of Budgerigar, and highly varying yodelling calls of Kaka *Nestor meridionalis*. Booming of Kakapo at lek unique form of vocalization in parrots. Sexually differentiated calls known in many species in most genera. Food-begging Call of all Aust. lorikeets a repeated sharp high-intensity hissing note that begins with a structureless hiss, which gives way abruptly to a brief high-energy blip preceding a structured hiss (see Courtney 1997b). For details of Food-begging and other calls of platycerine parrots see Courtney (1997c, which was not available for summary in species accounts).

Breeding well known in HANZAB region. Extralimitally, breeding of most species of Loriinae, Platycercinae and Cyclopsittacini virtually unknown; some species of Psittaculini moderately well known. Plum-headed Parrot *Psittacula cyanocephala* and some lovebirds *Agapornis* (Psittaculini) breed colonially (Forshaw & Cooper 1981), and Large Fig-Parrot *Psittaculirostris desmarestii* (Cyclopsittacini) thought to breed colonially within hollow trunks of large

trees (Rand 1942; Beehler 1982). Breeding generally seasonal but some species will breed at any time of year if conditions suitable, and some species can raise two or more broods in a season. Most species nest in hollows in trees, though some nest on ground, under rocks, vegetation or in burrows; some species excavate tunnels in termite mounds. Extraliminally, Red-flanked Lorikeet *Charmosyna placensis* (Loriinae), Orange-breasted Fig-Parrot *Cyclopsitta gulelimitertii* (Cyclopsittacini) and some *Agapornis* (Psittaculini) nest in holes excavated in arboreal termitaria (Rand 1942; Bell & Coates 1979; Forshaw & Cooper 1981; Coates 1985). Hollows generally unlined, or lined with wood dust chewed from sides of hollow; extraliminally, *Agapornis* and hanging parrots *Loriculus* (Psittaculini) line hollow with pieces of leaves or bark or both; female carries material in bill or tucked among feathers of rump, flanks or lower back (Abdulali 1964; Ali & Ripley 1969; Forshaw & Cooper 1981). Eggs invariably white but can become stained in nest. Mean size of eggs varies from 19.5×16.4 for Little Lorikeet to 50.5×37.2 for Kakapo. Extraliminally, smallest egg (16.8×13.5) laid by Pygmy Lorikeet *Charmosyna wilhelminae* (Forshaw & Cooper 1981). Loriinae, Nestorinae, Strigopinae, Cyclopsittacini, Ground Parrot and most Psittaculini generally lay small clutches (2–4); a few species of Psittaculini and most Platycercinae generally lay 4–7 eggs, but can lay up to nine. Incubation lasts 18–23 days for most species; up to 25 days for Rainbow Lorikeet *Trichoglossus haematodus*, 26 days for Eclectus Parrot, between 3 and 4 weeks for Kea *Nestor notabilis* and 25–30 days for Kakapo. In all species, female incubates; male usually feeds female at nest or nearby. Young altricial, nidicolous. Most hatch naked and develop whitish to grey down in first few days. Generally, young fed by regurgitation, by female only, or by female for first few days then assisted by male; only male Ground Parrots feed young; male Kakapos play no part in nesting. Young of most species fledge at 5–7 weeks, 7–10 weeks for Rainbow Lorikeet, Kaka and Kakapo, 11–12 weeks for Eclectus Parrot, and 13 weeks for Kea; Ground Parrot has the shortest fledging period, c. 24 days. Fledgelings usually remain with parents for some time (Forshaw & Cooper 1981).

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Platycercus unicolor Lear, 1831, *Illustr. Psittac.* 4: pl. 25 of bound volume — Antipodes Islands.

Cyanoramphus reflects the bluish-grey bill (of the extinct Black-fronted Parakeet *C. zealandicus*) (Greek κύανος, blue, enamel, and ῥαμφος, bill). The specific name alludes to the uniformly green plumage, from the Latin *unicolor*, uniform, of one colour.

OTHER ENGLISH NAMES Antipodes Green Parakeet.

MONOTYPIC

FIELD IDENTIFICATION Length 27–35 cm; wingspan 38–43 cm; weight: male 170 g, female 130 g. Largest *Cyanoramphus* parakeet. Distinctive bright-green parrot, found only on Antipodes Is in NZ Subantarctic. Noticeably bigger and bulkier than Red-crowned Parakeet *Cyanoramphus novaeseelandiae*, with bigger head, much bigger and broader bill and much broader wings in flight. Unmistakable: the only *Cyanoramphus* parakeet with wholly green head. Sexes alike in plumage but males of all ages bigger than females, with distinctly bigger and broader bill. No seasonal variation. Young juvenile separable by colour of bare parts in close view. **Adult** Bright green, noticeably brighter on forehead and face, and paler, more yellow-green on underbody; undertail, dark grey with yellow wash. Upperwing mostly bright green as upperbody, grading to black at tip and with dark-blue outer primary coverts and alula; on folded wing, primaries black, edged basally with duller dark-blue. Underwing: leading coverts, dark blue-green; greater coverts and remiges, dark grey. A few have irregular yellow markings, particularly on back, rump, wings and tail (R.H. Taylor; see Oliver). Bill, pale blue-grey with black cutting edge and tip to upper mandible. Cere, grey-black. Iris, normally red to orange-red but varies (see Bare Parts). Orbital ring, dark grey. Legs and feet, light pink-grey. **Juvenile** Poorly known. Very similar to adult and safely separable only for short period after fledging by colour of bare parts. Bill, as adult but with pinkish tinge to base when newly fledged; pinkish colour still obvious 4 weeks after fledging (R.H. Taylor). Iris darker, dull brown to red-brown; turns to reddish c. 10 weeks after fledging but still duller than in many adults (R.H. Taylor). Unknown when attain full adult colour of bare parts. Tail also shorter on fledging but quickly attains adult length.

Similar species Unmistakable. Larger and with heavier bill than other NZ parakeets and the only one with wholly

green head. Sympatric **Red-crowned Parakeet** has conspicuous red forehead, forecrown and eye-stripe in all plumages.

Solitary; usually seen singly or in pairs or, less often, in family parties of up to five birds; do not form flocks. Active and inquisitive, sometimes attracted to human activity, e.g. campsites, where recorded climbing over tents, pecking at ropes and so on. Often allow close approach while feeding. When alarmed, become furtive and silent or give only short call before disappearing into thick vegetation. Forage by climbing over, under or through vegetation; sometimes also forage on ground. Feed most intensively during mid-morning and before dusk. Flight very similar to that of Red-crowned Parakeet; strong, with regular wing-beats interspersed with occasional glides; flight direct, not undulating; tend to make only short flights but can be seen swooping about slopes on fine days or flying at heights of up to 30 m; fly much less in wet or windy weather. Large variety of calls, most similar to those of Red-crowned Parakeet but distinctly lower pitched and louder. Most common call, deep resonant *kok-kok-kok-kok-kok*, repeated rapidly and used to advertise ownership of territories and attract mate; also utter variety of calls that vary from soft clucking to high-pitched chatter.

HABITAT Account prepared by R.H. Taylor. Inhabit rolling tussock grassland dominated by *Poa litorosa*, with scattered areas of shrubland of *Coprosma rugosa*, fernland *Polystichum vestitum*, *Carex appressa* coastal swamp, *Carex sectoides* swamp, *Blechnum-Carex ternaria* swamp, *Carex ternaria-Anisotome antipoda* bog, and *Anisotome antipoda-Pleurophyllum criniferum* bog (Warham & Johns 1975; Godley 1989). Most common in tall dense tussock, sedges or ferns, especially on slopes and along watercourses (Taylor 1985).

Nest under thick vegetation; in burrows; either in peaty

ground or among fibrous roots of large tussocks (Falla *et al.* 1978; Taylor 1985; Greene 1996).

Forage on and within canopy of dense tussock, sedges, fern and shrubs (Taylor 1985; Forshaw & Cooper 1989); sometimes on ground, under vegetation or in sheltered open areas; also within penguin colonies (Falla *et al.* 1978; R.H. Taylor).

At night, roost on ground, in tunnels or shallow burrows under thick vegetation. During middle of day, loaf and bask at favoured sites above ground, in lee of tussocks or other vegetation (Taylor 1985).

DISTRIBUTION AND POPULATION Account prepared by R.H. Taylor. Endemic to Antipodes Is. Occur on most islands of group (Buller 1891; Taylor 1985; NZCL); widespread and common on Antipodes I. and Bollons I.; also occur on Leeward, Archway and Inner Windward Is. **Breeding** On Antipodes and Bollons Is; almost certainly on Leeward, and possibly on Archway and Inner Windward Is (Taylor 1985; R.H. Taylor).

Introductions Twelve introduced to Kapiti I., Cook Str., in 1907; died out after 1923 (Taylor 1985), probably from predation by rats. In 1986, 15 captive-bred birds were released on Stephens I., Cook Str.; breeding was successful and four young fledged, despite predation by Tuatara *Sphenodon punctatus*; the remnant population of two birds was removed in 1989 (R.H. Taylor).

Status Stable and secure (Taylor 1985); classified as Third Priority Threatened Species by NZ Dept Conservation (Molloy & Davis 1994; West *et al.* 1995). In 1978, total population estimated at 2000–3000 birds (Taylor 1985); observations in 1985–95 indicate population on Antipodes I. little changed (Miskelly *et al.* 1990; Greene 1996; R.H. Taylor). Total of c. 60 birds on Bollons and Archway Is; c. 12 on Leeward; and <12 on Windward Is (R.H. Taylor).



MOVEMENTS Account prepared by R.H. Taylor. Sedentary. Availability of food and water influences minor movements: birds move daily to patches of vegetation that are seeding or fruiting, and to streams and pools (Taylor 1985; Forshaw & Cooper 1989); some daily movements could be up to 2 km (R.H. Taylor). **Banding** Of 25 colour-banded birds followed for over 4–6 weeks during Feb.–Mar. 1969, 19 were recovered on 73 occasions, and only one >300 m from point of banding; one female moved 2 km. Two of 34 birds banded in Feb. 1969 near Hut Cove, Antipodes I., were recaptured at the same site 10 years later, in Nov. 1978 (R.H. Taylor).

FOOD Account prepared by R.H. Taylor. Mainly leaves, mostly of grasses and sedges, supplemented with flowers, seeds and berries in season. Also feed on dead seabirds and nesting Grey-backed Storm-Petrels *Garrodia nereis*. **Behaviour** Fly between foraging sites. When feeding, move by climbing over, under and through vegetation (R.H. Taylor). Often feed in pairs or small parties, never in flocks (Taylor 1985; Forshaw & Cooper 1989; Miskelly *et al.* 1990; Greene 1996). Feed most intensively in 2 h after dawn and for a similar period before sunset; feeding usually sporadic during middle of day. Activity influenced by weather, particularly wind and rain; during stormy days, marked emergence to feed whenever rain stops. Feed in sheltered positions and below canopy during strong winds (Taylor 1985; R.H. Taylor). Often feed for long periods on one item. When eating tussock leaves, cut lengths up to 20 cm long with bill and chew leaves toward tip while holding in one foot. When feeding intensively, a bird can chew more than 15 leaves/min, and will often remain in one place for long periods (Taylor 1985). When feeding on leaves of large sedges, similar method used, but bird often starts by cutting through only part of leaf, tearing it vertically with an upward jerk of head, then chewing that strip (R.H. Taylor). Piles of crushed and twisted chewings, and trimmed plants of tussock and sedge, are distinctive signs of feeding (Taylor 1985; Greene 1996). When feeding on seeds of *Carex*, often hold seedhead in one foot and use tail to balance against plant; excavate seed with bill and discard chaff (glume). Feed on aphids by dragging infested leaves through bill, without crushing leaf (R.H. Taylor). Scavenge fat and fragments of flesh from freshly dead and mummified bird carcasses; and remains of yolk and albumen from broken eggs (Falla *et al.* 1978). Actively hunt incubating Grey-backed Storm-Petrels and kill them in their nesting burrows during daylight; mainly eat muscle tissue (Greene 1996). During and after feeding, clean bill by rubbing it against feet, branches, stems, tops of ferns and tussocks, or rocks (R.H. Taylor). Structure of tongue suggests reliance on taste in discriminating between foods (McCann 1963).

Detailed studies ANTIPODES I. (first food item seen to be eaten by each bird encountered): (1) Oct.–Nov. 1995 (Greene 1996); (2) Nov.–Dec. 1978 (R.H. Taylor); (3) Feb.–Mar. 1969 (Taylor 1975). **Plants** Leaves 87.8% of all observations in Oct.–Nov. 1995, 75.3% in Nov.–Dec. 1978, 65.2% in Feb.–Mar. 1969; flowers 2.8, 3.2, 0.7; berries and fruits 0.9, 0.6, 9.2; seeds 0.0, 14.6, 12.2; other vegetation 2.8, 2.5, 4.6. **Animals** Invertebrates 0.0, 0.0, 1.1. **Carrion** Birds 7.4, 3.8, 7.0.

Other records **Plants** Leaves, flowers, seeds, berries^{1,2,3,7}; liverwort thallus⁸. **FERNS:** Aspidiaceae: *Polystichum vestitum* lvs, sh.^{8,9}; Blechnaceae: *Blechnum durum* lvs, sh.⁸. **MONOCOTYLEDONS:** Cyperaceae: *Carex appressa* sds, fl.^{8,9}, lvs, sh.^{6,8,9}; *C. sectoides* sds⁹; *C. ternaria* sds, lvs, sh.^{8,9}; *C. trifida* sds⁹; *Isolepis* sds⁹; *Uncinia hookeri*⁹; Poaceae: *Poa foliosa* sds, fl., lvs, sh.^{8,9}; *P. litorosa* sds, fl., roots^{8,9}, lvs, sh.^{6,8,9}; *Puccinella antipoda* lvs, sh.⁹. **DICOTYLEDONS:** Apiaceae: *Anisotome antipoda* sds, lvs, sh.⁸; Araliaceae: *Stilbocarpa*

polaris fl., lvs, sh.⁹; Asteraceae: *Senecio radiolatus* fl.⁹; Caryophyllaceae: *Stellaria decipiens* lvs, sh.⁹; Gentianaceae: *Gentiana antipoda* fl.⁹; Onagraceae: *Epilobium* sds⁹; Rosaceae: *Acaena minor* sds, lvs, sh.^{6,8,9}; Rubiaceae: *Coprosma rugosa* lvs, sh., bark, berries^{8,9}. **Animals** INSECTS: Hemiptera: Aphididae: unident. aphids⁹. BIRDS: seabird carrion incl. penguin, petrel and albatross corpses; also broken penguin eggs^{3,4,5,8,9}; Grey-backed Storm-Petrel⁷. (REFERENCES: ¹ Forshaw & Cooper 1989; Taylor ² 1975, ³ 1985; ⁴ Falla *et al.* 1978; ⁵ Warham & Bell 1979; ⁶ Miskelly *et al.* 1990; ⁷ Greene 1996; ⁸ T.C. Greene; ⁹ R.H. Taylor.)

Young The faeces of one newly fledged chick were packed with *Carex appressa* seeds; 11 days later this chick was still being fed occasionally, and tentatively cropping and chewing leaves of *Poa litorosa*. One adult fed on fruits and young shoots of *Coprosma rugosa* immediately before feeding fledged young (R.H. Taylor).

Intake When eating seeds, the utricle is probably the main food item, as faeces are commonly loaded with seeds that appear entire (R.H. Taylor).

SOCIAL ORGANIZATION Account prepared by R.H. Taylor. No detailed studies (and no observations Apr.–Sept.). Between Oct. and Mar. usually seen singly, but also seen in pairs, or in small, often family, groups of rarely more than five birds (Forshaw & Cooper 1989; Greene 1996; R.H. Taylor). Do not form flocks (Taylor 1985). Congregate in twos and threes at favoured bathing places (R.H. Taylor). During breeding season, most males widely dispersed and sedentary; females appear to range more widely than males (R.H. Taylor).

Bonds Monogamous; pairs stay together after young independent (R.H. Taylor). In captivity, can lay when 1 year old (Low 1980; C.D. Roderick). **Parental care** Female incubates (Greene 1996; C.D. Roderick) and, apparently, broods young. Male feeds female at or near nest during incubation and for much of chick-rearing period; male starts feeding young directly and takes over most feeding shortly before young fledge, when he is sometimes fed by female (see Social Behaviour). In wild, young continue to beg and are fed by both parents for at least 2 weeks after fledging (Taylor 1985).

Breeding dispersion Nest solitarily. Males display aggressive territorial behaviour to other males near nest-site but tolerate intruding females (R.H. Taylor).

Roosting Nocturnal, solitary; in shallow burrows and tunnels under thick vegetation. Arrive at roosting sites soon after sunset and leave before sunrise. During nesting period, male of pair roosts consistently at same site, within several metres of occupied nest (R.H. Taylor).

SOCIAL BEHAVIOUR Account prepared by R.H. Taylor. No detailed studies. Can be approached closely (Guthrie-Smith 1936; Taylor 1985; Forshaw & Cooper 1989); female said to be less wary than male (R.H. Taylor). Feed quietly, uttering occasional quiet contact calls to mate (R.H. Taylor). **Comfort behaviour** Bathe daily in shallow pools; crouch in water and splash by slowly flapping outstretched wings. Preen breast and underwing with bill; rub face on foliage. Dry plumage by shaking, and crouching in sun with feathers fluffed (Taylor 1985; R.H. Taylor). Dust-bathe in captivity, but not seen to do so in wild (Pickard 1990; R.H. Taylor). On Antipodes I., rest and sun-bathe in lee of vegetation, often with head tucked near wing and eyes closed, occasionally stretching, yawning and preening. Thorough preening and oiling of feathers can take up to 15 min; use bill on all of body that can be reached; scratch head with foot. While preening, plumage fluffed and tail-

and wing-coverts spread; after preening, sleek plumage and clean bill on vegetation (R.H. Taylor). In captivity, sometimes preen with mixture of chewed aromatic leaves and preen oil; apparently to deter or remove parasites (Greene 1989).

Agonistic behaviour During breeding season, males aggressive to other males at territorial boundaries and at sources of food; aggression involves loud calling, flying at and chasing opponent, and can last up to 10–12 min. Physical contact rare; occurs in flight and while perched (Greene 1996; R.H. Taylor). Usually tolerate close presence of Red-crowned Parakeet (Forshaw & Cooper 1989; Greene 1996; R.H. Taylor). **Alarm** When disturbed or alarmed, remain silent or give low clucking or single call, or occasionally high-pitched chatter (R.H. Taylor) and disappear into tunnels beneath thick vegetation (Taylor 1985; Greene 1996); such furtive behaviour said to be characteristic of males (Forshaw & Cooper 1989). In captivity, call loudly when potential aerial predator seen, then retreat to cover (Pickard 1990). Also see Relations within family group for alarm behaviour when with young.

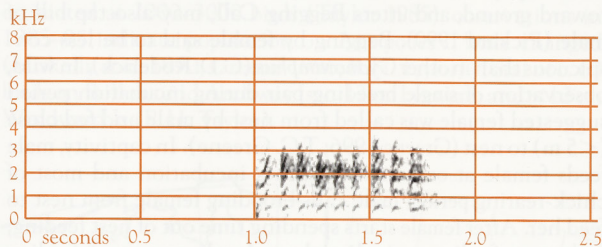
Sexual behaviour Few observations in wild; information from captive studies unless stated. **COURTSHIP DISPLAY:** Performed by male; includes circling and standing in front of female, and moving from side to side, bowing, pecking at ground, clicking bill, and calling; display lasts 1–2 min and is repeated once or twice. If female receptive, courtship feeding follows (Goudswaard 1988; Pickard 1990). **Courtship feeding** Observed during courtship, incubation and fledging periods. Female begs for food with distinctive posture: leans forward and down, but with head twisted up, bill open and tail pointed toward ground, and utters Begging Call; may also tap bill of male (Pickard 1990). Begging by female said to be less conspicuous than in other *Cyanoramphus* (C.D. Roderick). In wild, observation of single breeding pair during incubation period suggested female was called from nest by male and fed close (<5 m) to nest (Greene 1996; T.C. Greene). In captivity, male feeds female at or near nest during incubation and most of chick-rearing period; male calls brooding female from nest to feed her. After female starts spending time out of nest feeding, male starts feeding young directly; male takes over most feeding of chicks shortly before they fledge, and male is then partly fed by female in manner similar to courtship feeding (Pickard 1990; R.H. Taylor). Once in wild, male of pair feeding close together passed partly chewed length of *Carex* leaf to female with his bill, and female then chewed rest of leaf (R.H. Taylor). **Copulation** Occurs on ground; unlike other *Cyanoramphus*, male switches tail from side to side of female's tail between cloacal contacts, and rarely uses wings for balance; birds call during copulation (Pickard 1990).

Relations within family group During laying and incubation, male very assertive to female, driving her back to nest when she leaves it, and more so than in other *Cyanoramphus* (T.C. Greene; C.D. Roderick). In wild, adults and fledged young recognize, locate and maintain contact with each other by calls; use different calls between mates and between parents and offspring. Fledgelings beg for food with characteristic posture (see courtship feeding above) and Food-begging Calls. Young fed atop vegetation. Food-begging Call continues till parent regurgitates food, which is transferred with bills interlocked; parent rapidly jerks head up and down about three times before regurgitating. Process can be repeated 6–10 times/session, each regurgitation lasting 2–4 s (R.H. Taylor). Young continue to beg and are fed by both parents for at least 2 weeks after fledging (Taylor 1985). **Anti-predator response of young** When alarmed, disappear silently into thick vegetation (R.H.

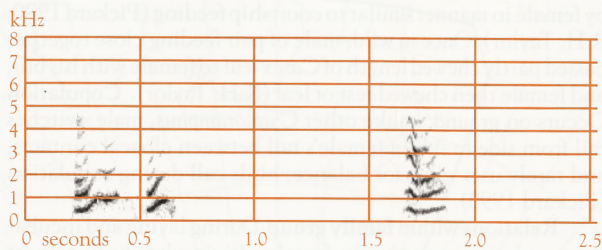
Taylor). **Parental anti-predator strategies** When disturbed or alarmed in wild, parents often utter single call, low-level clucking or, occasionally, high-pitched chatter (cf. Alarm above; R.H. Taylor). In captivity, male said to guard nest by roosting nearby (Pickard 1990) but no evidence of this in wild (T.C. Greene). When fledgeling called loudly on being caught by observer, nearby parent stayed close and silent, and soon resumed eating (R.H. Taylor).

VOICE Account prepared by R.H. Taylor. Reasonably well known. Detailed study of captive birds, with sonagrams, by Pickard (1990), on which account based unless stated. Pickard (1990) describes 13 adult calls and two calls of young, and recognized another 15 minor variants of these calls. Calls differ from those of other *Cyanoramphus* in three main ways: lower frequency and higher amplitude; number of unique calls (*contra* Falla *et al.* 1978); and predominance of non-chattering calls produced by individual birds. Calls also appear to differ in function from similar calls of other *Cyanoramphus*. Conversation notes seem softer and deeper (E.G. Turbott). Adults and fledged young recognize, locate and maintain contact with each other by calls (R.H. Taylor). No information on individual variation. Mimicry not reported. **NON-VOCAL SOUNDS:** **VOCAL MALE BILL-CLICK (VMclick):** Clicking sound made with bill; given by male as part of Courtship Display (Pickard 1990). Female can tap bill of male during courtship feeding.

Adult **VOCAL CHATTER DISPLAY CALL (VCHD)** (sonagram A): Chattering *kok-kok-kok...* (R.H. Taylor) or deep resonant *kok-kok-kok-kok-kok*, repeated rapidly (Forshaw & Cooper 1989).



A L.B. McPherson; captive, Apr. 1973; P106



B L.B. McPherson; captive, Apr. 1973; P106

Similar to single-note variant of Vocal Chatter Territory Display Call (see below) but faster, softer and of lower frequency and less intense. Most common call. Functions in advertising ownership of territory and in attraction of mate; used as less intense agonistic call than Vocal Chatter Territory Display, but is direct threat when accompanied by Standing Erect, Turning Toward and Walking Toward postures; when given quietly, functions as contact call indicating need to be alert. Most strident call of female. **VOCAL CHATTER (VCH)** (sonagram B): A syncopated, medium-intensity ascending call of 3–4 notes, usually with inflection; call uttered once or twice but not in

repeated bursts. Fairly common call. A querulous call; used during day-to-day activities, such as feeding; to seek contact with other birds; or to indicate mild threat or irritation. **VOCAL CONVERSATIONAL CHATTER (VCHCH):** A soft low-intensity call of 1–4 syllables, with phrases often repeated (Pickard 1990), sounding like *twenty-eight* (R.H. Taylor). Used to reinforce pair-bond as part of daily activities; also directed to young; and uttered by solitary birds as conversational chattering. **VOCAL SOFT SINGLE-NOTE (VSSN):** Soft single *pip* or *peep*. Contact call; and given while feeding or if alone, as conversational note. **VOCAL TWO-NOTE CHATTER (V2NCH):** Two-note call, the second usually of higher frequency. Possibly given only by male. Querulous, seeking contact with others. Contact call given by male to female on nest. **VOCAL THREE-NOTE CHATTER (V3NCH):** Soft call of 3–4 even notes, like soft Vocal Chatter. A contact call and given when inquisitive. Equivalent to soft clucking of NZRD (R.H. Taylor). **VOCAL LOUD SINGLE-NOTE (VLSN):** Loud single note, uttered once or twice. Used in alarm or surprise; rarely, given as prelude to Vocal Chatter Display Call or Vocal Chatter Display Territory Call (variant 2) calls.

Adult male **VOCAL CHATTER TERRITORY DISPLAY CALL (VCHDT):** Two variants: (1) A three-note ascending syllable delivered loud and fast. Functions in intense threat to an approaching intruder and just before fighting; most intense form of territorial calling. (2) Loud, slowly repeated single-note call, repeated in sequence from a few to many times. Given when fighting (when call high-pitched), in reply to vocal challenge from other males, and after successful copulation, and as an avian predator alarm. **VOCAL LOUD SINGLE-NOTE REPEATED CALL (VLSNRPT):** Loud, single note, repeated with increasing speed and intensity. Courtship call; used in Courtship Display (see Social Behaviour) and often interspersed with Bill-clicking (see Non-vocal sounds). Sometime accompanies courtship feeding.

Adult female **BEGGING CALL:** Intense drawn-out call, distinctive and high-pitched (Greene 1996). Pickard (1990) distinguished two types of begging call by females: **VOCAL FEMALE BEGGING COPULATION CALL (VFbegC):** Short low note uttered at intervals and repeated for a few seconds by female when soliciting copulation. **VOCAL FEMALE BEGGING FEEDING CALL (VFbegF):** Louder and longer version of Begging Copulation Call, given when soliciting food from male.

Other calls The following included within above description. When alarmed, utter low-level clucking, or short single call, or occasionally a high-pitched chatter (Taylor 1985; Greene 1986).

Young **FOOD-BEGGING CALL (= VOCAL NESTLING CHEEP [VFbegF] of Pickard):** Nestlings beg for food with rapidly repeated low-frequency note; becomes louder, higher pitched and repeated more rapidly as chick grows, and evolves into different calls after fledging (Pickard 1990). Begging Call of fledgelings described as high-pitched, rapid disyllabic call *aw-dit-dit... aw-dit-dit-dit*; the first syllable a single note followed by two higher notes and the second syllable similar but with the higher note repeated 3–4 times (NZRD; R.H. Taylor). **VOCAL NESTLING BUZZ (VNLB):** Sharp repeated buzzing; given by nestlings in alarm, distress and when disturbed.

BREEDING Account prepared by R.H. Taylor. Only known from incidental observations in wild and some captive observations (Taylor 1985; Greene 1996; R.H. Taylor).

Season Oct.–Jan. (Taylor 1985); Oct.–Nov. to Feb. (Taylor 1985); eggs recorded Nov. (Greene 1996); occupied nests, Nov.–Feb.; young, Feb. (Taylor 1985).

Site In well-drained burrow; in fibrous peat under thick vegetation or in thick matted base of tall tussocks (Taylor 1985). Well-used roosting sites have been found close to entrance to nests (R.H. Taylor).

Nest, Materials Entrance to burrow through thick cover, and often just large enough for bird to squeeze through (Greene 1996; R.H. Taylor). Eggs laid on bed of earth, root material, a few fern scales and feathers (Greene 1996; R.H. Taylor). **MEASUREMENTS:** Burrows usually < 70 cm deep, but may be >1 m deep (Taylor 1985; Greene 1996; R.H. Taylor). Diameter of nest-chamber, c. 25 cm (Greene 1996; R.H. Taylor).

Eggs Rounded; smooth; white (Buller 1905; Oliver). **MEASUREMENTS:** 27.1 (0.13; 26.9–27.2; 5) × 23.2 (0.55; 22.3–22.6) (Greene 1996); two eggs, 25.4 × 23.0 and 27.0 × 23.0 (Oliver). In captivity, 26.7 (0.94; 25.1–28.9; 25) × 22.7 (0.67; 20.8–24.0) (C.D. Roderick). **WEIGHT:** 7.68 (0.22; 7.5–8.0; 5) (Greene 1996).

Clutch-size One clutch of five (Greene 1996). In captivity, mean 5.6: C/4 × 6, C/5 × 5, C/6 × 11, C/7 × 6 (C.D. Roderick).

Laying In captivity, interval between eggs 1.9 days (0.48; 1–3; 17) (C.D. Roderick).

Incubation By female only (Greene 1996; C.D. Roderick). Female fed by male at intervals of between 59 and 189 min (Greene 1996; C.D. Roderick; see Social Organization, Social Behaviour). Full incubation starts with second egg; chicks hatch asynchronously (Pickard 1990; C.D. Roderick); partial incubation occurs between first and second eggs (R.H. Taylor). **INCUBATION PERIOD:** In captivity, from first egg laid to first hatched, 26 days (24–28) (Low 1980; C.D. Roderick).

Young Altricial, nidicolous. At hatching, blind, almost naked, with trace of extremely fine wispy down (R.H. Taylor; C.D. Roderick). At 10–14 days, fully covered in dark-grey down (C.D. Roderick; R.H. Taylor). Green plumage starts to appear at c. 25 days; fully feathered at 39–42 days (Pickard 1990; C.D. Roderick). **Growth** For two fledged juveniles, a female caught 1 and 12 days after fledging and male caught 12, 21 and 29 days after fledging (R.H. Taylor): wing (mm), of female, 138 at 1 day after fledging, 140 at 12 days; of male, 144 at 12 days, 149 at 21 days and 148 at 29 days; bill-width (mm), 13.3 and 13.5; 14.1, 14.9 and 15.2; bill-length (mm; from cere), 18.5 and 18.6; 21.7, 22.0 and 22.0; weight (g), 131 and 128; 152, 124 and 129. For details of tail, see Measurements. **Parental care, Role of sexes** Young fed by both parents (for details, see Social Organization, Social Behaviour). In captivity, male said to guard nest while female and young inside (Pickard 1990) but this not seen in wild (T.C. Greene).

Fledging to independence **FLEDGING PERIOD:** In captivity, c. 50 days (Goudswaard 1988). On Antipodes I., fed by both parents for at least 1 week after fledging (Taylor 1985); begin feeding themselves within 8 days; some still partly fed by a parent 2 weeks after fledging (R.H. Taylor).

Success On Antipodes I., broods of 1–3 fledged young have been recorded (Taylor 1985). No other information.

PLUMAGES Prepared by A.M. Dunn. Fledge in juvenile plumage at c. 6 weeks old (Pickard 1990; C.D. Roderick). Juvenile plumage indistinguishable from adult plumage. Almost no information on post-juvenile moult to adult plumage; probably complete, occurring toward end of first year. Thereafter, undergo a complete post-breeding moult each cycle, producing successive adult plumages without change in appearance. Sexes similar. No subspecies.

Adult (First and subsequent basic). **HEAD AND NECK:** Most

of head and neck, yellowish green (c162), slightly greener on lores and surrounding eye. Chin, mostly bare with a few small dark-grey (c83) feathers. Concealed bases of most feathers of head and neck, grey (84) to dark grey (83); small area of hindneck has concealed white bases. **UPPERPARTS:** Yellowish green (ne) with concealed grey bases to feathers. **UNDERPARTS:** Yellow-green (c158) with concealed grey (84) bases to feathers. **UPPERTAIL:** All rectrices, dark green (260–140) with fine yellowish-green fringe and grey-black (82) shaft. **UNDERTAIL:** Grey (c84) with yellowish wash. **UPPERWING:** All secondary coverts, yellowish green (ne) with concealed grey (c84) bases. Lesser and median primary coverts, mostly green (c160); some coverts near leading-edge of wing suffused with blue (69). Alula, mostly dark blue (70) with partly concealed lighter greyish-blue (ne) inner web to each feather; smallest feather of alula, dark green (c160) with blue wash. Greater primary coverts grade from blue (70) near leading edge of wing to dark green (160) on innermost coverts. Outer five or six primaries mostly grey-black (82) with narrow bluish dark-green (bluish 160) outer web, fine yellow-green (158) outer edge and dark-blue (c170) patch in basal half of outer web. Rest of primaries, dark green (160) with mostly concealed dark-grey (83) to grey-black (82) inner web. Secondaries grade from dark green (160) on outermost secondaries to yellowish green (ne) on inner secondaries and tertials; all secondaries have concealed grey (c84) inner web. **UNDERWING:** Lesser and median coverts, bluish dark-green (bluish 160) with concealed grey (84) bases. Greater primary and secondary coverts and remiges, grey (84) with green tinge.

Downy young Almost naked at hatching with only trace of fine wispy down (R.H. Taylor; C.D. Roderick). At 10–14 days covered in dark-grey down (R.H. Taylor; C.D. Roderick).

Juvenile Very poorly known; only one probable juvenile skin available and no published information. Plumage appears identical to adult. No differences from adult in shape of remiges or rectrices. Distinguished from adult only by subtle differences in colour of bare parts of newly fledged juveniles but little information (see Bare Parts).

Aberrant plumage A few birds have irregular yellow markings, especially on back, rump, wings and tail (NZRD; R.H. Taylor; also see Oliver).

BARE PARTS Based on photos (NZRD; unpubl.: T.C. Greene), museum labels (NMNZ), published descriptions (NZRD) and unpublished notes (R.H. Taylor). **Adult** Bill, pale bluish-grey (c86) with black (89) cutting edge and tip. Iris, red (14) or orange-red (15); brown-red, red-orange, bright orange, pale orange, yellow also reported (NMNZ; R.H. Taylor). Orbital ring, dark grey (83). Cere, grey-black (82). Legs and feet, dark grey (83) or greyish black (NMNZ); light pinkish-grey to greyish brown (NZRD; R.H. Taylor). **Downy young** Bill, pale-pinkish horn; iris, dark; legs and feet, pinkish grey (NZRD; R.H. Taylor). **Juvenile** Bill, as adult but with pinkish tinge to base when newly fledged; iris, dull brown to reddish brown (NZRD; R.H. Taylor). Three wild juveniles had dull-brown to brown iris, pinkish-grey feet, and some pink on base of upper mandible 4 weeks after fledging (R.H. Taylor). In captivity, iris changes from dull brown to reddish brown at c. 10 weeks old (R.H. Taylor).

MOULTS Based on examination of 13 adult skins and one probable juvenile skin (AIM, NMNZ), and 62 wild birds captured in Nov., Jan., Feb. and Mar. (R.H. Taylor). **Adult post-breeding** (Second and subsequent pre-basic). Complete; primaries centrifugal, usually beginning at p6 (Holyoak 1973).

Primaries replaced rapidly, with two or three feathers growing at once. Moults said to begin Jan.–Feb., after breeding (NZRD). In wild, moult began in Jan., was completed by early Mar., and timing appeared similar between sexes. One adult female began moulting about the time chicks fledged. Moults of primaries usually began before moult of tail. Moults of wing began with primaries, followed by secondaries and then coverts. Moults of tail began with outer rectrices, and was only occasionally asymmetrical (R.H. Taylor). Only two skins had active moult of primaries: one in Jan. had just begun (PMS=4) and one in Apr. had nearly finished (PMS=28); both had active moult of body. Four adults from aviaries all had active moult of primaries in Jan. (NMNZ). Moults of body possibly begins before start of moult of primaries; one adult in Nov. had slight moult of body. However, in live wild birds, replacement of body-feathers appeared to occur within the timing of moult of primaries and tail. The last feathers replaced usually on head (R.H. Taylor). **Post-juvenile** (First pre-basic). Little information. Complete. Moults of primaries possibly begins about Oct.; one possible juvenile, in Nov., had replaced p5–p7, p8 was growing, p1 and p2 were only slightly worn and rest of primaries and all rectrices were heavily abraded.

MEASUREMENTS Antipodes Is, adults; Bill W = Width of bill at widest part of upper mandible; Bill D = Depth of bill at base; Bill UMD = Depth of upper mandible at base; Bill OV = Bill overlap, which is distance from notch in upper mandible to tip: (1) Skins (AIM, AM, CM, MV, NMNZ); (2) Live birds (R.H. Taylor).

	MALES	FEMALES	
WING	(1) 149.5 (3.29; 143–155; 16)	144.5 (2.10; 142–148; 14)	**
	(2) 149.2 (4.66; 140–158; 13)	144.6 (3.48; 136–150; 40)	**
TAIL	(1) 146.8 (5.56; 136–157; 11)	139.8 (6.18; 132–150; 11)	*
	(2) 135.5 (10.55; 106–147; 13)	138.2 (6.39; 131–152; 26)	ns
BILL	(2) 24.2 (0.41; 23.5–24.9; 13)	20.6 (0.53; 19.4–21.9; 40)	**
BILL C	(1) 22.7 (1.56; 19.2–25.5; 17)	19.7 (0.49; 18.6–20.7; 15)	**
	(2) 23.3 (0.38; 22.5–23.8; 13)	19.6 (0.43; 18.7–20.7; 50)	**
BILL W	(2) 15.1 (0.29; 14.5–15.7; 13)	13.5 (0.32; 12.6–14.0; 50)	**
BILL D	(2) 26.8 (0.89; 25.4–28.3; 13)	22.0 (0.84; 20.1–23.7; 40)	**
BILL UMD	(2) 12.8 (0.42; 12.0–13.6; 13)	11.0 (0.31; 10.4–11.7; 50)	**
BILL OV	(2) 7.9 (0.46; 6.8–8.5; 13)	6.8 (0.60; 4.8–8.3; 35)	**
TARSUS	(1) 26.6 (0.96; 24.8–28.4; 15)	25.4 (0.56; 24.3–26.3; 14)	**
	(2) 27.3 (0.72; 26.2–28.7; 13)	25.9 (0.67; 24.2–26.9; 40)	**
TOE C	(1) 28.6 (1.38; 26.5–30.6; 9)	27.2 (0.89; 25.7–28.3; 9)	*
TOE	(2) 23.8 (1.01; 22.0–25.6; 13)	22.3 (0.89; 19.1–24.0; 40)	**
CLAW	(2) 12.2 (0.90; 10.3–13.1; 13)	11.2 (0.76; 9.1–12.5; 40)	**

At fledging, juveniles have shorter tails than adults (Warham & Bell 1979; NZRD; R.H. Taylor) as rectrices still growing (R.H. Taylor). In two wild juveniles, tail increased from 94 mm on day after fledging to 112 mm 11 days later in one juvenile; and in juvenile male, from 112 mm 12 days after fledging, to 131 mm 9 days later and 135 mm 29 days after fledging (R.H. Taylor). Some additional measurements in Forshaw & Cooper (1989).

WEIGHTS Antipodes Is, adults: (1) Skins (MV, NMNZ); (2) Live (R.H. Taylor).

	MALES	FEMALES	
(1)	151.2 (34.85; 105–210; 8)	121.2 (23.04; 99–165; 6)	ns
(2)	167.1 (18.53; 134–194; 13)	133.1 (12.40; 102–162; 40)	**

STRUCTURE Wing long, broad and rounded. Ten primaries: p8 longest; p10 9–14 mm shorter, p9 0–2, p7 1–2, p6 12–13, p5 23–29, p4 32–35, p3 37–40, p2 41–44, p1 45–50. Twelve secondaries, including about five tertials; tips of longest tertials fall between p2 and p3 on folded wing. Tail long, slender and pointed; 12 rectrices; t1 longest, t6 c. 70 mm shorter. Bill short and broad. Upper mandible very broad at base; cutting edges sharp, and slightly concave; tip rounded and lined with shallow v-shaped grooves on inner surface. Lower mandible broad and scoop-like, with straight sharp cutting edge. Narrow, partly feathered cere along base of upper mandible, in which small rounded nostrils situated close to top. Tarsus short and rounded; granulate. Tibia fully feathered. Outer toe directed backward. Outer hindtoe 79–90% of outer front, inner front 77–84%, inner hind 47–54%.

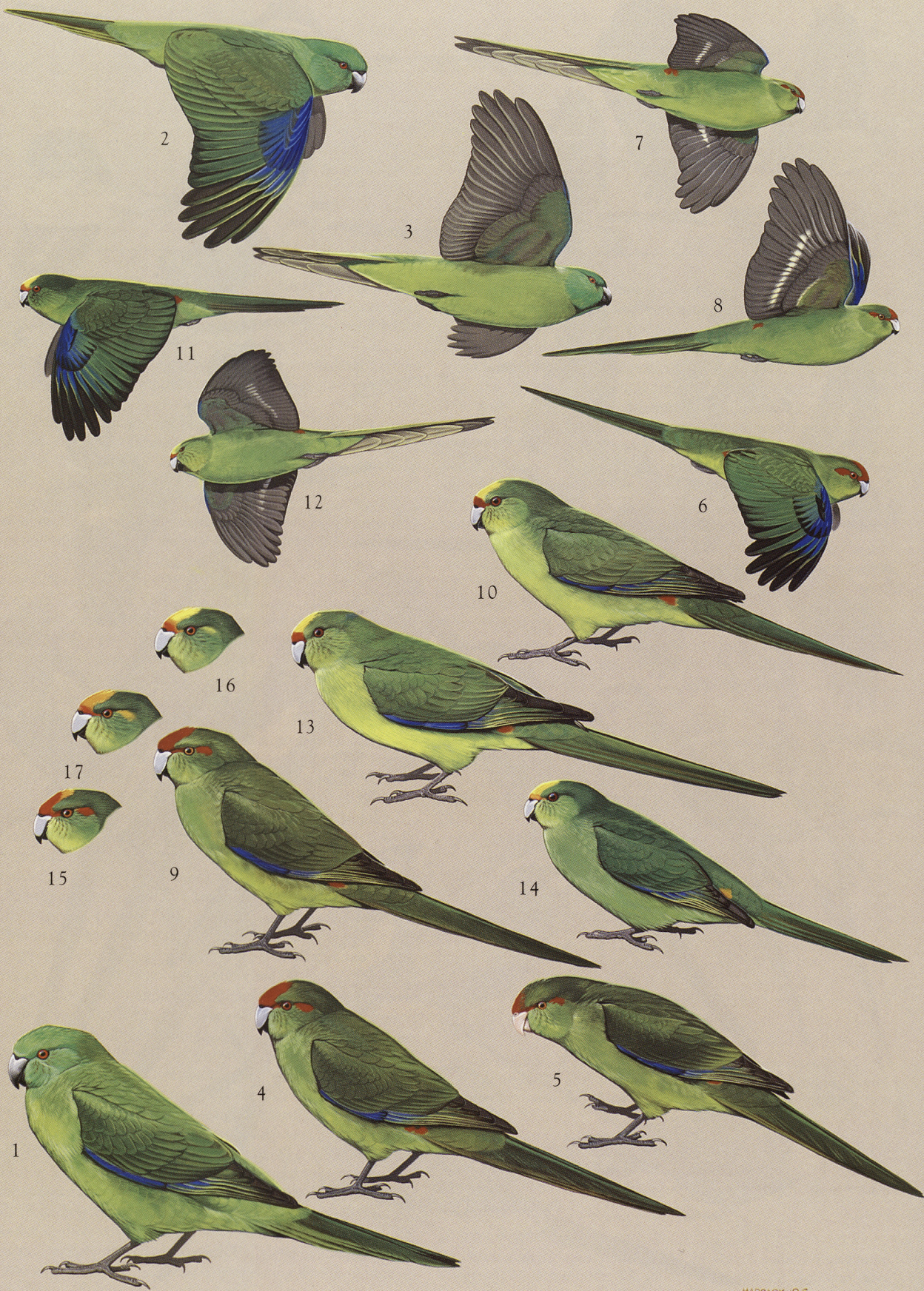
SEXING Adult males larger and heavier, with noticeably larger bills than females. Bills of newly fledged males longer and wider than those of adult females. Nestling males can also be identified from female siblings by size of bill (R.H. Taylor).

GEOGRAPHICAL VARIATION None.

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Volume 4, Plate 24 [caption error corrected from original]

Antipodes Island Parakeet *Cyanoramphus unicolor* (page 469)
 1 Adult male; 2, 3 Adult

Red-crowned Parakeet *Cyanoramphus novaezelandiae* (page 475)
 NOMINATE NOVAEZELANDIAE: 4 Adult male; 5 Juvenile female; 6, 7 Adult; 8 Juvenile
 SUBSPECIES CHATHAMENSIS: 9 Adult male

Yellow-crowned Parakeet *Cyanoramphus auriceps* (page 492)
 NOMINATE AURICEPS: 10 Adult male; 11, 12 Adult
 SUBSPECIES FORBESI: 13 Adult male
 SUBSPECIES MALHERBI: 14 Adult female

Hybrid Red-crowned *C.n. chathamensis* x Yellow-crowned *C.a. forbesi* Parakeet
 15 Red-crowned type; 16 Yellow-crowned type; 17 Intermediate type