

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.

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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.

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Phasianus colchicus Common Pheasant

COLOUR PLATE FACING PAGE 384

Phasianus colchicus Linnaeus, 1758, *Syst. Nat., ed. 10*, 1: 158 — Africa, Asia = Valley of Rioni River (formerly Phasis), western Transcaucasia.

Phasianus is the Latin for 'pheasant' and was derived from the Phasis, a celebrated river of Colchis, flowing into the eastern end of the Black Sea and famous for the expedition of Jason and the Argonauts in search of the Golden Fleece. Colchis (now Georgia), which provides the specific name, was a land bounded on the west by the Black Sea, on the north by the Caucasus and on the east by Iberia (not Spain).

OTHER ENGLISH NAMES Pheasant, Ring-necked Pheasant, English Pheasant.

POLYTYPIC In the natural range in Asia, at least 40 subspecies have been described (Peters).

FIELD IDENTIFICATION Length 55–100 cm, of which tail 25–60 cm; wingspan 70–90 cm; weight: males 1100–1650 g, females 850–1450 g. Distinctive, large, deep-bodied gamebird with strutting gait; somewhat similar to Domestic Fowl in size and shape. Tail elongated in both sexes. Male, colourful, always with bare red face; female, generally dull buff-brown. Sexes dissimilar in plumage and size; male larger and longer-tailed than female. No seasonal variation. Juvenile like female. A number of subspecies introduced with much hybridization and variation; in NZ, most birds resemble ring-necked subspecies.

Description Adult male Lores, bare facial skin round eye and broad wattle below, bright red; crown, glossy bronze-black, with white supercilium extending from forehead to rear of crown; nape and upper neck, glossy purplish-black to dark bottle-green, with tuft of similar colour behind each eye; most birds in our region have white ring encircling base of neck. All feathers of body, iridescent; mantle, golden orange-buff with broad black markings; scapulars and back, orange-buff with glossy violet tips and bold buff to white and glossy blue-black marks at tips of feathers; rump, greyish-green, with greenish or purplish gloss; upper tail-coverts, orange-buff. Tail, buff-brown with widely spaced narrow black barring and pale purple-chestnut gloss. Upperwing: secondary coverts, yellow-buff, with dark-chestnut centres on tertials; remiges and primary coverts, dark brown, barred buff; broad yellow-buff edges to outer web of secondaries. In flight, innerwing appears pale yellow-buff, contrasting with brown outerwing with buff bars and brightly coloured upperbody and

tail. Breast and flanks, bronze-orange, glossed purple in some lights; abdomen and vent, almost black with blue-green gloss; tinged rufous brown on vent; under tail-coverts, chestnut with scattered black markings. Undertail, as uppertail. Underwing, pale grey mottled buff. Bill, pale horn or horn-yellow. Bare facial skin and wattles, bright red. Iris, yellow-brown to orange-yellow. Legs and feet, ivory-white to pale grey. **Adult female** Forehead and crown, black, barred and edged buff; ear-coverts, brown; rest of head and neck, mostly buff to pinkish buff, barred or speckled black. Mantle, scapulars, back and rump, buff to chestnut with broad black U-shaped mark and pale fringes; longer upper tail-coverts, barred pale buff. Tail, buff-brown with widely spaced narrow pale buff and black bars; barring closer on outer feathers. Upperwing: remiges and primary coverts, brown with pale-buff barring and tips; secondary coverts, pale buff with black spots and broad buffish fringes. In flight, appears buff-yellow to buff with strong brown spotting and barring. Underbody, pale buff with dark-brown speckling; flanks, pinker buff with darker mottling; under tail-coverts, pink-buff, mottled brown and buff; undertail as uppertail. Underwing: lining, pale grey-brown; remiges, brown. Bill, pale brown. Iris, yellow-brown. Legs and feet, grey-brown. **Juvenile** Like female, but duller, with less regular pattern to plumage and shorter tail. Bill, pale brown. In male, skin round eye pink, becoming red with development of adult plumage. Iris, brown. Legs and feet, pale brown becoming greyer with age.

Similar species Adult unmistakable in our region; only large gamebird with long tail.

Sedentary. Seen singly in small groups (2–3) or in small flocks up to 15–20 birds; often in pairs when breeding. Walk with slow high steps, male strutting in display; run easily and quickly, with tail held high. Fly strongly; take off with burst of noisy flapping wing-beats; in sustained flight, wings continue to make distinctive whirring noise, active flight interspersed with long glides; burst out of dense vegetation. Pheasants respond to disturbance by taking to trees, stealing away, freezing, or flushing; plumages of hens, chicks and juveniles cryptic when they freeze on ground. Roost in trees, also hedgerows and scrub. In NZ, roost on ground. Male's territorial call a loud hoarse and sudden crowing; give similar call, repeated, when alarmed, and respond to extraneous loud noises like gunfire.

HABITAT Open land interspersed with patches of wooded cover; scrub; heathlands (Saunders & de Rebeira 1985; S.J. Cowlings; K.E. Westerskov); habitat selection probably influenced by sites of release. On Rottneest I., found in *Acanthocarpus preissii* heathlands, *Melaleuca lanceolata* woodlands, and along edges of swamps and lakes (Storr 1965; Saunders & de Rebeira 1985); when not breeding, mostly in more open heathland habitat (Saunders & de Rebeira 1985); roost in tall *M. lanceolata* at night (Storr 1965). On King and Flinders Is, in pastoral areas near shelter of hedges and dense tea-tree (Green & McGarvie 1971); partly cleared farmland and woodland; usually areas near wooded cover and fresh water (S.J. Cowlings). Recorded from orchards in se. Tas.; as orchard trees lose their leaves, birds disperse into nearby native forest (Fielding 1979). Roost above ground in hedgerows, bush or scrub; forage in partly cleared pasture, croplands, and heath; apparently prefer new pastures as foraging habitat. Nest in clearings in pasture, cereal crops, or adjacent scrub (S.J. Cowlings).

NZ Widespread in NI in pasture and scrub; abundant in cereal crops; common on lupin-covered dunes (Westerskov 1956b). Abundant in ecotones between forest and farmland, providing suitable mosaic of partly cleared land, pasture, scrub and weedy growth (Adams 1970). Areas most suitable when habitats interspersed, and where hedges or other woody cover provide safe travelling routes and protection (Westerskov 1956b). Rare or absent in tall native forests, dense stands of scrub, tussock grasslands, and high mountain regions (Phillipps & Lindsay 1948; Westerskov 1956b); though recorded up to 800 m asl (Caughley 1962). Observations of 9269 adults in lowland NI showed occurrence according to habitat: in pasture country 33%, fern and Manuka *Leptospermum scoparium* scrub 20%, lupin-covered dunes 9%, rough pasture 8%, other habitats the rest (Westerskov 1956b). Pasture and scrub country used evenly throughout year; hayfields commonly used Nov.–Mar.; maize fields Apr.–June (Westerskov 1956b). In Kaweka Ra., NI, recorded from scattered scrub (cover of 10–50%); dense (> 50% cover) Manuka scrub <3 m tall; and tall, dense Manuka and Kanuka *L. ericoides* scrub (Caughley 1962); Ruahine Ra., in Manuka scrub and *Poa* grasslands (Challies 1966); Kaweka Ra., recorded up to 650 m asl in old farmland that had reverted to Manuka and Kanuka scrub, and tussock grasslands of *Danthonia* and *Poa* (Fordham 1961). Breeding habitat in ranges unknown; in farmland and pasture areas, nest mostly in hayfields, blackberry *Rubus* or bracken *Pteridium* scrub, along roadsides and in rough pasture; nests usually well hidden (K.E. Westerskov).

DISTRIBUTION AND POPULATION Native to Eurasia, from Caucasus, through Mongolia to Korea, China and n. Indo-China. Introduced widely to Europe, N. America, Japan, various islands, Aust. and NZ (Long 1981; Aust. CL).

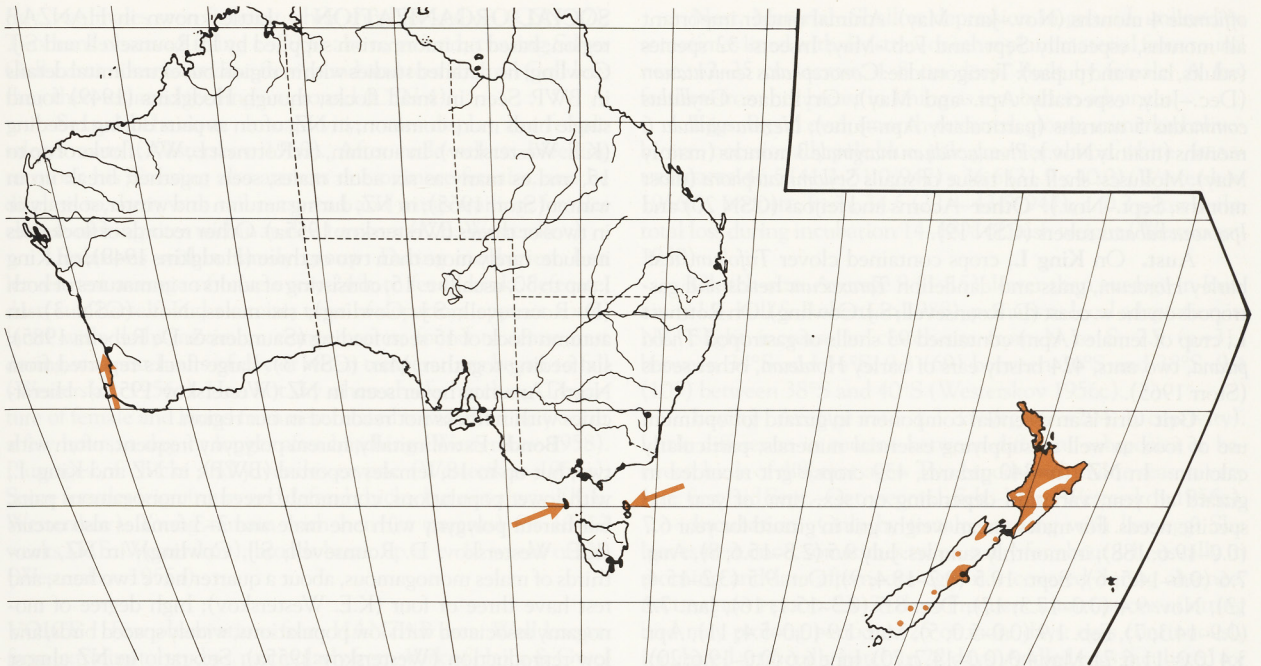
Aust. Aust. Atlas recognizes feral populations only in Bass St. and on Rottneest I. **NSW** Unsuccessfully released in Hawkesbury district in 1944 (Tarr 1950). Most current records are of birds that have escaped from captivity (e.g. NSW Bird Rep. 1984) or of small protected populations (e.g. Bowen I. and adjacent mainland; Morris *et al.* 1981). **Vic.** Several introductions in or before 1855; spread at Gembrook at that time (Long 1981). Many released on Phillip I.: eight in 1864; 30 in 1870; 15 in 1871; 70 in 1872; >100 in 1873 (Ryan 1906). Other releases before 1873 include six at Royal Park and ten in Plenty Ras (Balmford 1978); many unrecorded private releases and distribution of eggs (Ryan 1906; Balmford 1978). Apparently feral on Sunday I. after recent releases (Townsend 1990). **Tas.** First introduced in early 1880s at Newtown and Entally, where, after initial increase, population decreased gradually (Littler 1902). Repeated imports to Stanley, and young reared near Hagley, but all destroyed (Littler 1902). Some releases Sandford, Carlton, Cambridge and other areas of Tas. mainland (Sharland 1958); despite increase round Cambridge by 1940s (Tarr 1950), all introductions on Tas. mainland unsuccessful (Green 1989). Current new records assumed to be of birds escaped from captivity. Introduced to King I. c. 1912, where now common and widespread (Green 1989; Tas. Bird Rep. 17). Introduced to Flinders I., 1959 (Green 1969) and possibly earlier (Tarr 1950); widespread but not securely established (Green 1989; Newman *et al.* 1984; Tas. Bird Rep. 11). **SA** Fifty released at Echunga in 1961, and Mt Lofty Ras (Condon 1969; Fuller 1964). Between 500 and 600 released in early 1960s in various parts of SA, including Fleurieu Pen. (Condon 1969; Long 1981). Recorded at Kangaroo I., Aug. 1969 (SA Bird Rep. 1969–70). **WA** Several unsuccessful releases in sw. WA before 1912 (Long 1981). Introduced Rottneest I., Jan. 1928 (three birds; Serventy 1938, 1948); common and widespread by 1931; present status similar (Storr 1965; Saunders & de Rebeira 1985).

Norfolk I. Introduced before 1913; now extinct (Schodde *et al.* 1983).

NZ Four Pheasants (of the black-necked subspecies) introduced to Wellington from England, 1842; in 1851, ring-necked pheasants were introduced directly from China; Mongolian pheasants were introduced from England in 1923 (Westerskov 1956b; Long 1981; K.E. Westerskov). Many subsequent introductions of birds of English, Chinese and American origin up to present in many regions of NI and SI (Long 1981; K.E. Westerskov). Mainly in NI. **NI** Widespread, S to 40°S; in Northland, Waikato, Bay of Plenty, E. Coast, Hawke's Bay, Taranaki, Wanganui and coastal Wellington (Westerskov 1956b). **SI** Small local populations in Nelson, Canterbury and Otago (Westerskov 1957a; NZ Atlas).

Populations in A'asia have fluctuated, with numbers typically increasing soon after release, then gradually declining, in response to competition, predation, shooting, poisoning and habitat requirements (Ryan 1906). The species would probably disappear in some districts if birds were not being liberated continually (Stidolph 1939), but maintains populations in many areas without assistance (Long 1981). Numbers steady on King I. (R.H. Green). NZ population probably c. 250,000 birds at densities of between 2.3 and 13.8 birds/km² (Westerskov 1963b).

In NZ, up to 50,000 cocks shot per year (Westerskov 1963b). King I. Pheasant Assoc. breed and release birds annually for 2-day open season, first weekend in June; shooters limited to three cock birds per day (Green 1989; Robinson & Brouwer 1989; R.H. Green). Other introduced birds (e.g. Starlings) may compete with young birds for food (Oliver); introduced predators (ferrets, stoats, feral cats) prey heavily on the species (Ryan 1906; Oliver). In the past, many died from eating poisoned grain (Anon. 1904;



Ryan 1906; Oliver). Occasionally cause local damage to new potato crops and sprouting maize (K.E. Westerskov).

MOVEMENTS Sedentary. During non-breeding season may move locally to forage in more open habitats (Saunders & de Rebeira 1985), or from deciduous orchards to evergreen forest (Fielding 1979). Of 512 males banded and recovered in NZ, 83% moved 0–6.5 km; 14% moved 7–24 km; 4% moved more than 25 km (Westerskov 1956b). Of 36 females banded and recovered, 89% moved 0–6.5 km, the rest moved 7–16 km. The longest distance moved by an individual was 56 km. Apparently move farthest from unsuitable habitat to find good-quality habitat (Westerskov 1956b). Sedentary on King I. (S.J. Cowling).

FOOD Based on research by K.E. Westerskov and Westerskov (1965), except where otherwise referenced. Omnivorous: grain, seeds, berries and other small fruits, roots, green shoots, small invertebrates, snails, and some small vertebrates. **Behaviour** Active during day, especially morning and late afternoon; may be active at other times of day. Mainly feed on ground, scratching with feet and bill. Will dig 30–45 cm for tubers (CSN 20). Characteristic crouched posture, often raising head to check for potential danger. May also feed on buds in trees, and pick berries by jumping (Glutz von Blotzheim *et al.* 1973). Diet varies with availability of food (Hill & Robertson 1988). Often gather grit from roadsides (Westerskov 1965; D. Rounsevell).

Table 1 Crop contents of 439 adult Pheasants in New Zealand, based on % volume (K.E. Westerskov).

Food groups	Winter	Spring	Summer	Autumn
Green foliage	60.4	60.1	10.6	14.9
Seeds	12.6	17.7	48.0	22.6
Berries	9.9	tr.	14.4	23.7
Grain	5.9	4.9	6.3	7.1
Plant varia	8.6	0.4	8.7	3.2
Animal matter	1.8	16.7	11.7	28.3
Minerals	0.8	0.2	0.3	0.2

Table 2 Crop contents of 100 Pheasant chicks aged 1–12 weeks, and 32 young birds, aged 13–20 weeks, based on % volume (+ = present) (K.E. Westerskov).

Food groups	Age in Weeks					
	1–3	4–6	7–9	10–12	13–16	17–20
Animal matter	87.5	64.0	14.7	50.3	43.1	2.0
Seeds and grain	12.5	30.8	67.9	37.4	19.9	27.4
Green foliage	+	2.6	10.1	1.3	17.7	48.2
Berries	+	2.6	7.3	11.0	19.3	22.4

Adult NI, NZ (n=439 crops and 340 gizzards; 13 crops empty). Seven major groups (annual average): green foliage 36.5% vol., seeds 25.2, berries 12.0, grain 6.1, various plant material 5.2, animal matter 14.6, mineral matter 0.4; seasonal summary in Table 1. Green material dominant, particularly winter–spring (maximum 76% vol. in Aug.); less important summer (minimum 2% vol. in Feb.); green leaves consist mostly of clover *Trifolium* and grasses Gramineae, also *Vicia*, *Ranunculus*, *Polygonum*, *Cerastium* and others. Seeds of weeds important (25% vol.) most of year, highest Jan. (67%), lowest Sept. (tr.); 93 species identified, most important are *Cerastium glomeratum* (eaten during 7 months), *Cirsium vulgare* (5 months), *Plantago lanceolata* (4 months), *Poa annua* (5 months), *Polygonum* (7 months), *P. hydropiper* abundantly Apr.–June, *P. persicaria* May), *Ranunculus* (6 months), *Rumex acetosella* (5 months), *Silene gallica* (8 months, particularly May–June), *Stellaria media* (5 months). Berries from Dec. to Aug. (25–33% total Feb.–May); 22 species eaten, especially *Phytolacca octandra* (Nov.–Aug. dominating May–June) and *Solanum nigrum* (Dec.–Aug. especially May–June). Waste grain important but limited in distribution; most important is maize (especially May, also Apr., June, some Oct.–Nov.); oats (June), barley (Jan. and May). Other plant material important Feb. (21% vol.) and Aug. (14% vol.), but some eaten most months; consists of flowers, flower-heads, stems, roots, corms, rhizomes, acorns, nuts; 37 species identified, pieces of Kumara *Ipomoea babatas* 4 months (most May and July), acorns commonly May–July, flowers and roots of *Ranunculus* 6 months (Apr.–June, Oct.–Jan.), flowers of *Taraxacum*

officinale 4 months (Nov.–Jan., May). Animal matter important all months, especially Sept. and Feb.–May; Insects: 32 species (adults, larva and pupae): Tettigoniidae: *Conocephalus semivittatum* (Dec.–July, especially Apr. and May); Gryllidae: *Gryllulus commodus* 5 months (particularly Apr.–June); *Nezara viridula* 6 months (mainly Nov.); *Phaulacridium marginale* 3 months (mainly May). Molluscs: shell and tissue of snails *Stylommatophora* (most months, Sept.–Nov.). **Other** Acorns and feijoas (CSN 20) and *Ipomoea babatas* tubers (CSN 19).

Aust. On King I., crops contained clover *Trifolium* leaf, barley *Hordeum*, grass and dandelion *Taraxacum* heads and gastropods on the w. coast (D. Rounsevell; S.J. Cowling). On Rottneest I., crop of female (Apr.) contained 93 shells of gastropod *Theba pisana*, two ants, 424 bristly ears of barley *Hordeum*, other seeds (Storr 1965).

Grit Grit is an essential component in gizzard for optimum use of food as well as supplying essential minerals, particularly calcium. In NZ (n=340 gizzards, 439 crops): grit recorded in gizzard all year, variation depending on sex, time of year and specific needs. For males, mean weight grit in gizzard for year 6.7 (0.0–19.6; 188); in monthly samples: July 9.5 (2.8–15.6; 8), Aug. 7.6 (0.6–14.5; 6), Sept. 10.5 (0.7–18.4; 9), Oct. 9.5 (3.2–15.4; 12), Nov. 9.4 (0.0–17.3; 17), Dec. 8.5 (0.3–15.1; 16), Jan. 7.2 (0.9–14.3; 7), Feb. 1.9 (0.0–5.0; 5), Mar. 1.9 (0.0–5.4; 11), Apr. 3.4 (0.0–11.6; 7), May 4.0 (0.0–14.7; 70), June 6.6 (0.0–19.6; 20). For females, mean weight grit in gizzard for year 5.8 (0.0–26.2; 92); for monthly samples: July 4.9 (0.0–11.6; 6), Aug. 7.8 (4.0–11.8; 6), Sept. 9.6 (6.7–13.2; 3), Oct. 10.1 (1.7–26.2; 11), Nov. 8.3 (0.2–20.8; 12), Dec. 9.1 (1.3–16.7; 7), Jan. 4.8 (0.0–9.3; 10), Feb. 3.9 (0.0–9.9; 9), Mar. 1.0 (0.0–4.3; 6), Apr. 1.7 (0.0–8.0; 7), May 2.7 (0.4–7.7; 11), June 6.3 (1.1–15.1; 4). Demand for grit by females doubles in breeding season (Sept.–Dec.). Amount of grit in gizzard varies from a little to 2709 pieces found in a male in Sept. and 2094 in a female in Oct.; average for year: males 618, for females 535. Indigestible material eaten all months, mostly May–Dec.; gravel and small fragments of stone (all months, mostly May–July), sand in 5 months of year (Oct., Mar.–June), pieces of pumice in 9 months, other gizzards had lead-shot (6 months), bone, linoleum, seashell (3 months). Minerals and other hard fragments (not seeds) used as grit. Where grit not available, hard seeds are substituted, with preference for large-sized seeds: *Pinus ponderosa* (mean 8 mm), *Lupinus luteus* (7), *Albizia lophanta* (7), *Calystegia sepium* (6), *Berberis vulgaris* (5), *Sophora tetraptera* (5), *Calystegia sylvestris* (5), *Rosa rugosa* (4), *Rosa multiflora* (4), *Galium aparine* (3), *Cyathodes fraseri* (3). Few hard seeds when much grit, hard seeds in 25 of 70 males shot during May (Westerskov 1965).

Young NZ (n=159 crops; 27 empty; 100 from chicks 1–12 weeks old; 32 from chicks 13–20 weeks old); summarized Table 2. During first 2–3 weeks, mainly insects (adults, larvae and pupae); increase in seeds and decrease in insects in weeks 7–9; increase in insects in weeks 10–16 (possibly reflecting increased availability); 20 weeks when fully plumaged, adult weight and eating adult diet, only trace of insects in diet. *Trifolium* and other green leaves, berries and some grain important from 12 weeks. Plants: seeds: *Cirsium vulgare* (most common), *Polygonum*, *Stellaria media*; berries: *Phytolacca octandra*, *Solanum nigrum*; Insects: *Conocephalus semivittatum*, *Teleogryllus commodus*, *Phaulacridium marginale*, *Melanchra* larv. From 17 weeks, diet like that of adults. **Grit** NZ Sixty gizzards (1–12-week-old chicks): first few days sand, later replaced by larger grit; at 5–6 weeks increase in grit till at 9–10 weeks 2 ml or 3 g (Westerskov 1965).

Intake Up to 350 g of *Trifolium* per day and other items on King I. (D. Rounsevell).

SOCIAL ORGANIZATION Little known in HANZAB region; based on information supplied by D. Rounsevell and S.J. Cowling; no detailed studies within region but extralimital details in BWP. Seen in small flocks, though Hodgkins (1949) found single birds more common; in NZ, often as pairs during breeding (K.E. Westerskov). In autumn, on Rottneest I., WA, flocks of up to 15, and as many as six adult males, seen together; break up in winter (Storr 1965); in NZ, during autumn and winter, solitary or in twos or threes (Westerskov 1955a). Other records of flock sizes include: rarely more than two or three (Hodgkins 1949); on King I., up to 30, usually c. 15, consisting of adults or immatures or both (D. Rounsevell; S.J. Cowling); six males, Nov. (CSN 3). In autumn flock of 15 seen feeding (Saunders & De Rebeira 1985); six feeding together, Mar. (CSN 3). Large flocks reported from North America never seen in NZ (Westerskov 1955a). Hierarchies within flocks not recorded in our region.

Bonds Extralimitally, harem polygyny frequent, often with two, but up to 18, females reported (BWP); in NZ and King I., with lower populations, commonly breed in monogamous pairs, but harem polygyny with one male and 2–3 females also occurs (K.E. Westerskov; D. Rounsevell; S.J. Cowling); in NZ, two-thirds of males monogamous, about a quarter have two hens, and rest have three or four (K.E. Westerskov); high degree of monogamy associated with low populations, widely spaced birds, and low reproduction (Westerskov 1955a). Sex-ratio in NZ almost even (Westerskov 1955a, 1963b). Ratio of 1:4 in favour of females reported on King I., although numbers may have been affected by yearly open season, which continued until 1983, and was strictly limited to bags of male birds only (D. Rounsevell; S.J. Cowling). On King I., age at pair-formation 9–10 months, and age of first breeding 11–12 months (D. Rounsevell; S.J. Cowling); in NZ, mature at 20–24 weeks (Westerskov 1955a), first breeding at about 1 year old (Westerskov 1957b). **Parental care** Female incubates (K.E. Westerskov; D. Rounsevell; S.J. Cowling). Brood usually attended by female alone (BWP), but in NZ attendance by pair seen in c. 1/12 broods observed (K.E. Westerskov). Young remain with hen (or parents) for 10–12 weeks (K.E. Westerskov).

Breeding dispersion Solitary, territorial (D. Rounsevell; S.J. Cowling). **Territories** Large, all-purpose, for courtship, mating, nesting, feeding, and rearing of young; on King I., up to c. 1 km² (D. Rounsevell; S.J. Cowling). In NZ, males select breeding territories in spring, and defend by Crowing (NZRD); crowing ground preferably a spot overlooking part of territory, necessary for male to display (K.E. Westerskov).

Roosting During breeding, mainly on ground until young can roost, thereafter hedgerows (young), bush and scrub. In NZ, roost on ground (K.E. Westerskov). Typical sites next to accessible fresh water and open fields (D. Rounsevell; S.J. Cowling); on Rottneest I., roost in tall tea-trees at night (Storr 1965). Loaf on ground, in or next to cover, or at roosting sites (D. Rounsevell; S.J. Cowling).

SOCIAL BEHAVIOUR Little known in HANZAB region; for information outside region, see BWP. Dust-bathe (K.E. Westerskov).

Agonistic behaviour Males defend territories by Crowing; given by males from ground, mounds or other low features, e.g. logs (D. Rounsevell; S.J. Cowling); on Rottneest I., Crowing by males heard early July to late Nov., and in July one male seen standing on mound with head up, flapping wings vigorously and then began preening (Storr 1965). Males **Fight** over territories (Westerskov 1960; D. Rounsevell; S.J. Cowling). In NZ, in mid-

July, two males seen fighting while third looked on (CSN 37). Two hens observed flying c. 30 m above ground, chasing Silver Gull *Larus novaehollandiae*; flew round and round, until Gull left; they then resumed feeding on ground (CSN 4).

Sexual behaviour In captivity, males display, but female selects mate (Westerskov 1960). After male selects breeding territory, his Crowing also attracts one or more females, and he displays to them with tail outspread and wings trailing; females choose nesting sites within male's territory (K.E. Westerskov).

Relations within family group During incubation, hen leaves nest average of once every 24 h to feed, drink, defecate, dust, sun herself, and exercise; time of departure appears correlated with daily maximum temperatures; found to leave nest during warmest hours of day or when temperatures began to fall (Westerskov 1956a). Hen not shy when chicks hatching. Departure of female and brood from nest related to weather; may occur a few hours, a day, or longer after hatching (Westerskov 1958). Plumages of chicks and juveniles cryptic (Westerskov 1955a). Some females feign injury and defend chicks, but not always (K.E. Westerskov). Young remain with hen (or parents) for 10–12 weeks (K.E. Westerskov); broods break up at c. 12 weeks of age (Westerskov 1955a).

VOICE Few observations from HANZAB area. Well known from extralimital studies, particularly from work of Heinz & Gysel (1970), which provides basis for summaries in BWP and Johnsgard (1986). Most conspicuous call is loud hoarse sudden **CROWING**: *ko-or-ok*, *korok-kok* or *kok-ok-ok* of male, given mostly at dawn and dusk and particularly in spring, but heard occasionally all year; audible to 1.5 km; in spring, followed by brief loud wing-drumming. Female can recognize crow of male and replies with hoarse *kia-kia* (Kozlova 1947). Loud noise (e.g. gunshot, explosion, banging door) may stimulate male to crow and drum wings. Great variety of calls (BWP lists 19); others include: male's croaking call on take-off (Johnsgard 1975), whether flushed or leaving roost undisturbed; hisses, audible only at close range; growls, coos, purrs, clucks, barks and squeals. Seasonal variation in rate of calling studied by Barker (1991) along Wanganui–Manawatu coast of NZ. Calling well under way by mid-Sept.; peak from late Oct. to early Nov. at five of six transects; late Sept. to early Oct. at sixth transect; much lower by early to late Dec.

BREEDING Aust. No information except casual mention of C/14 on 26 Nov., small chicks in early Dec., and half-grown young, just able to fly, in Jan. and Feb., on Rottnest I. (Storr 1965); nest-scraps between small bushes and under tussocks of *Stipa*, lined with grass stems and some Pheasant's feathers. Also generalized information from local inhabitants on King I., Tas., to S.J. Cowling. **NZ** Quite well known. Unreferenced statements may be attributed to K.E. Westerskov and to Westerskov (1956a–d, 1957a,b, 1958). Commonly breed in pairs or in harem polygyny with one male and 2–3 females.

Season Broadly late July to late Mar. but peak of laying Sept.–Dec.; earlier in n. than in s. areas; most late nests, replacements after loss (Westerskov 1956c).

Site Chosen by female. Of 190 nests, 33% in hayfields (lucerne), 24% in scrub (blackberry, bracken), 11% on roadsides, 8% in rough pasture, 6% in gardens and crops, 6% on banks of rivers and ditches, rest in swamps, hedges, plantations, golf course. On ground, usually well hidden (Westerskov 1956c). Two nests on Rottnest I. under tussocks of speargrass *Stipa*, and close to cover of *Acanthocarpus* or *Thomasia* bushes (Storr 1965). Two-thirds of nests in crops or plantations; one-third in introduced vegetation (bracken, gorse, thistles) (Westerskov 1956c).

Nest, Material Shallow depression in ground, unlined or sometimes lined with dry straw or other plant material from round nest; 12–25 cm across, 4–8 cm deep. Built by female. A few feathers from her breast in lining as incubation advances.

Eggs Broad oval; smooth-textured, glossy; unmarked olive-brown, occasionally pale blue, pale green or almost white. **MEASUREMENTS**: 46.5 (41.2–51.0; 947) × 36.6 (31.9 × 40.0) (Westerskov 1956c). **WEIGHT**: fresh, 34.5 (22.4–43.5; 947); c. 0.2 g lost daily; total loss during incubation 14–18% of fresh weight (Westerskov 1950).

Clutch-size Average 9 (3–15); lower than average in Britain (11.4; Hill & Robertson 1988), perhaps as local adaptation in NZ. Slight increase in clutch-size from N to S: 7.9 (n=31) between 34°S and 36°S; 9.3 (69) between 36°S and 38°S; 9.4 (105) between 38°S and 40°S (Westerskov 1956c).

Laying Average rate: 1.3 days/egg (n=294 in captivity). Little difference in routine between different subspecies or between birds of different ages. Two broods within one season very rare; first laid Sept.–Oct.; second, Feb.–Mar. (Westerskov 1956c).

Incubation Only by female, starting with last egg. She leaves nest once, sometimes twice, a day for about 1 h, usually in morning and late afternoon; eggs not covered during absence. **INCUBATION PERIOD**: 23–24 days. Frequent interruptions of sitting bird may prolong period to 25 or more days; eggs continuously incubated artificially hatch in 22 days. Added eggs incubated for up to 47 days. Hatching synchronic within 1–2 h; chicks dry in 3 h and leave nest with female (Westerskov 1958). Egg-shells left in nest. Temperature of incubation: female has average cloacal temperature of 41.8 °C; skin of her breast, 39.5 °C. During incubation, top of eggs average 35 °C, increasing from 33–34 °C to 37–39 °C; bottom of eggs average 25 °C, increasing from 23–24 °C to 25–27 °C. Female away from nest for 25 intervals totalling 21 h or 4% of total incubation period (average 53 min [12–84]). While away, temperature at top of eggs drops to just above that at bottom of nest or 1–2 °C above ambient temperature measured at 1 m height. Female changes position at intervals varying from 10 min to several hours; when rising, she turns eggs and causes drop of 1–2 °C, occasionally as much as 6 °C at top of eggs; eggs on average turned 20 times during daylight (16 h) and seven times at night (8 h) (Westerskov 1956a).

Young Precocial, nidifugous. Newly hatched chicks densely covered with soft brown spotted down; seven primaries emerged, p1 longest (14 mm), p7 shortest (7); length of wing 24; egg-tooth remains for 1–2 days, rarely longer and may fall off as soon as 5–6 h after hatching. Young can fly at 10–12 days old. Age at first breeding, 1 year (Westerskov 1957b).

Growth Weight at hatching averaged 23 (n=26); males 23 (21–26; 14); females, 22 (19–26; 12); newly hatched chick about 66% of weight of fresh egg, about 77% of egg just before hatching. Grow most rapidly between Weeks 1 and 9; percentage weekly gain highest in Week 4. Males increase to 1.4 kg or 61 times weight at hatching in 24 weeks; females, to 1.15 kg. Foot grows relatively faster than wing or culmen and reaches almost full size in 11 weeks: length of footmark 30 mm (27–33) at hatching; 83 (75–89) in Week 11; in males at 24 weeks, 90 (83–99; 550). Spur on tarsus, small, hardly noticeable knob during first 4 weeks; at 5 weeks, up to about 1 mm long; at 10 weeks, 2.5 (0.5–4); at 24 weeks (mature), 10 (8–11; 464) (Westerskov 1957b). **Parental care** Brood normally attended by female alone, probably because harems less common than in natural range and two-thirds of birds observed during breeding were in pairs. One in every 12 broods observed attended by male and female. Chicks stay with female or with parents for 10–12 weeks; broods break up at c. 12 weeks (Westerskov 1955a). Female may brood chicks; sometimes feigns

injury and defends chicks but seems less attentive and defensive than in natural range, perhaps because frequent releases of hand-reared birds have upset adaptation of wild birds.

Success Of 208 nests, 87 (42%) hatched some chicks; in most favoured habitat for nesting (hayfields), mortality in nest, 73%; in scrub, mortality in nest 47%. Best success of nests in those in rough, marginal and damp pastures with many patches of weeds, sedges, long grass and occasionally scrub, 67%. Success of nests in scrub with large patches of bracken, manuka, gorse and blackberry with cover of weeds and grass, 53%. Nests mostly destroyed by farming activities (mowing, burning): of 32 females on nests thus destroyed, 15 unharmed, 12 killed and five crippled. Of all females surviving the nesting season, two-thirds brought off a brood; replacement laying made up somewhat for high loss of first nests. Mortality of chicks high; average size of broods dropped from 8.2 (2.7; 2–11; 13) at hatching to 4.1 (2.6; 1–8; 7) at 9–11 weeks, and to 3.6 (2.1; 2–7; 12) at 12 or more weeks. Cause of loss of chicks poorly known: of 22 known losses, seven drowned, five killed by Swamp Harrier *Circus approximans*, five killed by mowing machine, two lost in bracken, one killed by dog. At game farm, of 815 chicks, 53% died in first week; 23% in second; 13% in third; 7% in fourth; 4% in fifth; and 2% in sixth week (Westerskov 1956c).

PLUMAGES Prepared by D.J. James. In HANZAB area, three subspecies-groups (described below), a variety of hybrids and melanistic mutants have been introduced (see Geographical Variation). Hybridization of stocks from numerous origins produces many individuals with characteristics intermediate between subspecies or occasionally quite aberrant; exceptions may be populations on islands. All forms strongly sexually dimorphic in plumage from first adult onwards; males generally iridescent coppery colours, with green-black neck, and bare red face; females drab, cryptic; juveniles, like females but separable, with bare parts and morphometrics (but not plumage) sexually dimorphic. Hatch in dense fluffy down with juvenile remiges just beginning to emerge; first adult plumage, which is practically identical to adult, acquired between Weeks 4 and 24; sexually mature and can breed at c. 6 months (Bissonnete & Csech 1938) though normally do not do so until 1 year old. Adult plumage attained with first adult post-breeding moult early in second year (Westerskov 1957b).

Subspecies group *torquatus* (Chinese ring-necked pheasant).

Adult male (Definitive basic). **Head and neck** Sides of face, mostly bare, red; thin stripes of short blackish feathers extend from bill to front of eye and backwards from bottom of eye. Crown, olive (c47), variegated with cream (54) and extending as U down centre of nape; white sides of crown bordered by narrow green-black supercilium that extends as short black crest on each side of head. Neck and sides of nape, glossy dark-green (glossy 162) with dark-blue and dark-purple iridescence. Broad white ring encircling base of neck, usually complete. **Upperparts** Feathers have concealed dark-grey (83) plumulaceous bases. Mantle and upper back, mostly golden brown (c123B); feathers have concealed black base, varying white central streak, elongated black (glossed green) spot at tip, and black distal edges. Sides of mantle, coppery red-brown (c132) with cream (92) centres to feathers bordered by thin black stripes. Scapulars, golden brown (c123B) with broad wedge-shaped cream (92) centres bordered by black chevrons. Lower back, light olive-grey (c42) (sometimes grading to more yellowish or golden mid dorsally), with several blackish crescents across tips of feathers. Rump, light greyish (85) with soft pale-blue, blue-grey or olive tinge; some feathers have crescents like back; fringes of feathers,

disintegrated, hair-like. Upper tail-coverts, vary; shortest, like rump; longest, buff (c124) to red-brown (c132) with narrow widely spaced dark-brown (121) bars. **Underparts** Feathers have concealed black-brown (119) bases. Breast, copper-brown (c340) with strong purple iridescence, strongest at sides; feathers, broadly fringed glossy blue-black and notched at tip. Lower breast, similar but with less purple iridescence. Feathers of belly, dark brown (121) with broad glossy dark-green (glossy 162A) fringes. Flanks, yellow-buff (53–123C) with large black spot at tips of feathers that appears iridescent blue or purple according to light. Feathers of vent and thighs, plumulaceous, loose and coarse, dark brown (121). Under tail-coverts, rufous-brown (c136) to red-brown (c32) distally and irregularly patterned black. **Uppertail** Olive (51) to light olive-grey, sharply and narrowly barred blackish; edges of webs, disintegrated and forming fringe, often paler greyish with bars suddenly becoming red-brown (c32) laterally. Outer rectrices also heavily speckled and vermiculated black. Some have more noticeable red-brown (32–132) edges to tail. **Undertail** Dark brown (c219) with varying pale speckles along edges of rectrices; black-brown (119) bars usually evident at least at edges. **Upperwing** Primaries, grey-brown (91) to light grey-brown (119C) with off-white shaft and marbling along outer edge; off-white sawtooth barring along inner web, finely speckled grey-brown (as ground-colour). Secondaries, grey-brown (as primaries) densely marbled cream (92) with cream (92) outer edge. Tertiaries, olive-brown (c30) with dark-brown (121) and cream (92) marbling and narrow coppery red-brown (c132) edges. Greater primary coverts, grey-brown (as primaries) with mottled cream (92) stripes down centre of each web that meet near tip, forming indistinct V. Alula, cream (92) finely speckled and mottled brown (c28). Greater secondary coverts, grey-brown (as primaries) fading to cream shaft-streak and edges; outer feathers, marbled cream (92). Lesser and median secondary coverts, pale grey (c86) with bluish tinge and white edges and shaft-streaks; inner coverts have bold coppery red-brown (c132) edges. Marginal coverts, white. **Underwing** Remiges, brownish grey (c80) marbled cream (92). Coverts, brownish-grey (c80) with whitish edges and shaft-streaks. Lesser and median coverts sometimes have varying brown (28) markings.

Adult female (Definitive basic). Females of all forms, rather similar. **Head and neck** Crown, rufous-brown (136) to light brown (223C) with dark-brown (121) bars across feathers. Lores and ear-coverts, feathered, mostly off-white to cream (92) with fine dark-brown (121) streaks, fringes and edges to feathers. Chin and throat, cream (92) to straw-yellow (57). Neck, light rufous-brown, feathers with thin, indistinct blackish chevrons. **Upperparts** Mostly mottled various shades of brown and cream; feathers, light rufous-brown (39) with blackish V on basal half and broad band of cream and light-brown (c25) mottling along edges. Lower feathers have broader, more prominent blackish markings. Upper tail-coverts, buff (124) irregularly barred black-brown (119). **Underparts** Breast, pale brown (c223D) or dirty buff with a few dark markings. Flanks, buff (124) barred dark brown (121). Belly and vent, straw-yellow (57) to yellow-buff. Under tail-coverts, pale brown (223D) with faint irregular dark-brown (121) markings. **Uppertail** Light grey-brown (c119C) with thin, widely spaced, irregular black-brown (119) barring. **Undertail** Light grey-brown (119D) with black-brown (119) and brown (223B) barring. **Upperwing** Primaries, brown (28–119B) with broad bold regular cream (92) bars (about eight visible beyond greater coverts). Alula and greater primary coverts, similar. Secondaries, similar but edges of feathers cream, mottled brown (28) and brown bars incomplete. Tertiaries, brown (c37) mottled cream and with bold black-brown (119) blotches. Greater

and median secondary coverts, brown (33) with narrow cream (92) shaft-streak and broad cream (92) edges; lesser secondary coverts, similar but with broad cream wedge-shaped centres at base. **Underwing** Remiges, light grey-brown (119C) with broader cream barring than male. Coverts, similar to male.

Downy young Head and neck, mostly buff (124) with black-brown (119) median crown-stripe and less regular lateral crown-stripe or line of blotches. Small, varying dark spots behind eye. Black-brown (119) streak on lower sides of face in some females. Upperparts, buff (124) lightly suffused and streaked blackish. Underparts, pale buff (c124). For sexing see Ageing, Sexing.

Juvenile Similar to adult female. In early stage, smaller than adult with retained down on head. Feathers that grow later in moult tend to resemble those of adult female. **Upperparts** Brown (c119A–119B) with broad cream (92) edges and narrow cream shaft-streaks on feathers. Back, rump and upper tail-coverts, dull brown (28), with buff (121D) to cream (92) fringes. **Underparts** Breast and upper flanks, buff (124) with narrow broken brown (28) submarginal U on each feather. Lower flanks, cream (92), obscurely barred dull brown (28). Rest, whitish. **Tail** Buff (124), boldly barred dark brown (121) and rich brown (121C). **Upperwing** Remiges, dull brown (28) barred and edged cream (92). Coverts, cream (92) to buff (124) blotched dull brown (28). **Underwing** Remiges, light grey-brown (119C) marked with cream (92); coverts, mostly cream to whitish.

First immature Very similar to adult of respective sex. See Ageing, Sexing.

Subspecies group *mongolicus* (Mongolian pheasant). **Adult male** Similar to subspecies *torquatus*. **Head and neck** Blackish stripes on facial skin, less extensive. Crown and nape, olive (c47), lacking cream mottling and white lateral crown-stripes. Crest, dark green like neck. White ring at base of neck, generally present but narrower and usually interrupted ventrally. **Upperparts** Ground-colour almost entirely coppery red-brown (c132) and iridescent maroon (c31). Mantle, coppery red-brown (c132) with elongated metallic green-black spots at tips of feathers. Upper back, iridescent maroon (c31) with cream (92) wedge-shaped centres speckled and bordered blackish. Lower back, metallic purple with cream bases only occasionally exposed. Scapulars, coppery red-brown (c132) with broad iridescent maroon (c31) tips. Rump and upper tail-coverts, red-brown (c132B). **Underparts** Mostly coppery red-brown (c132) to iridescent maroon (c31). On breast and flanks, feathers have glossy black rosethorns at tip. Belly, uniform, darker, iridescent blackish purple. Vent, plumulaceous, dark brown (121). Under tail-coverts, maroon (31). **Uppertail** Rectrices, light olive-brown (brown 51) with c. 30 very faint, narrow, widely spaced incomplete dark red-brown (c132) bars. Disintegrated edges of webs, faintly tinged rufous-brown (36). Outer rectrices, grey-olive, paler towards edge and speckled dark brown (119A). **Undertail** Similar to *torquatus*. **Upperwing** Remiges and primary coverts, similar to *torquatus*. Secondary coverts, white, faintly washed pale blue; inner coverts, white with broad bold red-brown (32) edges. **Underwing** Similar to *torquatus*; lesser and median coverts have richer light-brown (c223) mottling.

Adult female Similar to *torquatus* but ground-colours of upperparts, tail and upper wing-coverts, tinged light rufous to rich brown (121C) with slightly darker and heavier markings.

Downy young Much darker than downy *torquatus*. Crown usually has broad black median stripe separated from narrower stripe down centre of hindneck by buff band across nape. Black lateral crown-stripes, bolder. Upperparts usually have broad distinct blackish vertebral and dorso-lateral stripes.

Juvenile Darker, more heavily marked than *torquatus*. Feathers of neck and centre of breast have thin dark-brown (121) to blackish scallops that give impression of indistinct barring. Feathers of upperparts have larger dark centres and narrower pale fringes.

Subspecies group *colchicus* (black-necked pheasant); described more fully in BWP. **Adult male** Similar to subspecies *mongolicus*. **Head and neck** Crown and nape, iridescent bronze-brown (c121). Rest of feathering of head, iridescent black-green; no white collar. **Upperparts, Underparts, Tail** Similar to subspecies *mongolicus*. **Upperwing** Remiges, primary coverts and alula, fairly similar to preceding forms. Secondary coverts, buff to buff-brown (c24); inner coverts have broad bold maroon (31) edges.

Adult female Like female *mongolicus* but darker. Feathers of neck have bold dark-brown (121) subterminal crescents, which align to form barred pattern on light-brown (223D) ground. Upperparts, mostly heavily blotched dark brown; scapulars, rufous-brown or rich-brown (121C) with thin buff (124) or light-brown (223D) fringes. Breast with varying dark-brown (121) scalloping or speckling.

Downy young Much darker than preceding subspecies. Head mostly black, framing buff (124) chin, throat, face and streak over eye; broad black median crown-stripe only narrowly bordered by buff stripes. Upperparts, mottled and blotched buff (124) and black. Underparts, mostly pale buff (c124) to cream (92); blackish band across upper breast, sharply demarcated from throat and grading gradually into lower breast.

Juvenile Much darker and browner than female. Ground-colour, brown (c223B–123). Feathers of neck and breast have bold black-brown (119) subterminal crescents that align as distinct barring.

Aberrant plumages A melanistic mutation of nominate *colchicus* group (variation '*tenebrosus*') introduced to NZ; males, mostly dark metallic-green with purplish-blue breast and flanks; females, dark blackish brown (Westerskov 1955a). Albino and isabelline birds reported from NZ (Westerskov 1955a). Several sex-anomalous conditions (including hermaphrodites) can produce plumage approaching that of opposite gender (see Morejohn & Genelly 1961); unspecified cases reported from NZ (Westerskov 1955a).

BARE PARTS Based on photos (Campbell 1974; Moon 1992; Aust. RD; NZRD; NZDOC; unpubl.). Subspecies apparently differ only slightly. **Adult male** Bill, straw-yellow or bone-yellow (c57). Iris, yellow-brown, golden-brown or golden-yellow. Facial skin, including wattle, bright red (8–108); colour intensifies when excited. Feet, ivory-white to pale grey (86) or light grey (85), usually with brownish, pinkish or pale pinkish-brown tinge. Claws, greyish brown. **Adult female** Bill, straw-yellow (c57) with greyish-brown culmen and sides to upper mandible. Orbital ring, whitish to straw-yellow (57). Iris, yellow-brown through light brown to red-brown, darkest in *colchicus* subspecies group. Feet, similar to male. **Downy young** Bill, grey (84) on culmen and side of upper mandible (darkening gradually) with pale-pink tomiium and lower mandible; possibly not so dark in *torquatus*; egg-tooth, white, present up to Day 2 (Westerskov 1957b). Orbital ring, buff (124) to light grey (85). Iris, dark brown (121–219); turning light brown from about Week 6 (BWP). Feet, pale pink to pale pink-brown. **Juvenile** Bill, greyish brown, darkest on culmen. Iris, gradually lightens, brown to light brown, eventually as adult. Facial skin of female as adult female, of male gradually turning pale pink.

MOULTS For NZ birds, based on Westerskov (1955a,b; 1957b). **Adult post-breeding** (Pre-basic). Complete. Primaries, outwards; tail, centripetal; usually bilaterally symmetrical. Timing partially or wholly dependent on timing of hatching of broods. Females begin round same time as their chicks begin post-juvenile moult; males moult slightly earlier. Long breeding season in NZ probably leads to extended moult season in population. **Post-natal** Already begun at hatching, juvenile p1–p7 just emerging. By Week 1, p1–p7 and secondaries developing rapidly. By Week 2, juvenile contour-feathering evident, covering much of body, and rectrices emerging; flutter by about Day 12. P10 emerges Week 3 or as late as Day 30. By Week 5, post-natal almost complete except for replacement of down on head and growth of p9 and p10. Feathers of head evident as pins by Week 6 and complete by Week 8. **Post-juvenile** (First pre-basic). Complete; primaries, outwards; tail, centripetal. Timing depends on date of hatching. Begins with p1 in Week 4–5, before post-natal moult finished. In Week 7, first metallic contour-feathers evident on breast and back of male, outer 2–3 rectrices and p4 shed. At 9 weeks, first green feathers appear on neck of male. By Week 10, moult of primaries at p7, rectrices at t1–t2 (though inner primaries and outer rectrices still growing). During Week 15, p10 shed and contour-feathers almost complete except on neck. P10 fully grown by Week 24. Growth rate of primaries, sigmoidal, each growing 5–6 mm/day until half grown then gradually slowing (outer two may be slightly slower); rectrices grow at a maximum of 5 mm/day; more details in Westerskov (1957b). **First adult post-breeding** (Second pre-basic). Complete. Follows breeding season at end of first year. **Embryonic moult** Details of embryonic development given by Westerskov (1957b): feathering begins on Day 9 of incubation, feather-papillae appearing on back and upper thigh; on Day 13, largest papillae clearly pigmented and developing into down; fully feathered, Day 21; hatch Day 23.

MEASUREMENTS NZ, adults, live and freshly dead, May; Wing, flattened (Westerskov 1956b): (1) subspecies group *torquatus*; (2) *mongolicus*; (3) *colchicus*.

	MALES	FEMALES
WING	(1) 231 (218–241; 25) (2) 240 (229–248; 25) (3) 237 (224–250; 25)	209 (201–217; 10) 217 (210–225; 10) 213 (207–218; 10)
TAIL	(1) 454 (416–510; 25) (2) 463 (400–535; 25) (3) 469 (377–583; 25)	269 (246–308; 10) 295 (275–325; 10) 276 (240–302; 10)
BILL F	(1) 32 (29–36; 25) (2) 30 (24–33; 25) (3) 33 (28–39; 25)	27 (25–29; 10) 27 (23–30; 10) 28 (25–31; 10)
TARSUS	(1) 60 (56–67; 25) (2) 60 (58–63; 25) (3) 61 (58–66; 25)	51 (49–54; 10) 53 (51–56; 10) 52 (49–54; 10)
SPUR	(1) 8.8 (4–13; 25) (2) 10 (5–15; 25) (3) 10 (8–14; 25)	

Wing-length of male increases from c. 24 mm (primaries 0 mm) at hatching to full length at about Week 20; juvenile tail reaches maximum length (c. 80 mm) by Weeks 7–9, foot by Week 12, and bill and spur by Week 24 (see Westerskov 1957b).

Measurements from European populations (Dement'ev & Gladkov 1952; Glutz von Blotzheim *et al.* 1973; Vaurie 1965; BWP) and USA (*torquatus*) (Friedmann 1946).

WEIGHTS NZ, adults, live and freshly dead, May (Westerskov 1956b): (1) subspecies group *torquatus*; (2) *mongolicus*; (3) *colchicus*.

	MALES	FEMALES
(1)	1340 (1058–1655; 25)	1184 (1061–1354; 10)
(2)	1370 (1101–1552; 25)	1262 (1010–1429; 10)
(3)	1331 (1172–1537; 25)	1097 (851–1356; 10)

Weights from Europe in Dement'ev & Gladkov (1952), Glutz von Blotzheim *et al.* (1973), Vaurie (1965) and BWP; from USA in Robertson (1958). Newly hatched chicks, still wet: 22.7 (18.5–26.3; 28); hatchlings, 0.5–1 day old, dry: 20.2 (17.3–20.1; 33); no significant difference between sexes; chicks lose c. 1.6 g/day for first 3–4 days, enduring maximum total loss of not more than 6.4 g; rate of gain thereafter, sigmoidal (though varying much) up to full weight at about Week 24; maximum rate of gain, 90–100 g/week in Weeks 9–13; sexual dimorphism evident by end of first week.

STRUCTURE Wing, short, broad, rounded; distinct step in trailing-edge between longer primaries and shorter secondaries. Eleven primaries; p8, sometimes p7 longest; p10 18–27 mm shorter than longest, p9 5–7, p6 1–5, p5 5–11, p4 14–19, p3 24–35, p2 42–56, p1 56–73, p11 minute. Tertials fall well short of wing-tip when wing folded. Tail, very long, bowed downward (arched) slightly, pointed at tip; does not spread laterally; 18 rectrices (sometimes 16–17 in female); graduated, t1 longest, others progressively shorter outwards. Bill, short, heavy, broad and deep; decurved along culmen and tomium. Nostril, covered dorsally by bulbous operculum. In male, large patch of bare skin (numerous small villi) from lores round eye and as wattle over cheek; enlarges when cock excited (especially in display) distending wattle and swelling brow-ridge. Tarsus, stout; male has spur (resembling rose-thorn) two-thirds down rear of tarsus (see Ageing, Sexing); flat knob (presumptive spur) present in both sexes of downy young. Outer toe 72–81% of middle, inner, 62–73%, hind, 23–32%.

AGEING, SEXING Male downy young have small flaps of skin on cheek and over lores (visible when down pushed aside) (Westerskov 1957b; BWP). Westerskov (1957b) presented data for ageing young (up to 24 weeks old, accurate to within 1–2 weeks) on length of developing first adult primaries. By Week 7, males show growing metallic feathers on neck, back and breast, and pinkish facial skin (Westerskov 1957b). First immature essentially identical to adult; structure and pattern of third greater primary covert recalls juvenile (short, narrow, slightly attenuated, faintly barred in male, narrowly regularly barred in female) contrasting slightly with that of second covert, which is adult-like (longer, broader, faintly rounded, uniform in male, more coarsely

Plate 31

Common Pheasant *Phasianus colchicus* (page 377)

- 1 Adult male, hybrid *colchicus* x *torquatus*, NZ;
- 2 Adult female, hybrid *colchicus* x *torquatus*, NZ;
- 3 Adult male, nominate *colchicus*;
- 4 Adult male, subspecies *mongolicus*;
- 5 Adult male, subspecies *torquatus*;
- 6 Adult female, subspecies *torquatus*;
- 7 Adult female, subspecies *mongolicus*;
- 8 Downy young, nominate *colchicus*;
- 9 Downy young, subspecies *mongolicus*;
- 10 Downy young, subspecies *torquatus*;
- 11 Juvenile, hybrid *colchicus* x *torquatus*, NZ;
- 12 Adult male, hybrid *colchicus* x *torquatus*, NZ;
- 13 Adult female, hybrid *colchicus* x *torquatus*, NZ

barred in female) (BWP); distinction difficult (especially for female) and also dependent on timing and extent of moult; technique has not been tested in HANZAB area. First winter males have shorter, blunter spurs (all <12 mm, most <11) than adults (>11 mm) (Westerskov 1957b). Presence of sheaths at base of rectrices has been advocated for ageing first adults (Westerskov 1957b) but has limited application and alone is unreliable. Bursa of Fabricius present, enlarged until about Week 12, thereafter regressed (see Mercer-Oltjen & Woodard 1987). For details of ageing on diameter of calamus of p1 see Greenberg *et al.* (1972) and Hill & Robertson (1988).

GEOGRAPHICAL VARIATION Pronounced, complex; 30–40 subspecies recognized in four subspecies groups, three treated above; *principalis-chrysomelas* group most like nominate group; see Delacour (1951), Dement'ev & Gladkov (1952), Westerskov (1956b), Vaurie (1965), Glutz von Blotzheim *et al.* (1973), Hill & Robertson (1988), and Peters for discussions of variation and indigenous distribution.

Often assumed that taxa introduced to HANZAB area were pure representative subspecies, but this not confirmed; here use of subspecific epithet refers to subspecies group only. NZ: *colchicus* first introduced from England in 1842 and well established before *torquatus* was introduced from China in 1851; *mongolicus* imported from England and first released in 1923 and mutant 'tenebrosus' first introduced 1938; also numerous releases of locally bred hybrids (Westerskov 1955a). Some isolated populations strongly resemble a particular parental stock but most are hybrids that are typically dark like *colchicus* but with broad white collar; this phenotype may predominate because *colchicus* has greater survival rate and white neck genetically dominant (Westerskov 1963a). Aust.: numerous introductions since at least 1855 till at least 1969 (see Long 1981); most introductions failed, apparently including all on mainland and Tas. Little information available on origins of released birds; *torquatus* and 'tenebrosus' released mainland Tas. (Long 1981) and King I.; because there is so much hybridization, Aust. CL did not apply subspecific names; unconfirmed reports from aviculturalists that birds are close to pure *mongolicus* on Flinders I., Tas.; *colchicus* on islands of Corner Inlet, Vic.; and *torquatus* on Rottnest I., WA.

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Common Pheasant *Phasianus colchicus* (page 377)

1 Adult male, hybrid *colchicus* x *torquatus*, NZ; 2 Adult female, hybrid *colchicus* x *torquatus*, NZ; 3 Adult male, nominate *colchicus*; 4 Adult male, subspecies *mongolicus*; 5 Adult male, subspecies *torquatus*; 6 Adult female, subspecies *torquatus*; 7 Adult female, subspecies *mongolicus*; 8 Downy young, nominate *colchicus*; 9 Downy young, subspecies *mongolicus*; 10 Downy young, subspecies *torquatus*; 11 Juvenile, hybrid *colchicus* x *torquatus*, NZ; 12 Adult male, hybrid *colchicus* x *torquatus*, NZ; 13 Adult female, hybrid *colchicus* x *torquatus*, NZ