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Chukar Partridge

Alectoris chukar (Gray) 1830
{*Alectoris graeca* (Meisner) in *A.O.U. Check-list*}

OTHER VERNACULAR NAMES

CHUKOR, Indian hill partridge, rock partridge (refers to *graeca only*).

RANGE

Native to Eurasia, from France through Greece and Bulgaria (typical *graeca*) southeastward through Asia Minor and southern Asia (typical *chukar*). These two populations should probably be regarded as separate species (Watson, 1962a, b), and all of the introduced United States stock is apparently referable to *A. chukar*. The racial origin of the birds introduced into North America is varied and includes not only Indian stock (probably *A. c. chukar*, as recognized by Sushkin, 1927) but also some Turkish stock (*cypriotes* or *kurdistani*). These Turkish birds probably merged with Indian stock or have disappeared, except in New Mexico and California. The present range of the North American population is from southern interior British Columbia southward through eastern parts of Washington, Oregon, and California to the northern part of Baja California, and east in the Great Basin uplands through Nevada, Idaho, Utah, western Colorado, and

Montana, with small populations of uncertain status in Arizona, New Mexico, western South Dakota, and southern Alberta.

MEASUREMENTS

Folded wing (various races): Adult males, 144–76 mm; adult females, 140–70 mm. Males average 7 mm longer than females of same subspecies.

Tail: 78–105 mm (range of both sexes).

IDENTIFICATION

Adults, 13–15.5 inches long. The sexes are identical in appearance, with white or buffy white cheeks and throat separated from the breast by a black collar or necklace that passes through the eyes. The crown and upperparts are grayish brown to olive, grading to gray on the chest. Otherwise, the underparts and flanks are buffy, with conspicuous black and chestnut vertical barring on the flanks. The outer tail feathers are chestnut brown. The bill, feet, and legs are reddish, and males often have slight spurs on the legs.

Two other closely related species have been locally introduced in some western states and might occasionally be encountered. These include the Barbary partridge (*Alectoris barbara*) and the red-legged partridge (*A. rufa*). All have *chu-kar* calls and red legs, but the Barbary partridge has a reddish brown rather than black collar and a grayish throat and face terminating in a chestnut crown. The red-legged partridge more closely resembles the chukar partridge, but its black neck collar gradually blends into the breast by breaking up into a number of dark streaks, whereas in the chukar partridge the collar is clearly delineated from the grayish breast. Barbary partridges have been unsuccessfully introduced in California (Harper, 1963), and red-legged partridges have been introduced without success in various states including Utah, Texas, and Colorado. They have possibly survived in eastern Washington (Bump and Bohl, 1964).

According to Watson (1962a, b) chukars from Turkey and farther east are specifically different from those occurring from Greece and Bulgaria through western Europe. Birds from the Asia Minor and India populations have been successfully introduced in several states and according to Watson (1962a, b) represent the species studied by Stokes (1961) and identified as *A. graeca*. There is no evidence that wild birds representing *graeca* now occur in North America. Watson states that in addition to a number of minor plumage differences, *A. graeca* differs greatly from *A. chukar* in

voice, with males of *graeca* emitting a clear ringing series of whistling notes whereas *chukar* males produce only clucking or cackling sounds.

FIELD MARKS

The striking black and white head pattern of this species can be seen for considerable distances in the arid country which this bird inhabits, as can the contrasting flank markings. In flight the reddish legs and chestnut outer tail feathers are usually visible. The *"chu-kar"* call often provides evidence for the presence of this species.

AGE AND SEX CRITERIA

Females have no apparent plumage differences from males, and measurements must be used. After the third primary (counting from inside) is fully grown (by about 16½ weeks of age) the distance from the tip of the feather to the wrist joint is diagnostic for sex, with males measuring over 136 mm (averaging 139.3 mm) and females measuring under 136 mm (averaging 131.8 mm) when measured properly (Weaver and Haskell, 1968).

Immatures may be recognized by the fact that the length of the upper primary covert for the ninth primary is less than 29 mm long in immatures and is 29 mm or longer in adults (Weaver and Haskell, 1968). Since some chukars molt their ninth primary the first year, determining age by the use of the outer primaries is often difficult, but in general the presence of faded vanes and pointed tips on the outermost or two outer primaries would indicate an immature bird. These feathers may also have a yellowish patch near the tip.

Juveniles may be identified (until about 16 weeks old) by the presence of mottled secondaries, with the innermost ones usually persisting longest (Smith, 1961). Retention of the outermost secondaries of this plumage into the first-winter plumage has been found in one captive bird (Watson, 1963).

Downy young (illustrated in color plate 61) are rather reminiscent of downy scaled quail, but the head lacks a crest or a distinctly recognizable crown patch. Instead, the crown is only slightly darker brown than is the rather grayish face, which has an eye-stripe extending back past the ear region. The underparts are buffy white, and the back pattern is similar to that of the scaled quail and elegant quail.

DISTRIBUTION AND HABITAT

The distribution of this introduced species was recently mapped by Christensen (1970), whose study provided the basis for the range map shown

in this book, with minor modifications as seemed to be justified on the basis of recent information. This indicated range is considerably greater than that shown by Aldrich and Duvall (1955) or the range indicated by Edminster (1954). It is probable that continued distributional changes will occur until all of the habitats suitable for this species are eventually occupied. It would seem that much of the arid Great Basin highlands between the Cascade and Sierra ranges and the Rocky Mountains provide the combinations of climate, topography, and vegetation that best suits the chukar partridge, and only very limited success has been achieved in introducing the species to the grassland plains east of the Rocky Mountains.

The history of chukar introductions in the United States has been summarized by a variety of authors, including Cottam, Nelson, and Saylor (1940), Christensen (1954, 1970), and Bohl (1957). All told, at least forty-two states and six provinces have attempted introductions; ten states and one province have had sufficient success to declare legal seasons on the bird. These specific cases may be mentioned individually, to provide an indication of the degree of success that has been attained, as indicated in a summary made by Christensen (1970).

The first state to open a hunting season on chukars was Nevada, which had begun its introductions in 1935 and initiated a season in 1947. From that time through 1967 about 968,000 chukars had been harvested in Nevada. In 1949 Washington declared its first season, eighteen years after first introducing the species. Its total kill of an estimated 1,337,000 birds through 1967 represented the largest harvest of any state. Idaho was the third mainland state (Hawaii had its first season in 1952) to open a season on chukars, starting in 1953, following introductions that had started in 1933. Since then, an estimated 994,000 birds had been harvested through 1967. California followed with an open season in 1954, after an intensive planting program that was started in 1932 and continued through the 1950s in nearly all of the state's counties (Harper, Harry, and Bailey, 1958). An estimated 438,000 birds had been harvested there through 1967. Wyoming's first open season was held in 1955, following introductions that began in 1939. Estimated hunter kills through 1967 were 160,000 birds. Oregon and Utah both opened chukar seasons in 1956, after initially introducing birds in 1951 and 1936, respectively. The total estimated kills through 1967 were 346,000 for Utah and 1,235,000 for Oregon; the latter figure is second only to that of Washington and is based on seven fewer total years of hunting. Colorado and British Columbia had their initial hunting seasons in 1958, in the case of British Columbia only eight years after the initial introduction. Although British Columbia's population is currently limited to the Okanagan and Similkameen valleys and the lower Fraser and Thompson drainages

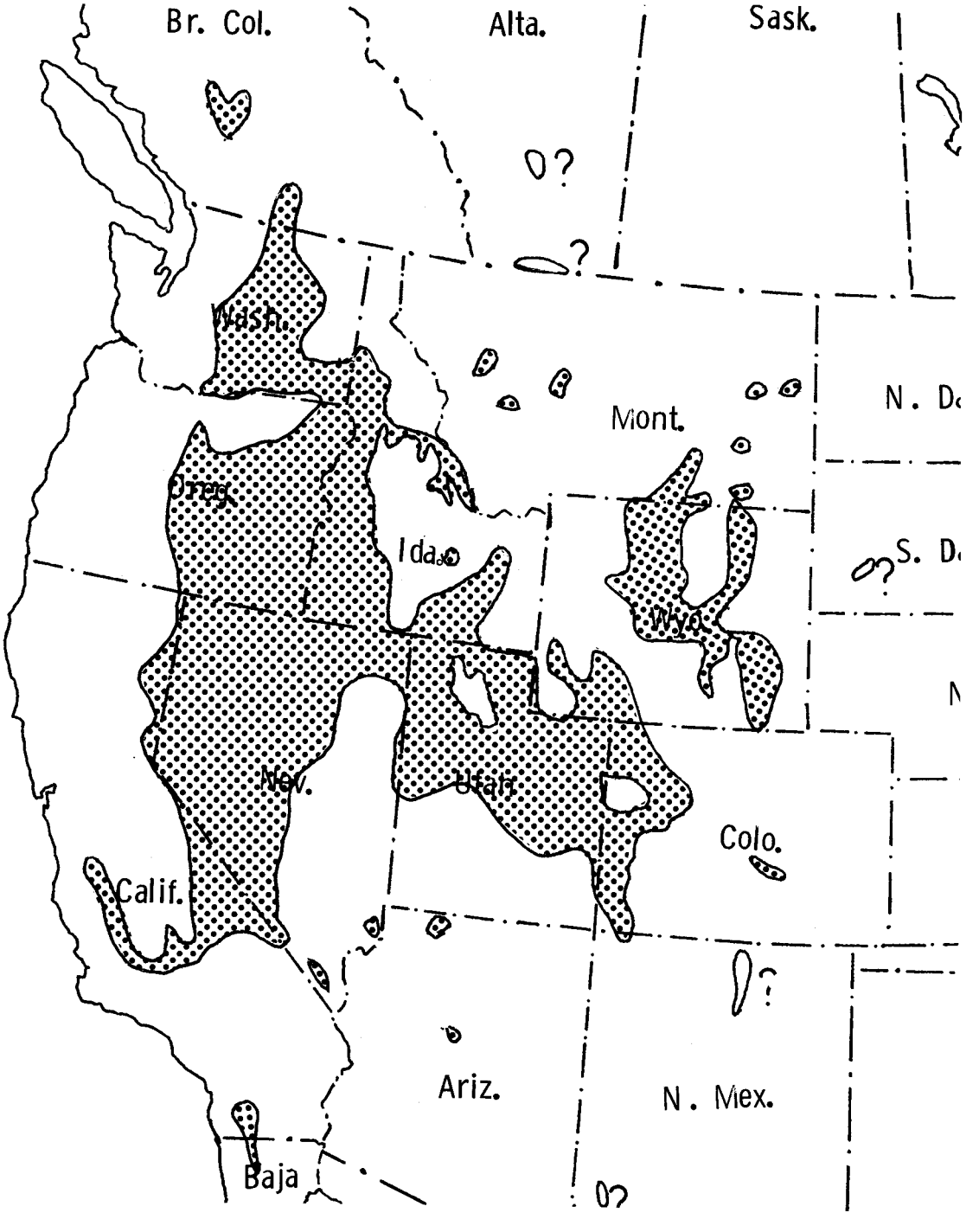

FIGURE 45. Current North American distribution of the chukar partridge.

(Godfrey, 1966), an estimated total of 107,000 birds had been harvested during the ten seasons through 1967. Montana's success with introduced chukar partridges warranted their first open season in 1959, and approximately 20,000 birds had been harvested through 1967.

A very limited degree of success can be indicated for Arizona, which first opened a season on chukars in 1962 and reported an estimated total of 250 birds harvested through 1967. Even more doubtful are South Dakota's efforts, which resulted in a very few birds shot after it opened a season in 1966. Presently the state does not list the chukar as legal game, and its status as a successfully reproducing population there is in doubt. Also in doubt is the bird's status in Alberta's Milk River valley (Godfrey, 1966) and in New Mexico and Texas (Christensen, 1970). There are no recent records of birds surviving in Nebraska in spite of a fairly extensive introduction program. Chukars spread into the Baja area of Mexico from adjacent California and now are well established there (Leopold, 1959). In addition, the Mexican government is rearing the birds in captivity for supplemental releases, and a considerable part of northwestern Mexico might eventually prove suitable for them.

Through virtually all of the chukar partridge's adopted North American range the typical vegetation is a sagebrush (*Artemisia*)–grassland community, although in the southern part of its range in California and Mexico the chukar also occurs in a saltbrush-grassland community type (Christensen, 1970). It ranges in altitude from below sea level in California's Death Valley to as high as twelve thousand feet in the White Mountains. Harper, Harry, and Bailey (1958) noted that in California the bird's distribution generally follows the 5- to 20-inch annual rainfall isohyets, and Christensen (1970) noted that in Nevada habitats the annual precipitation varies from 3.5 inches to about 12 inches. Throughout most of the species' North American range the summers are hot but short, and winters are long and moderately cold. At higher elevations snow may cause the birds to move downward into snow-free areas, but many areas in good chukar range have recorded extreme winter temperatures that are well below zero (Christensen, 1970).

POPULATION DENSITY

Remarkably little information is available on population densities of the chukar, and because of their considerable mobility and tendency to "clump" at natural or artificial watering areas it is difficult to judge populations occurring over broad areas. Moreland (1950) reported that on one study area of 61 square miles a fall population prior to the hunting season

was determined to consist of 1,705 birds, which would represent 22.9 acres per bird. He also noted that on one area of 360 acres 37 chukars were flushed, in addition to a variety of other upland game. This suggests that in favorable habitats considerably greater densities might occur, possibly in excess of one bird per 10 acres. Harper, Harry, and Bailey (1958) estimated that on a study area of 60,000 acres a fall population estimate of 6,060 birds was indicated, or approximately 10 acres per bird.

Natural or artificial watering sites for chukar partridges may attract as many as one hundred birds (Harper, Harry, and Bailey, 1958; Alcorn and Richardson, 1951). Assuming that the birds rarely travel more than a mile to water (Harper, Harry, and Bailey), such a water source might be expected to have an effective "range" of about two thousand acres. Thus, visits by one hundred birds might suggest a population density of about twenty acres per bird.

HABITAT REQUIREMENTS

Habitat requirements of the chukar partridge include topographic as well as vegetative characteristics. Foremost among the topographic features that are needed by chukars is the presence of rocky slopes, which the birds use for escape (by running upslope) and roosting cover. Observations in Washington (Moreland, 1950; Galbreath and Moreland, 1953) indicate that optimum range includes from a quarter to half of the area in talus slopes, rock outcrops, cliffs, and bluffs, about half the surface covered by sagebrush and cheatgrass (*Bromus tectorum*), and a small amount of brushy creek bottom habitat as well as the presence of bunch grass (*Agropyron*) and bluegrass (*Poa*). The slopes should exceed a 7 percent grade and should have more than a two hundred-foot elevation range.

In the northern portions of the chukar's range, the amount of snow cover may be a major factor in survival. The birds are known to be able to survive winter temperatures as low as thirty degrees below zero (Moreland, 1950), but several major winter losses have been reported when snow cover more than a few inches in depth has persisted for several weeks (Christensen, 1970).

Nesting cover is little different from that used for foraging purposes and usually consists of sagebrush or a mixture of sagebrush and grassland on mountains several hundred feet above creek bottoms, often on south-facing slopes (Galbreath and Moreland, 1953). The availability of water during the summer months is a significant habitat factor; Harper, Harry, and Bailey (1958) noted that of 317 adult and young chukars seen on two California study areas between April and June, 288 birds (91 percent)

were seen within a half mile of water. Further, reproductive success in California appeared to be correlated with normal or above normal late winter and early spring precipitation and associated with improved vegetative growth for food and nesting cover.

Sites for dusting and obtaining grit are no problem in the arid habitats utilized by chukar partridges, and roosting sites are usually abundant. Preferred roosting locations include talus slopes or similar rocky areas, sometimes underneath shrubs or low trees (Bohl, 1957; Christensen, 1970). During winter in Washington, the birds may roost in protected niches and caves on rocky cliff faces (Galbreath and Moreland, 1953). Circle roosting, similar to that of gray partridges and bobwhites, has been noted in various areas.

FOOD AND FORAGING BEHAVIOR

Fairly extensive studies on the foods of the chukar partridge are now available from several states, including Nevada (summarized by Christensen, 1970), Washington (Galbreath and Moreland, 1953) and California (Harper, Harry, and Bailey, 1958). More limited data are available from New Mexico (Bohl, 1957) and Colorado (Sandfort, 1954). However, virtually all of these analyses point to a predominating importance of grasses, especially cheatgrass (*Bromus tectorum*) leaves and seeds, and the seeds of weedy forbs such as Russian thistle (*Salsola*), filaree (*Erodium*), and fiddleneck (*Amsinckia*). In contrast to the western quails, chukars utilize legume seeds little, although the leaves of alfalfa (*Medicago*), clover (*Trifolium*), and sweet clover (*Melilotus*) are highly preferred foods when they are available, and locust (*Robinia*) seeds are sometimes utilized.

On a year-round basis, the seeds of cheatgrass and grass leaves are probably the most important foods, judging from studies in Washington (Galbreath and Moreland, 1953). These are supplemented during the spring by the leaves of various herbs such as dandelion (*Taraxacum*), fringecup (*Lithophragma*), and shepherd's purse (*Capsella*). The crowns and seeds of bunch grass (*Agropyron*), the fruits of serviceberry (*Amelanchier*) and hawthorn (*Crataegus*) are consumed during summer, wheat (*Triticum*) kernels are used during the fall, and various forb and shrub seeds or fruits are eaten during the winter.

Young birds eat the usual array of insect or other animal materials, but adult consumption of animal foods is rarely more than 15 percent by volume. These consist primarily of grasshoppers, crickets, and ants.

Foraging behavior is usually high during midmorning and may extend through the afternoon, with the birds moving widely while searching for

food (Christensen, 1970). During hot days, they may feed early in the morning and again in late afternoon, spending the hottest period in shady canyons near a supply of water. Toward evening they again gradually move back into the canyon slopes to spend the night, foraging on the way.

Although the birds are said to be adept at scratching the ground free of litter to expose seeds, they have only a limited capacity to dig through snow. Snow depths as great as eight inches may force the birds out of mountainous areas and into the lower foothills, but the birds can scratch through snow that is only an inch or two deep (Christensen, 1970).

MOBILITY AND MOVEMENTS

Considerable dispersal ability is present in the chukar partridge, and following releases into a new habitat a large number of cases have indicated that the birds may travel extensively before becoming localized. Bohl (1957) listed dispersion records from three release points in New Mexico, which included maximum mobility records of thirty-eight miles in about seven months, twenty-two miles in a year, and thirty-eight to forty miles in a year. Brood movements of ten, eleven, and eighteen air distance miles were also reported from one release site. In California, one banded bird was known to have moved twenty miles in three months, and another banded bird was found thirty-three miles from the point of banding after two years and three months (Harper, Harry, and Bailey, 1958). In Nevada one adult bird was killed twenty-one miles away from the point where it had been caught and banded only ten days previously. All of these records indicate a remarkable ability to move across unfamiliar terrain with surprising speed.

Seasonal movements are known to occur in chukars as well; these often involve altitudinal migrations to lower valley areas during the wintertime, followed by a return to higher elevations in spring (Galbreath and Moreland, 1953; Christensen, 1970). Following the growth of succulent plants after fall rains, the birds may also move into waterless areas that were previously unoccupied during the summer (Christensen, 1970).

Individual daily ranges have not been well studied, but various lines of evidence suggest that the birds may often move about an area as wide as a mile in the course of a day, and Bump (1951) reported that the birds may travel as much as two or three miles to reach waterholes.

SOCIAL AND REPRODUCTIVE BEHAVIOR

From the appearance of broods in late summer until the beginning of

pair formation in spring, the social unit of the chukar partridge is the covey. Covey sizes range widely, often from five to forty or more birds, perhaps averaging about twenty. It is possible that, as in the bobwhite, the circular roosting behavior during winter places an upper and lower limit on optimum covey size in this species, but apparently few winter counts of covey sizes have been made.

In late winter the coveys gradually begin to disband as pair formation progresses; Mackie and Buechner (1963) found that in Washington this period of breakup occurred from February through March, with older birds pairing sooner than young ones. Although basically monogamous, pairing of one male with two females may occur at the rate of about 10 percent of total pairings, according to these observers.

Although some earlier authors suggested that after pair formation has occurred the male establishes and defends a breeding territory, recent studies (Mackie and Buechner, 1963; Blank and Ash, 1956) indicate that no true territorial behavior is present, although males will repel other males from the vicinity of their mates. Stokes (1961, 1967) believes that the *chukar* or rally call when uttered by paired birds tends to repel other males; thus it may have some spacing effects. Indeed, Stokes indicated that his limited observations on wild birds suggested that the birds do defend well-defined territories.

As in the New World quail and the gray partridge, pair formation is a subtle process. It may occur only gradually, after some initial shuffling of mates (Stokes, 1961). Several displays and calls are associated with courtship, and these postures will be noted here.

Because the females have plumage identical to that of the males, it is not surprising that initial responses of males to females are aggressive ones. Stokes (1961) has described these postures, and the following description is based on his work. Three postures are usually initially performed by a reproductively active male when first exposed to a female. Head-tilting is the most common aggressive display, during which the bird tilts his head away from the opponent, simultaneously turning sideways so as to expose his barred flanks to the greatest degree. The neck and chin feathers may be raised, and the bird often stands in an erect, stiff posture ("lateral stance"). A more intense form of aggressive display is "circling," in which the dominant bird moves about another while tilting his head, again exhibiting his flank feathers. The most extreme form of circling is "waltzing," in which the head is held low and the body is nearly horizontal, as the outer wing is lowered to the point that the primaries touch the ground, and the inner wing is nearly concealed by the flank feathers (see fig. 21). Between bouts of waltzing the bird may stand erect and utter a long call, sounding like

errrrrrr or *errrk*. The female usually responds to these displays simply by continuing her normal activities, such as foraging, preening, or dusting.

As the male loses his aggressive tendencies, perhaps by recognition of the nonaggressive female-like responses of the other bird, he may move off some distance and begin pecking at various edible or nonedible objects. This tidbitting display is performed in association with a special call, sounding like a rapid *tu-tu-tu-tu-tu*, becoming progressively more rapid and higher in pitch. A second call, sounding like *pitoo*, may also be uttered while tidbitting. If the female is sexually active, she may then run to the male and begin pecking in the same area. The male then moves off in a stiff-legged "high-stepping" posture, gradually working toward the rear of the female and again performing tidbitting. This behavior may lead to copulation, which begins with the female facing away from the male and crouching. The male stands erect briefly, often from three to ten feet away, then utters a precopulatory "rattle" note, *uh-uh-uh-uh*, and approaches in the high-stepping posture. As he mounts the female he stops calling and grasps her nape, and copulation then occurs. No calls are uttered during copulation, and afterward the male may move away in a high-stepping posture while the female vigorously shakes her feathers.

A second important element of sexual behavior between a pair is the "nest ceremony." In this display the male enters a clump of vegetation, crouches, raises and spreads his tail, and turns while performing nest-scraping motions. He also utters a special call, a soft, continuous *churrr*, and may vibrate his wings and tail. Females may perform the same ceremony, particularly when the mate is nearby, and Stokes suggests that the display performs an important role in keeping the male closely associated with the female during the nesting period or for attaching the male to a clutch of eggs that he might take over for incubation.

Eggs are deposited in the nest by the female at the rate of about 1 to 1.9 days per egg, with the longer intervals typical earlier in the season and shorter extremes late in the season. Clutches range from about 10 to more than 20 eggs, with the average of four nests being 15.5 eggs (Mackie and Buechner, 1963). An incubation period of 24 days is typical. There is some uncertainty as to the role of the male in incubation and brood care. Some authorities (e.g., Galbreath and Moreland, 1953; Alcorn and Richardson, 1951; Mackie and Buechner, 1953) believe that the pair bond may normally last until early in the incubation period, after which the males may desert and gather together in groups. However, other observations (Goodwin, 1953; Stokes, 1961) suggest that the male may not only help raise the brood but may sometimes take over the first clutch, freeing the female to lay a second one. Mackie and Buechner (1963) noted that males were present

in about 10 percent of 103 brood observations, but in many cases of two birds tending broods both appeared to be females. Christensen (1970) could find no definite case of a male chukar incubating under noncaptive conditions. There is little question that renesting by unsuccessful females does occur, but the incidence of such renesting has not yet been established. Mackie and Buechner doubt that renesting is likely after the final stages of incubation or after hatching, but they did find a nesting period extending for about five months from early March until mid-August.

Following hatching the young leave the nest with one or both parents and within a few weeks are likely to become mixed with members of other broods. Christensen (1970) reported seeing thirty to fifty chicks with from one to three adults and sometimes seeing coveys of more than one hundred chicks associated with up to ten adults. Perhaps the association of broods at watering places facilitates such interbrood transfers in this species, and thus brood-size data are of somewhat limited value. In Nevada, yearly state-wide averages of brood sizes have ranged, between 1960 and 1969, from 8.5 to 12.5 chicks, but it would seem that fall age-ratio data might provide a better index of reproductive success. Christensen noted that during 1968 and 1969 adult-to-young ratios of 1:4.14 (79.5 percent immature) and 1:5.05 (83.4 percent immature), respectively, existed. This ratio is close to those typical of bobwhites and suggestive of a high annual mortality rate. However, state-wide age ratios based on summer field surveys in Nevada between 1951 and 1969 have varied enormously, from 1:0.42 to 1:8.76, and would indicate remarkable yearly variation in productivity. Very low adult-to-young ratios were associated with drought years, such as 1953 and 1959, while high adult-to-young ratios were associated with years of favorable precipitation.

Vocal Signals

The studies of Stokes (1961, 1963) on the chukar and Goodwin (1953) on a related species of *Alectoris* provide the basis for the terminology of vocalizations in this genus. Several of these calls were mentioned in the preceding section, and need not be reviewed here. Alarm calls noted by Stokes (1961) include a ground alarm note, *whitoo*, which is also used when birds are flushed or are held in the hand. A short, gutteral *kerrr* note serves as an aerial predator note, which may be repeated as a continuing alarm or "on-guard" call while the bird soars overhead. An "all's-well" note, a soft, plaintive *coo-oor*, may be uttered when the source of alarm is gone or by loafing or feeding birds. Foraging birds also utter a food call, a slow

took note or a rapidly repeated *tu-tu-tu-tu* series of notes, depending on the degree of excitement.

Several calls are present that may serve dual sexual and agonistic functions and are characteristic of the breeding season but not entirely limited to it. The best known of these is the rally call. This consists of a series of repeated *chuck* notes, which at progressively more intense stages sound like *per-chuck!* and *chuckara.* A single series of these calls may last up to twenty seconds, and as many as three series may be uttered in a minute. This call serves several different functions. It functions in both sexes as a scatter call to reassemble broken coveys throughout the nonbreeding period. Second, it may serve in unmated males as an advertising call that may attract available females. Third, during the breeding season it has aggressive characteristics and may serve to repel other males. To what extent this latter function might serve to space breeding pairs is still uncertain, but if it is a significant spacing mechanism for paired birds this would set the chukar's rally call apart functionally from the advertising calls of male New World quail, which are characteristic primarily of unpaired males and are only infrequently utilized after pair formation has occurred.

Besides the rally call, males in breeding condition may utter a harsh, repeated *chak* note reminiscent of an old steam engine, thus the name "steam-engine call." This call is evidently indicative of a conflict between attack and escape, especially when in the presence of a more dominant bird. Dominant males often alternate between the rally call and an excited squeaking series of notes, called by Stokes the *squee* call, apparently reflecting a stronger attack than escape tendency. A bird being attacked may also utter a raspy squealing note, lasting a second or more, indicative of extreme submission.

Finally, a series of strictly sexual notes are present, which are limited to the breeding season and characteristic of behavior associated with copulation and nesting. These include the copulation-intention note, the tidbitting and *pitoo* calls, and the nest-ceremony calls already mentioned earlier.

EVOLUTIONARY RELATIONSHIPS

As mentioned in the gray partridge account, there is little purpose in discussing the evolutionary relationships of these introduced species, since their nearest living relatives are beyond the limits established in this book. The reader is referred to Watson's discussion (1962a, b) of the problems of speciation in the *Alectoris* partridges.