

Order GALLIFORMES

Morphologically similar, though apparently genetically divergent, group of small to large terrestrial birds (though some species arboreal or partly so). Colloquially often referred to as 'gamebirds', because some of the most familiar pheasants, partridges and grouse are important quarry for shooters, or 'gallinaceous birds', because the Domestic Fowl is a characteristic species. Distributed world-wide (except Antarctica).

Six (or seven) families, containing about 250 species in about 90 genera (or 283 species in 75 genera; Sibley & Ahlquist 1990). Only two families occur naturally in HANZAB region: Megapodiidae (megapodes, scrubfowls and brush-turkeys), with about 19 species in six genera, in A'asia, se. Asia, the Philippines and islands of sw. Pacific; and Phasianidae (pheasants, partridges, Old World and New World quail and allies) with about 160 species in 50 or so genera (189 in 46; Sibley & Ahlquist 1990) distributed in n. and s. America, Africa, Eurasia and Asia; only four species of *Coturnix* indigenous to Aust. and NZ, though many other species have been introduced. The other families are: Tetraonidae (grouse) with 17 species in about six genera, confined to n. hemisphere; Meleagrididae (turkeys) with two species in two genera, confined to North America, with one species introduced to Aust. and NZ; Numididae (guineafowl) with 6-7 species in four genera, confined to Africa, with one species introduced to Aust. and NZ (though no definitely feral populations extant); Cracidae (curassows, chachalacas and guans) with 36-50 species in 8-11 genera, confined to Neotropical region.

The families are said to be closely similar in egg-white protein, osteology, immunology and haemoglobins, though the Megapodiidae differ somewhat from other families. DNA comparisons, however, reveal substantial genetic diversity. On the basis of DNA comparisons, Sibley & Ahlquist (1990) placed both Cracidae and Megapodiidae in a separate Order (Craciformes); they also submerged Tetraonidae and Meleagridae within the Phasianidae, and kept New World quail in a separate family, Odontophoridae. The aberrant Hoatzin *Opisthocomus hoatzin* of South America, in the monotypic family Opisthocomidae, has been placed in the Galliformes on the strength of immunological data (Brush 1979) but study of egg-white proteins (Sibley & Ahlquist 1973) and DNA comparisons (Sibley & Ahlquist 1990) show it most closely allied to the Crotophagidae in the Cuculiformes. Here we do not consider Tetraonidae or Cracidae further. History of taxonomic classification of the Order reviewed by Johnsgard (1988) and Sibley & Ahlquist (1990).

Mostly stocky birds with small heads and short broad wings. Flight, generally fast and low but not sustained and no species are long-distance migrants except the European Quail *Coturnix coturnix*. Eleven primaries (including remicle), curved; 9-20 secondaries; eutaxic, except Megapodiidae; 8-32 rectrices. Bill, heavy at base with curved culmen, usually shorter than head. Nostrils often partly covered by operculum; holorhinal; nares, impervious. Two carotids, except in Megapodiidae. Brightly coloured bare skin, wattles or combs on head in many species. Legs, short, powerful with heavy toes; hind toe present and spurs on tarsus in some. Oil-gland, varies, usually feathered; naked or with short tuft in Megapodiidae; absent in some. Crop, large; gizzard, powerful; caecae, well developed. Syrinx rather simple; tracho-bronchial. Feathers with long aftershaft; down on apteria only.

Clutch-size usually large; 6-15; up to 34 in Malleefowl. Young of most families, downy when hatched; Megapodiidae probably hatch in juvenile plumage (for discussion, see introduction to that Family); precocial, nidifugous. Most species able to fly soon after hatching (3-15 days) but some megapodes can fly almost immediately, though usually only weakly; all can fly strongly before fully grown and before post-natal moult finished. Post-juvenile moult starts within 1 month of hatching and before post-natal moult finishes; complete, or nearly so, outer 2-3 outer primaries and primary coverts retained in most species. Adult post-breeding moult complete, primaries outwards or serially outwards; moult of tail varies between families. Partial pre-breeding moult in many species.

Many species of galliforms have been introduced throughout the world (Long 1981; Westerskov 1990). In Aust. and NZ, most introductions have failed to establish or maintain feral populations; these are treated separately and briefly under the heading 'Failed introductions' at the end. Species with established feral populations are treated in the normal way.

REFERENCES

- Brush, A.H. 1979. *Biochem. Syst. Ecol.* 7: 155-65.
Johnsgard, P.A. 1988. *The Quails, Partridges, and Francolins of the World*. OUP, Oxford.
Long, J.L. 1981. *Introduced Birds of the World*. Reed, Sydney.
Sibley, C.G., & J.E. Ahlquist. 1973. *Auk* 90: 1-13.
—, — 1990. *Phylogeny and Classification of Birds*. Yale Univ. Press, New Haven.
Westerskov, K. 1990. *Proc. Perdix V: Gray Partridge and Ring-necked Pheasant Workshop*: 47-62.

Family PHASIANIDAE pheasants, partridges, quails, and allies

Small to large gamebirds; c. 140 species in c. 45 genera (189 in 46; Sibley & Ahlquist 1990), of which only four species of *Coturnix* indigenous in our region (one extinct); many species have been introduced to our region with five species in five genera, extant. New World (American) quail restricted to Americas; distribution of rest of Family centred in e. Himalayas and se. Asia; rather few species and genera spread W to Africa, N to central Asia and Europe, and S to Aust. and NZ, barely extending beyond the Greater Sunda Is. On the basis of DNA comparisons, Sibley & Ahlquist (1990) submerged the Tetraonidae and Meleagridae within the Phasianidae; they also placed the New World quail in a separate family, Odontophoridae. Morphologically similar to other families in Order, though usually lacking specializations found in other families, such as pectinate claws and feathered tarsi (Tetraonidae), bare heads, bony helmets and fleshy wattles (Numididae), bristles on breast and bare heads and fleshy wattles (Meleagrididae); less adapted to arboreal life than Cracidae. The family is absent only from polar regions, parts of South America and oceanic islands.

New World (American) quail (usually regarded as a sub-family Odontophorinae or put in a separate family Odontophoridae) are small to moderately sized, compact gamebirds; possibly originated in forests of Central America (Johnsgard 1988). About 30 species in nine or ten genera, of which two, *Colinus virginianus* and *Lophortyx californica*, have been introduced to our region, only the latter extant. Similar to partridges and Old World quail, differing in serrated tomium of lower mandible and lacking spurs. Sexes mostly alike in plumages or differing only slightly. Often with crest on head. Bill, short and stout, rather high. Nostrils, bare. Rectrices, 10–14; tail-moult, centrifugal. No species undertake long migrations though *Oreortyx* undertake seasonal altitudinal movements (Johnsgard 1988). Typically monogamous; gregarious when not breeding, in coveys or flocks.

Partridges (including francolins) and Old World quail are small to moderately sized (15–35 cm long), generally brownish birds with short tails. About 106 species in 20 genera distributed in se. Asia, through Himalayas and central Asia to w. Palaearctic and Africa; *Coturnix* extending to Aust. and NZ. Sexes generally similar but usually distinguishable by plumage. Few species have spurs. Rectrices, 8–22; moult of tail, centrifugal. Typically live in open grassy, semi-arid or agricultural land. Fly fast and low but not far, with burst of wing-beats at take-off and then alternate gliding and flapping. Free-striding gait; well adapted for running. Outside breeding season live in coveys or flocks.

Pheasants and their allies (tragopans, monals, peafowl, junglefowl) are generally larger than partridges and have long tails. About 50 species in 16 genera. Males are often brilliantly and spectacularly plumaged, differing strongly from the drab females. Males distinguished by spur. Rectrices, 14–32; moult of tail, centripetal. Usually live in wooded habit, roosting in trees. Walk with high-stepping stately gait and run easily with tails held high. Flight, strong but usually only for a few hundred metres; take off with loud wing-beats and in longer flights whirring of wings maintained; often with the ability to rise sharply upwards out of thick woods and scrub. Sedentary, living in loose groups rather than forming coveys; sexes separate outside the breeding season in some species. Many species are not monogamous (Johnsgard 1988).

Habitats vary from arid or semi-desert regions through tropical forests and temperate woodlands to high mountain tops. Particular species and genera are confined to, or prefer, tropical rainforest, woodlands, scrublands, edges of woodlands and forests, open plains, pasturelands and near-deserts. In general, sedentary; only *C. coturnix* of Europe and Africa subject to long migrations. Pheasants typically perch and roost in trees but forage on ground in open areas, where partridges both feed and roost; some pheasants feed in bushes or in the lower parts of trees. Most phasianids are omnivorous, eating roots, tubers, bulbs and other parts of plants such as seeds and fruit, as well as worms, snails, grubs and insects. Bill, feet and claws well adapted for digging and scratching.

Often gregarious but species of woodlands and forest less so than those of open country. In most species with little sexual differences in plumage, pair-bond monogamous, perhaps long-lasting. In strongly dimorphic species, harem polygamy or promiscuity prevalent. In monogamous species, males establish territories and defend them with help from mate. In polygynous species, males hold territories and display within them, in some species at traditional cleared sites or courting grounds. In all species, advertisement by male has a strong vocal accompaniment, sometimes with whirring of wings. Lateral circling display is widely, if not always, used in courtship but among polygamous species may often be replaced by frontal displays in which erection, spreading and shivering of wings, tail or tail-coverts is used. Courtship feeding by several methods is widespread. Voice, especially in large species, is loud, far-carrying and consists of simple crowing, howling, hooting, cackling or whistling. Some pheasants liable to call and whirr wings on hearing a loud noise. True bathing in water does not take place; instead, dusting in one way or another widespread. Birds pant to cool themselves. At rest, squat with head drawn into shoulders and tail drooped in species with long tails. Yawn; scratch head directly.

Breed seasonally. Nest on ground, in open, in shelter, or rocks and vegetation, or in dense cover. Usually female makes simple scrape, often lined with grass, leaves and debris collected from nearby by throwing material sideways. Eggs, oval; smooth, glossy; off-white to brown, immaculate or lightly spotted. Clutch-size, large (7–16) except in a few forest species that lay only 2–8 eggs. Usually single brooded but female may lay at two sites, one clutch for male and another for herself, in *Alectoris rufa*. Replacements laid after loss of eggs. Laying interval, 1–2 days. Incubation by female alone, except for

A. rufa as above, so far as is known. Incubation period, 17–28 days, beginning with last egg of clutch. Hatching synchronic; young, precocial, nidifugous, hatched in down; self-feeding or occasionally fed when first hatched, bill to bill, or shown food by female. Tended by female or by both parents. Injury-feigning and distraction displays may or may not be given. Young can generally fly when 7–12 days old but are not fully grown till 20–60 days old.

REFERENCES

- Johnsgard, P.A. 1988. *The Quails, Partridges and Francolins of the World*. OUP, Oxford.
- Sibley, C.G., & J.E. Ahlquist. 1973. *Phylogeny and Classification of Birds*. Yale Univ. Press, New Haven.

Alectoris chukar **Chukar**

Perdix chukar J.E. Gray, 1830, in Gray and Hardwicke, *Ill. Ind. Zool.* 1(2): Pl. 54 — India, no exact locality but Srinagar, Kumaon, accepted as type-locality by Hellmayr (1929).

Alectoris (ἄλεκτορίς) is the Greek for the Domestic Fowl. *Chukar* is the Hindi name for this bird, onomatopoeic after its call.

POLYTYPIC About 20 subspecies have been described from natural range in Eurasia. Some authors (e.g. Peters) include these in Rock Partridge *A. graeca* of se. Europe but others (e.g. BWP) separate the two. Apparently both nominate *chukar* and subspecies *koroviakovi* were among birds successfully introduced into NZ.

FIELD IDENTIFICATION Length 32–34 cm; wingspan 47–52 cm; weight: males 510–800 g, females 450–680 g. Plump, upright, medium-sized partridge; larger than California Quail *Lophortyx californica*. Short broad wings; tail, rather short, rounded; legs, short, strong. Strongly patterned head and throat, plain upperparts, strongly barred flanks, and rufous outer tail-feathers. Sexes similar; male slightly larger than female. No seasonal variation. Juvenile separable; immature inseparable.

Description Adult Thin black band extends across forehead, over lores, through eye to ear-coverts, then curves forward into band round upper breast, enclosing buff-white to white cheeks, chin, throat and upper neck; indistinct white supercilium and small rufous mark on upper ear-coverts, bordering black band; small black rictal spots; crown, nape and hindneck, pale grey tinged pinkish. Mantle, scapulars and upper back, slate-grey tinged rufous-brown; slightly paler and greyer on lower back, rump and upper tail-coverts. Uppertail, grey centrally, with distal half of outer feathers rufous, prominent in flight. Upper wing-coverts, secondaries and tertiaries, grey with brownish tinge and buff outer edges to outer secondaries; primaries, brownish grey with small buff patch on outer edge of central primaries. Breast, grey tinged pinkish brown, especially on sides of breast; flanks, buff, barred vertically with about ten thick black-and-chestnut bars; rest of underparts, buff. Undertail, dark grey centrally, with distal half of outer feathers, rufous. Underwing, brownish grey. Bill and eye-ring, red. Iris, brown to red-brown. Legs and feet, bright pink to red. Claws, black. **Juvenile** Like adult but smaller and with pattern of head and throat, and barring on flanks, duller and less clear. No black band on head; face, paler, whitish; crown, greyish. Upperparts, mostly dull olive-brown, with short white to buff streak or spot at tip of each feather of mantle and scapulars; breast, as mantle; rest of underparts, off-white to buff, flanks untidily barred brown. Tail, pinkish, mottled brown. Upperwing: primaries, dull black, with buff mottling on outer web of inner seven primaries; secondaries, olive-brown mottled buff; coverts, as scapulars. Bill, dull red or dark horn with pink tinge. Iris, brown. Legs and feet, pale red or orange-red.

Similar species In NZ, recently introduced Red-legged Partridge *Alectoris rufa* similar; differs in: pale grey restricted to forecrown with hindcrown and nape, brownish (not grey); black necklace below throat bordered behind by white, with black streaking running off hind edge of necklace, making necklace appear broader; barring on flanks more chestnut.

Sedentary; gregarious; seen in pairs, family groups of 8–10 birds or flocks as large as 50–150 birds; flocks and family groups break up before breeding but non-breeders may remain in small groups over summer. Inhabit steep dry rocky hillsides and ridges, especially sunny sites, with little vegetation; often close to run-

ning water; mostly in hill country and mountains on e. side of Southern Alps. Secretive and wary. Run well, dashing between rocks and up slopes. Fly with burst of wing-beats on take-off, interspersing active flight and gliding on short stiff wings, swinging low to ground. When disturbed, fly readily, scattering downhill where possible and sweeping round contours out of sight. Voice, a loud resonant chucking.

HABITAT In natural range, rocky arid regions with sparse shrub and grass cover (Ali & Ripley 1980). In NZ, mostly in hill country and mountains (Williams 1950). Prefer steep rocky hillsides with scant vegetation (tussock-grasses, snow grass, and scattered shrubs) and dry ground, close to running water; especially sites exposed to sun; often reported from ridges (Williams 1950, 1951; Marples & Gurr 1953). Once reported in Wild Irishman *Discaria toumatou* scrub (CSN 20); occasionally seen in ecotone where newly sown grainfields adjoin natural cover (Williams 1951). Absent from dense forests, dense scrub, or second growth (Williams 1950, 1951). Seem to have flourished best where mean annual rainfall <625 mm, though recorded from districts with 380–2000 mm mean annual rainfall; few found W of 1250 mm isohyet (Williams 1950, 1951; Johnson 1976; NZRD). Range apparently not limited by temperature, so long as climate dry. Recorded to edge of permanent snowline, birds moving higher in warmer months, downwards in winter (Williams 1950). Reported from altitudes of 235–1950 m asl (Williams 1950, 1951; Marples & Gurr 1953); most commonly below 600 m contour, where ground rockier and more broken (Williams 1950).

Nest on ground, usually below grass tussocks or snow grass; also recorded under rocks or scrub, or at entrance of rabbit burrows (Marples & Gurr 1953).

DISTRIBUTION AND POPULATION Native to Eurasia, from Balkan area and Turkey, E through Levant, Middle East and Iran, to Mongolia and China. Introduced to North America, Europe, s. Africa, Aust. and NZ (Long 1981; BWP).

Aust. Not established. In 1864, 1865 and 1872, 23, 13 and eight birds respectively were released at Gembrook, Vic. (Ryan 1906). Five birds released at Phillip I. before 1873 (Balmford 1978). Possibly other releases about 1874 (Long 1981). A recent report that a private individual tried to establish the species in Vic. (Harvey 1975) has been found to be false (Long 1981). Unconfirmed records of established population near Gulgong, NSW (Anon. 1977). Recent records of probably escaped birds at Martins Ck, NSW (NSW Bird Rep. 1985). Indefinite reports of liberations in Qld (H.J. Lavery).

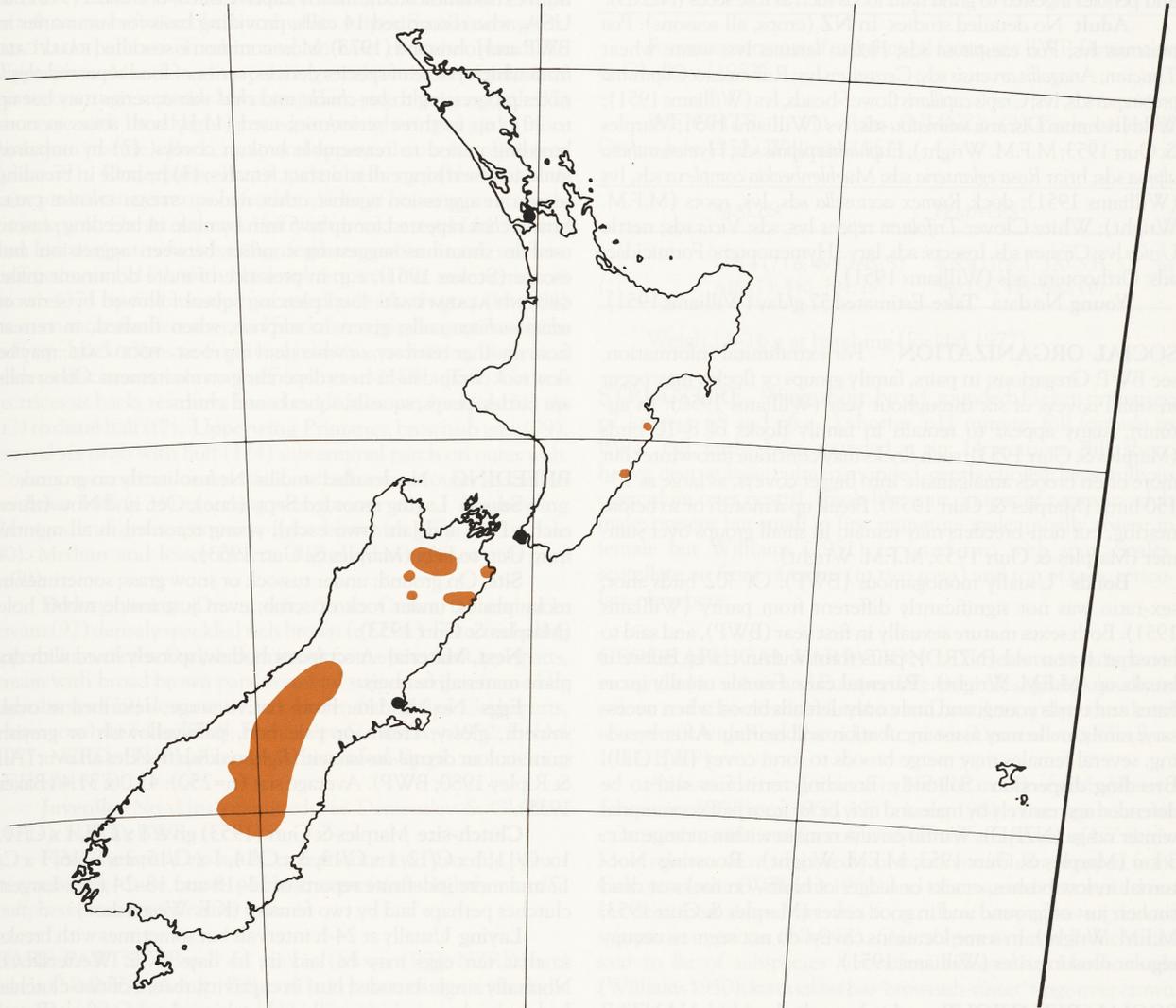
NZ NI Unsuccessful introduction of 24 birds at Taringamotu Valley in 1929. In 1931–32, the Auckland Acclimatization Society

made four further importations of c. 730 birds from India, 66 of which reached NZ alive; all died before release. In Oct. 1949, eight birds of SI origin released at Manaia, Coromandel Pen.; 13 more released there late 1950. All introductions unsuccessful (Williams 1950, 1951; Marples & Gurr 1953; Westerskov 1990). Between 1973 and 1987, nearly 1500 birds from SI released by Hawke's Bay Acclimatization Society. Some have bred, but long-term status not known (Hawke's Bay Acclimatisation Society 1986, 1987). No NI Atlas records. Said to persist round Tauranga, Bay of Plenty (NZCL). Recent sightings at Kahuranaki, Waipara R. and Herbertville, Hawke's Bay (CSN 36, 37). **SI** Widespread E of Southern Alps, at Nelson Ls, in Marlborough, central Canterbury and Otago, between L. Coleridge and Wakatipu (NZ Atlas). Formerly present in n. Canterbury (Marples & Gurr 1953), but now apparently rare or absent. Imported in 1920 and 1925, but died before release. Fifteen pairs of Indian origin successfully liberated in L. Heron district in 1926, and a further 25 birds at L. Hawea (Williams 1950; Marples & Gurr 1953; Oliver). Eighteen freed in SI between 1926 and 1932, mainly in n. and w. Canterbury, Banks Pen. and central Otago (Williams 1950, 1951). Further liberations were made throughout n. Canterbury, at Clarence R. (Marlborough), on Banks Pen. and Castle Hill area

from 1933 to 1936. In recent years, locally obtained birds released in Canterbury and Otago.

By 1938, 6 years after first release in n. Canterbury, range extended thence up to 100 km northward throughout Marlborough, from Seaward Kaikouras to Wairau R. By 1948, recorded round L. Rotoiti and ranges adjoining Wairau R. (Williams 1950); currently present in Nelson Ls district (NZ Atlas). On Banks Pen., despite several releases between 1932 and 1936, no Atlas records. The species has spread NE, SE and SW from L. Heron since 1926. By 1933, recorded from the Rakaia to the Rangitata, and near L. Tekapo. Reached Mt Cook (80 km away) by 1935. Birds in Hunters Hills, Waimate, probably come from stock at L. Heron (Williams 1950). In S. Lakes district, spread up to 80 km in most directions from two points of liberation, reaching Alexandra and Queenstown by 1934, Becks in 1938 and Glenorchy in 1947. By 1950 established in much of Central Otago, especially along Clutha R., between Alexandra and Roxburgh (Williams 1950).

In NZ, densities of up to 10 birds/61 ha recorded in prime habitats (Williams 1951). Young and eggs taken by introduced mustelids, rats, feral cats and hedgehogs (Williams 1950, 1951; Oliver). Poisoned by eating carrots and swedes laced with



strychnine, laid for rabbits (Williams 1950, 1951; Oliver). Numbers in s. Canterbury were said to have diminished after widespread poisoning by phosphorized pollard (Marples & Gurr 1953) though strychnined pollard said not to cause great mortality (Williams 1951). Occasionally caught in rabbit traps (Marples & Gurr 1953; Oliver). Shot during open season. Over 1000 said to be shot in a year in Alexandra district; generally few shot (Marples & Gurr 1953; Williams 1950). May invade newly sown cereal crops (Williams 1951).

MOVEMENTS Mostly sedentary (Marples & Gurr 1953). Some seasonal movement at higher altitudes; birds migrating higher in summer, downwards in cooler months (Williams 1950; Marples & Gurr 1953). Possibly driven down by snow and bad weather, though recorded from one site, 1500 m asl, with 45 cm of snow on ground (Marples & Gurr 1953).

FOOD Mainly seeds and leaves, occasionally insects. **Behaviour** Diurnal. Feed on ground. Opportunistic gleaning; scratch round scrub and tussocks, pull out young tussock plants (Marples & Gurr 1953). Eat equal amount of seeds and shoots throughout year. Controversy in 1950s that scratching may cause erosion. Small stones and pebbles ingested to grind hard foods such as rose seeds (NZRD).

Adult No detailed studies. In NZ (crops, all seasons): *Poa pratensis* lvs; *Poa caespitosa* sds; *Holcus lanatus* lvs; waste wheat *Triticum*; *Anagallis arvensis* sds; *Cerastium* lvs; Rubiaceae: *Coprosma propinqua* sds, lvs; *Crepis capillaris* flower-heads, lvs (Williams 1951); Wild Irishman *Discaria toumatou* sds, lvs (Williams 1951; Marples & Gurr 1953; M.F.M. Wright); *Euphorbia pepius* sds; *Hymenanthera alpina* sds; briar *Rosa eglanteria* sds; *Muehlenbeckia complexa* sds, lvs (Williams 1951); dock *Rumex acetosella* sds, lvs, roots (M.F.M. Wright); White Clover *Trifolium repens* lvs, sds; *Vicia* sds; nettle *Urtica* lvs; *Cirsium* sds. Insects: ads, larv.; Hymenoptera: Formicidae: ads; Orthoptera: ads (Williams 1951).

Young No data. **Take** Estimated 57 g/day (Williams 1951).

SOCIAL ORGANIZATION For extralimital information, see BWP. Gregarious; in pairs, family groups or flocks; may occur in small coveys of six throughout year (Williams 1950). In autumn, many appear to remain in family flocks of 8–10 birds (Marples & Gurr 1953); such flocks may continue into winter but more often broods amalgamate into bigger coveys, as large as 50–150 birds (Marples & Gurr 1953). Break up a month or so before nesting, but non-breeders may remain in small groups over summer (Marples & Gurr 1953; M.F.M. Wright).

Bonds Usually monogamous (BWP). Of 302 birds shot, sex-ratio was not significantly different from parity (Williams 1951). Both sexes mature sexually in first year (BWP), and said to breed at 1 year old (NZRD); pairs form within covey before it breaks up (M.F.M. Wright). **Parental care** Female usually incubates and tends young, and male only defends brood when necessary; rarely, male may assist incubation and rearing. After breeding, several females may merge broods to form covey (B.J. Gill). **Breeding dispersion** Solitarily. Breeding territories said to be defended aggressively by male and may be far from pair's communal winter range (NZRD). Winter coveys remain within a range of c. 3 km (Marples & Gurr 1953; M.F.M. Wright). **Roosting** Nocturnal in low bushes, cracks or ledges of bluffs, on rocks or dead timber; just off ground and in good cover (Marples & Gurr 1953; M.F.M. Wright). In some locations coveys do not seem to occupy regular roosting sites (Williams 1951).

SOCIAL BEHAVIOUR Little studied within HANZAB region; for extralimital studies see BWP and Stokes (1963).

Secretive, wary and difficult to approach (Williams 1950). Large coveys may break into smaller ones when disturbed (Marples & Gurr 1953).

Agonistic behaviour Territorial behaviour by male includes calling from outcrops and other high points; male fights all other males that enter territory (Williams 1951). **Alarm** When disturbed scatter, flying swiftly downhill when possible and then sweeping round contours out of sight; may call (Williams 1950). **Sexual behaviour** Male displays to female during pair-formation. Includes WALTZING DANCE, in which male runs at and circles female with his neck extended, head and tail lowered, and one wing lowered with tip scraping ground (CSN 5; NZRD); also report of female running round male (CSN 5). **Relations within family group** Young call continuously to maintain contact. **Parental anti-predator behaviour** For a few days after hatching, parents may feign injury; record of parent displaying aggressively at a dog (CSN 21). When young 3 weeks old, broods may merge (Williams 1951), often into coveys of 30–50 chicks and several adults; later these become the large wintering coveys (NZRD).

VOICE No information from HANZAB area. Well known from extralimital study, mostly captive birds, of Stokes (1961) in USA, who recognized 14 calls, providing basis for summaries in BWP and Johnsgard (1973). Most common is so-called RALLY CALL from which name of species derives; series of loud repeated *chuck* notes progressing to *per-chuck!* and *chu! -kar-a*; series may last up to 20 s, up to three series/min; used (1) by both sexes in non-breeding period to reassemble broken coveys; (2) by unpaired male as advertising call to attract females; (3) by male in breeding season in aggression against other males. **STEAM ENGINE CALL**: hoarse *chak* repeated for up to 5 min by male in breeding season; used in situations suggesting conflict between aggression and escape (Stokes 1961), e.g. in presence of more dominant male. **GROUND ALARM CALL**: loud piercing squeal followed by series of *whitoo-whitoo* calls; given in surprise, when flushed, in retreat from another territory, or when leaving roost. **FOOD CALL**: may be slow *took* or rapid *tu-tu-tu-tu* depending on excitement. Other calls are rattles, peeps, squeals, squeaks and churrs.

BREEDING No detailed studies. Nest solitarily on ground.

Season Laying recorded Sept. (one), Oct. and Nov. (three each), Dec. and Jan. (two each); young recorded in all months from Oct. to Feb. (Marples & Gurr 1953).

Site On ground; under tussock or snow grass; sometimes in rocky places, under rock or scrub; even just inside rabbit hole (Marples & Gurr 1953).

Nest, Material A scrape or hollow, sparsely lined with dry plant material, feathers.

Eggs No NZ data. From native range, described as oval, smooth, glossy; cream or pale buff, pale-yellowish or greyish stone-colour or *café-au-lait* with light reddish freckles all over (Ali & Ripley 1980; BWP). Average size (n=250): 43.0 x 31.4 (Baker 1935).

Clutch-size Marples & Gurr (1953) give: 1 x C/8, 1 x C/10, 1 x C/11, 1 x C/12, 1 x C/13, 3 x C/14, 1 x C/15, 2 x C/16, 1 x C/17 and more indefinite reports of 12–18 and 18–24 eggs. Largest clutches perhaps laid by two females (K.E. Westerskov).

Laying Usually at 24-h intervals but sometimes with breaks so that ten eggs may be laid in 13 days (K.E. Westerskov). Normally single-brooded but, in captivity, record of two clutches laid in quick succession, with male taking charge of first (Portal 1924; BWP). No further information.

Incubation Usually by female. INCUBATION PERIOD: 24–25 days (K.E. Westerskov) or 22–24 days in native range (BWP).

Nestling Precocial, nidifugous; leave nest as soon as down is dry: covered in dense soft down; crown light brown, speckled dark; side of head and supercilium, cream: black streak from eye to back of neck; back, black with three longitudinal stripes; breast and belly off-white. Attended by female, or male when two clutches laid; incubated and reared independently (K.E. Westerskov). Can fly short distances at about 2 weeks old. Broods tend to amalgamate at about 3 weeks of age. Parents feign injury to attract predators from young (K.E. Westerskov). No further information from NZ.

PLUMAGES Prepared by D.J. James. From NZ skins of (probably) nominate *chukar* or hybrids thereof; two forms apparently in NZ (see Geographical Variation).

Adult Sexes similar; attained after 3–4 months (BWP).

Head and neck Crown, nape and hindneck, light grey (c85). Fairly broad black band across forehead, through eye, to side of neck and broadening across foreneck in broad U-shaped band; extends narrowly under but not over eye; band outlines white throat, foreneck and lores. Fairly long white stripe on ear-coverts, behind eye and above black band; short rufous-brown (37) stripe or tuft on ear between black-and-white stripes. Small inconspicuous black patches on chin and at base of lower mandible. **Upperparts** Mantle and scapulars, greyish with deep-pinkish or vinaceous tinge; anterior lower scapulars, pale blue-grey (pale 87) in centre with broad light-grey edges strongly tinged pink (more pink than mantle). Back, rump and upper tail-coverts, olive-grey (olive 79). **Underparts** Breast, pale bluish-grey (blue 86) with faint pinkish tinge at tips of feathers; sides of breast more strongly tinged pink. Flanks, salmon-buff with broad crisp black barring and less distinct rufous barring; feathers, rather broad, salmon-buff (salmon 121D), with black subterminal bar, narrow rufous-brown (37) tip and mostly concealed pale bluish-grey (blue 86) base; on most feathers a second black bar separates grey base from buff tip; black aligns in fairly long continuous barring. Belly and under tail-coverts, salmon-buff (salmon 121D). **Tail** Central rectrices as back; rest have broad reddish-brown (reddish 34) tip (t2) to distal half (t7). **Upperwing** Primaries, brownish grey (79), central six or so with buff (124) subterminal patch on outer web. Coverts, secondaries and tertials, as back except outer secondaries have buff (124) mottling along outer edge. **Underwing** Remiges and greater coverts, light brownish grey (80 or pale 80). Median and lesser coverts slightly darker, brownish grey (c79).

Downy young Down, soft, dense. Crown to hindneck, cream (92) densely speckled rich brown (c123A). Face, including supercilium, cream. Dark-brown streak from eye to ear. Upperparts, cream with broad brown para-vertebral stripes; stripes formed by light-brown (39) down with dark-brown (121) tips. Underparts, cream to white (skin [CM]); Dement'ev & Gladkov 1952; Fjeldså 1977; NZRD; BWP). Average 90 mm total length at hatching (Fjeldså 1977).

Juvenile No skins examined; see Dement'ev & Gladkov (1952), NZRD, BWP.

First immature As adult, except outer two juvenile primaries retained; these, more pointed, sometimes slightly mottled buff; best clue, comparative wear.

BARE PARTS Based on photos (Moon 1992; NZRD) and labels (NMNZ). **Adult** Bill, red (c11), sometimes with slight orange tinge. Orbital ring, red (11). Iris, black. Legs, pinkish red or red (10).

MOULTS Thirteen NZ skins (AWMM, CM, NMNZ) examined. Primaries, outwards; secondaries, inwards; tail, centrifugal. For details see Dement'ev & Gladkov (1952) and BWP. **Adult post-breeding** Complete. Said to follow breeding (NZRD). Three skins from Jan. with primary-moult at p8–p9; some body-moult on skin from Otago, July. **Post-juvenile** Complete, usually except outer two primaries. Skin collected Jan. with moult at p9.

MEASUREMENTS Adult and first immatures: (1) NZ, skins (AWMM, CM, NMNZ). (2) Birds collected Otago, July 1950 (Williams 1951).

	MALES	FEMALES	
WING	(1) 166.8 (2.14; 163–169; 6) (2) 166 (5.67; 156–176; 19)	158.5 (2.17; 156–161; 6) 158 (2.36; 153–166; 19)	**
8TH P	(1) 115.0 (2.45; 112–118; 5)	111, 112, 112	
TAIL	(1) 95.7 (4.46; 87–99; 6)	85.3 (5.79; 78–96; 7)	*
BILL F	(1) 21.4 (1.28; 19.4–23.3; 6) (2) 22.5 (0.61; 21.0–23.5; 19)	18.9 (0.83; 17.8–20.2; 7) 21.0 (1.13; 21.0–23.5; 19)	*
TARSUS	(1) 47.4 (1.90; 44.5–49.4; 6) (2) 54.5 (2.10; 50.0–58.0; 19)	43.0 (2.71; 38.0–45.0; 7) 50.0 (2.21; 45.0–56.0; 19)	ns
TOE	(1) 37.5 (0.98; 36.1–38.4; 6)	34.6 (2.28; 31.7–38.4; 7)	ns

For measurements of extralimital forms, see BWP, Dement'ev & Gladkov (1952).

WEIGHTS (1) Skins (NMNZ). (2) Birds collected Otago, July 1950 (Williams 1951).

	MALES	FEMALES	
(1)	606.4 (73.6; 495–695; 5)	408.4 (108.1; 320–535; 5)	ns
(2)	638 (73; 510–794; 19)	540 (56; 454–680; 20)	

Weigh 11–16 g at hatching (Fjeldså 1977).

STRUCTURE Wing, short, broad, rounded. Eleven primaries; p7 longest, p8 and p6 c. 3 shorter, p11 minute; full formula in BWP. Tail, fairly short, rounded at tip; 14 rectrices. Bill, short, heavy, deep at base; culmen rounded, gently curved; large bulbous operculum over nostril. Knob-like spur on rear of tarsus in adult male; present but small in first immature male; usually absent in female but Williams (1951) reported two with spur. Scales, scutellate on front of tarsus (in two rows) and top of toes, reticulate elsewhere.

GEOGRAPHICAL VARIATION Thirteen to 16 subspecies recognized in s. Asia and Europe, differing only slightly, clinally in colour and size; closely related to and, until recently, considered conspecific with Rock Partridge *A. graeca* (Dement'ev & Gladkov 1952; BWP).

At least 21 introductions in NZ (18 in SI) of probably two subspecies (Williams 1950, 1951; Long 1981); overseas material examined insufficient for confirmation of subspecies of NZ skins. Most releases were supposedly of nominate *chukar*, shipped from Calcutta, India (Williams 1950) and it is assumed that most skins (as described above) are this form; these very close to skin of subspecies *cypristes* (NMNZ). One shipment from Baluchistan said to be of subspecies *koroviakovi* released in Marlborough (Williams 1950); *koroviakovi* has 'brownish-russet' tinge over crown and forehead with upperparts 'russety red' tinged grey (Dement'ev & Gladkov 1952); no NZ material matches this. Three female

skins (CM) from Canterbury, SI, differ from other NZ skins in: (1) pinkish-brown tinge to head and neck matching back and contrasting with hindneck; and (2) black band discontinuous above and below eye; wing, 156, 163 mm; these possibly hybrids between *chukar* and *koroviakovi*.

REFERENCES

- Ali, S., & S.D. Ripley. 1980. *Handbook of the Birds of India and Pakistan*. OUP, Delhi.
- Anon. 1977. *Atlas Newsl.* 4: 4.
- Baker, E.C.S. 1935. *The Nidification of Birds of the Indian Empire*. Taylor & Francis, Lond.
- Balmford, R. 1978. *Aust. Bird Watcher* 7: 237–48.
- Dement'ev, G.P., & N.A. Gladkov (Eds) 1952. *Birds of the Soviet Union*. 4. Israel Program Scient. Transl., Jerusalem (1967).
- Fjeldså, J. 1977. *Guide to the Young of European Precocial Birds*. Skarv. Nature Publs, Strandgården, Tisvildileje.
- Harvey, N. 1975. *Aust. Outdoors*: 14–17.
- Hawke's Bay Acclimatization Society. 1986. *118th Annual Rep.*
—1987. *119th Annual Rep.*
- Johnsgard, P.A. 1973. *Grouse and Quails of North America*. Univ. Nebraska Press, Lincoln.
- Johnson, W.B. 1976. *Otago Acclimat. Soc. Ann. Rep.* 110: 31–7.
- Long, J.L. 1981. *Introduced Birds of the World*. Reed, Sydney.
- Marples, B.J., & L. Gurr. 1953. *Emu* 53: 283–91.
- Moon, G. 1992. *A Field Guide to New Zealand Birds*. Reed, Auckland.
- Portal, M. 1924. *Br. Birds* 17: 315–16.
- Ryan, C.S. 1906. *Emu*. 5: 110–19.
- Stokes, A. W. 1961. *Condor* 63: 111–27.
— 1963. *Anim. Behav.* 11: 121–34.
- Westerskov, K.E. 1990. *Proc. Perdix V: Gray Partridge and Ring-necked Pheasant Workshop*: 50.
- Williams, G.R. 1950. *NZ Sci. Rev.* 8: 2–6.
— 1951. *Notornis* 4: 151–5.



Volume 2, Plate 30

Chukar *Alectoris chukar* (page 386)

1 Adult; 2 Downy young; 3 Juvenile; 4, 5 Adult

California Quail *Lophortyx californicus* (page 358)

6 Adult male; 7 Adult female; 8 Downy young; 9 Juvenile; 10 Adult male; 11, 12 Adult female

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