

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

---

Grouse and Quails of North America, by Paul A.  
Johnsgard

Papers in the Biological Sciences

---

May 2008

# 15 White-tailed Ptarmigan

Paul A. Johnsgard

*University of Nebraska-Lincoln*, [pajohnsgard@gmail.com](mailto:pajohnsgard@gmail.com)

Follow this and additional works at: <http://digitalcommons.unl.edu/bioscigrouse>



Part of the [Ornithology Commons](#)

---

Johnsgard, Paul A., "15 White-tailed Ptarmigan" (2008). *Grouse and Quails of North America*, by Paul A. Johnsgard. 17.  
<http://digitalcommons.unl.edu/bioscigrouse/17>

This Article is brought to you for free and open access by the Papers in the Biological Sciences at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Grouse and Quails of North America, by Paul A. Johnsgard by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

# White-tailed Ptarmigan

---

*Lagopus leucurus* (Richardson) 1831

## OTHER VERNACULAR NAMES

*S* NOW grouse, snow partridge.

## RANGE

From central Alaska, northern Yukon, and southwestern Mackenzie south to the Kenai Peninsula, Vancouver Island, the Cascade Mountains of Washington, and along the Rocky Mountains from British Columbia and Alberta south to northern New Mexico (*A.O.U. Check-list*, 1957).

## SUBSPECIES (*ex A.O.U. Check-list*)

*L. l. leucurus* (Richardson): Northern white-tailed ptarmigan. Resident above timberline from northern Yukon, western Mackenzie, British Columbia, and west central Alberta south to the northern border of the United States.

*L. l. peninsularis* Chapman: Kenai white-tailed ptarmigan. Resident above timberline from south central Alaska to Cook Inlet and the Kenai Peninsula, extending east and southeast to Glacier Bay and White Pass.

*L. l. saxatilis* Cowan: Vancouver white-tailed ptarmigan. Resident above timberline on Vancouver Island, British Columbia.

*L. l. rainierensis* Taylor: Mount Rainier white-tailed ptarmigan. Resident above timberline in Washington from Mount Baker south to Mount Adams and Mount St. Helens.

*L. l. altipetens* Osgood: Southern white-tailed ptarmigan. Resident above timberline in the Rocky Mountains from Montana south through Wyoming and Colorado to northern New Mexico.

## MEASUREMENTS

Folded wing: Adult males, 164–94 mm; adult females, 155–92 mm (males average 5 mm longer than females).

Tail: Adult males, 85–109 mm; adult females, 83–98 mm (males average 8 mm longer than females).

## IDENTIFICATION

Adults, 12–13.5 inches long. In any nonjuvinal plumage the white tail will serve to separate this species from the other two ptarmigans. Adult males in summer plumage are vermiculated and barred or mottled with black, buffy, and white dorsally, with a buffy or pale fulvous tone predominating on the lower back, rump, and upper tail coverts, and the underparts are mostly white. Unlike the other ptarmigans, the wings as well as the tail (except for the central pair of feathers) are completely white at this season. Females are similar in plumage but have a heavily spotted and more yellowish color dorsally. In the fall both sexes are mostly pale cinnamon-rufous above, with fine spotting and vermiculations of brownish black and with a lighter head and neck. A few breast feathers are usually marked with white, and the abdomen, undertail coverts, tail, and wings are white. In the winter both sexes are pure white except for a black bill, eyes, and claws.

## FIELD MARKS

A small alpine ptarmigan with white wings and tail in summer, or an entirely white plumage in winter, is of this species. It is usually extremely difficult to see against a lichen-covered rocky background and is therefore overlooked unless forced to fly.

## AGE AND SEX CRITERIA

*Females* exhibit eye-combs (unlike the two other ptarmigan species) virtually identical to those of adult males, but in summer hens are more coarsely and regularly barred with black and rich ochraceous buff markings on their brownish back and side feathers, while feathers of males in these areas are finely vermiculated with brown and black. In addition, although males retain their white lower breast, abdomen, and undertail coverts through the summer, females have yellowish buffy brown feathers with some black barring present in these areas (Braun and Rogers, 1967a). In the autumn differences between the sexes diminish, but for a time females retain a few of their coarsely barred nuptial plumage feathers, especially on the nape, sides, inner wing, and upper tail coverts. In winter birds of both sexes are identical in plumage but may differ slightly in wing length, length of the outer five primaries, and outer rectrix length (Braun and Rogers, 1967a). In spring, males can be recognized by their distinctive black-tipped head and neck feathers, which provide a "hooded" effect that is lacking in females as they gradually acquire their brown, black, and yellow nuptial plumage (Braun, 1969).

*Immatures* may be recognized by the pigmentation of their two outer primaries (Taber, in Mosby, 1963). If black pigment occurs on either the ninth or tenth primary the bird may confidently be called an immature. Likewise pigmentation on the outer primary covert is an indication of an immature bird, whereas lack of pigmentation in these areas is typical of adults (Braun and Rogers, 1967a).

*Juveniles* have tail feathers that are yellowish brown centrally or white with mottled brown edges (Ridgway and Friedmann, 1946). Until they are all molted, the secondaries and inner eight primaries are also brownish in juveniles (see willow ptarmigan account).

*Downy young* are illustrated in color plate 61. Downy white-tailed ptarmigan are the least rufous dorsally of all the ptarmigans and have only a suggestion of the usual chestnut crown with its black margin. The two black dorsal stripes are also indistinct, and instead the back has an indefinite blending of buff, gray, sepia, and black shades. The feathered toes will separate downies of this species from any non-*Lagopus* forms.

## DISTRIBUTION AND HABITAT

The current distribution of the white-tailed ptarmigan in North America closely conforms to that of alpine tundra, although it does not extend southward along the Cascade and Sierra ranges into Oregon or California,

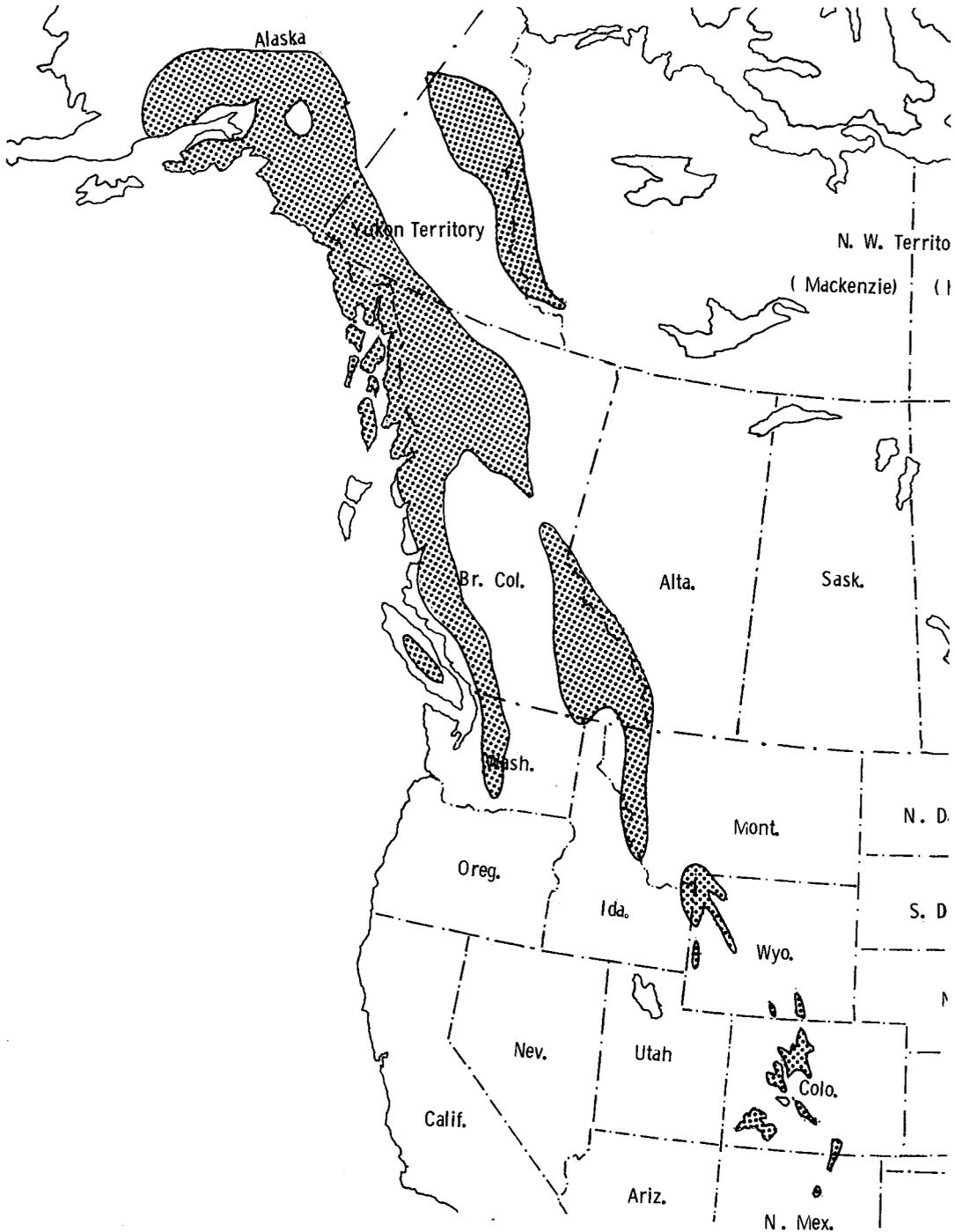


FIGURE 28. Current distribution of the white-tailed ptarmigan.

nor does it apparently include the Brooks Range of northern Alaska, both of which would seem to provide suitable habitat opportunities for the species. In the Rocky Mountains of the western states the range of the species is highly disjunctive because of the limited elevations above timberline, and it must be presumed that these southern populations became isolated during Pleistocene times. These southernmost populations are probably the ones most vulnerable to possible extirpation. Ligon (1961) noted that although the New Mexican range of this species once included all the alpine ridges of the Sangre de Cristo range from Lake Peak to the Colorado line, the birds are now found only on a few peaks near the Colorado line. Braun (1970) reported finding them on Costilla Peak in 1970, and has also verified their occurrence on Baldy Peak near Santa Fe. Braun (1969) concluded that although the birds may once have occurred in Oregon, Idaho and Utah, their recent natural occurrence in these states is unproved. Attempts have recently been made to introduce them in northeastern Oregon.

Except for Alaska, Colorado is the state with perhaps the greatest amount of white-tailed ptarmigan range in the United States. Rogers and Braun (1968) estimate that more than four thousand square miles in the state are occupied by this ptarmigan.

Weeden (1965b) reported that typical terrain of this species consists of steep slopes and ridges, often around cirques and stony benches, where ledges, cliffs, and outcrops commonly occur. The vegetation is generally sparse, with shrubs nearly absent and dwarfed when present. The birds in Alaska are usually from five hundred to two thousand feet above timberline. In Montana, Choate (1963) found that ptarmigan are not present in timber or in shrubby vegetation more than eighteen inches high. Rather, they prefer areas of rocks and moist ledges with alpine vegetation that is low-growing but well developed. Rocks from six to twenty-four inches in diameter provide optimum habitat, since they provide protection from bad weather and cover from visual predators. Ptarmigan are never found in boggy areas or areas where the vegetation is taller than the birds themselves. They usually frequent gently sloping areas where moisture is abundant and vegetation is present. Preferred cover plants, which also are among the most important food plants, including willow, heath (*Phyllodoce* and *Cassiope*), and mosses.

Braun (1969, 1970) concluded that in Colorado the distribution and abundance of alpine willow is the key factor determining ptarmigan distribution. Willow not only represented the majority of the ptarmigan's food from late September until May, but its occurrence in snow-free areas in late May is an essential component of breeding territories.

## POPULATION DENSITY

Relatively little information is available on breeding densities. Choate (1963) reported the over-all density of breeding birds on a 2-square-mile plot at 17.5 birds per square mile, but if unsuitable habitats are excluded from consideration, the density could be calculated as 50 breeding birds per square mile. On study areas totaling 8.41 square miles, Rogers and Braun (1968) reported 52 and 56 breeding pairs plus 11 to 25 unmated birds in 1966 and 1967, or 15.2-15.5 birds per square mile. In 1968 there were 55 pairs and 21 unmated males on areas totaling 6.93 square miles, or 19.2 birds per square mile, and in 1969 there were 60 pairs and 28 unmated males on 8.41 square miles, or 17.8 birds per square mile (*Colorado Game Research Review*, 1968 and 1969).

## HABITAT REQUIREMENTS

### *Wintering Requirements*

Braun (1969, 1970) reported that wintering areas for ptarmigan in Colorado must contain alpine willows (*Salix nivalis* and *S. anglorum*), and alpine areas lacking this species cannot support ptarmigan for prolonged periods. Braun and Pattie (1969) reported that the Beartooth Plateau of Wyoming almost completely lacks willow in this timberline zone, and willow stands that do occur are snow-covered during winter. The birds evidently do not occur there or in certain northern New Mexico peaks where willow is also absent (Braun, 1970).

### *Spring Habitat Requirements*

Braun (1969, 1970) reports that the presence of willow is essential to the habitat characteristics of successful male territories. In Colorado, breeding territories are adjacent to the spruce-willow alpine timberline (krummholz) zone, and also include small windblown areas. In the Beartooth area of Wyoming, this combination of habitat characteristics in the alpine zone is lacking, thus the area is apparently unsuitable as a breeding ground (Braun and Pattie, 1969). In Colorado, territories are established in suitable habitats where the snow is gone by early May (Braun, 1969).

### *Nesting and Brooding Requirements*

Nest site characteristics for the white-tailed ptarmigan are evidently rather broad, judging from the diversity of nest sites that have been found (Schmidt, 1969). Probably more important than specific nest sites during the summer period is the accessibility of suitable brooding areas. Brooding areas for females and suitable summering areas for post-territorial males as well as unsuccessful hens occur where the vegetation is short and where rocks six inches or larger cover more than 50 percent of the ground surface (Braun, 1969). The vegetation of suitable meadow areas adjacent to rock fields consists principally of hedges (*Carex*) and forbs such as *Geum* and *Polygonum*. During late summer, adults and young move to snow accumulation areas between the summering and wintering habitats, which provide the last source of green plants in the alpine zone and also offer the best protection for intermediate-plumaged birds.

### FOOD AND FORAGING BEHAVIOR

Weeden (1967) has reported on the analysis of 167 crops of this species collected from Colorado to Alaska. Winter foods of Alaskan populations differ from those in Colorado in that alder (*Alnus*) catkins are an important part of the winter diet, with willow (*Salix*) and birch (*Betula*) of secondary importance. In contrast, Colorado ptarmigan subsist largely on the buds and woody twigs of various alpine willows (Quick, 1947). Weeden attributed this difference to the increased availability of alder in northern areas, and to possible competition from other species of ptarmigan in Alaska.

May and Braun (1969) reported that among forty winter food samples from Colorado, willow occurred with a 100 percent frequency, but alder also occurred in samples from areas where that species was locally abundant. Coniferous food sources (*Picea*, *Pinus*, *Abies*), although readily available, are rarely taken in winter (May, 1970). With spring, a diversity of green leaves and flowers are consumed, although willow remains the most important food. The leaves and flowers of *Potentilla*, *Ranunculus*, *Saxifraga*, and *Dryas*, all of which are high in protein, were other important spring foods. During summer a diverse array of leaves and seeds are also consumed, and the bulbils of *Polygonum viviparum* are an important summer food for adults. During their first two weeks juveniles feed largely on invertebrate foods, then they too begin to feed extensively on these bulbils. Gradually willow gains importance over *Polygonum* for both juveniles and

adults, and eventually the birds go back to a diet consisting almost entirely of *Salix* buds and twigs (May and Braun, 1970; May, 1970).

## MOBILITY AND MOVEMENTS

Relatively little is known of white-tailed ptarmigan movements, but certainly little lateral movement is normally typical. During winter, the birds typically descend to the edge of treeline, where food is more readily available. In Colorado, ptarmigan gather in flocks of five to thirty birds in high alpine basins where willows are abundant (Quick, 1947). Single birds also sometimes occur in alpine fir (*Abies lasiocarpa*), limber pine (*Pinus flexilis*), or on steep rock slopes during winter but when flushed usually drop down into the snow basins below. Weeden (1965b) indicated that in Alaska most birds remain above the timberline, feeding in areas such as steep cliffs, ridge tops, and benches that are blown fairly free of snow. In parts of southwest Colorado the birds go to low valleys every winter regardless of snow cover (Braun and Rogers, 1967b). During early winter in Colorado, flocks of up to fifty ptarmigan can be found in areas containing available willow, but later the sexes tend to segregate, with males occurring nearer timberline and females remaining in the larger willow expanses at lower elevations (Braun and Rogers, 1968). Birds may move as much as a mile in a day during winter and up to fifteen miles on a longer basis (Braun and Rogers, 1967b).

In spring, Colorado ptarmigan move back up to the breeding areas, which in the case of males may be a distance of less than a mile. Movements of both sexes are very restricted during the breeding and nesting periods, with birds rarely moving more than five hundred yards (Braun and Rogers, 1967b). When broods appear, males and broodless females move uphill into higher rocky summering areas that may be up to 2 miles from nesting areas, where the birds once again become fairly sedentary. Hens may also move their broods as much as 1/3 mile to such summer brood-rearing areas (Braun and Rogers, 1967b). Subadult males and unsuccessful hens move considerably farther than adult males or brooding females, and fall movements of females may exceed 10 miles (Braun, 1969).

Daily movements probably differ considerably according to sex, age, and time of year and with varying weather conditions. Minimal daily movements may occur among brooding females caring for young chicks. Schmidt (1969) noted that one brood moved about eight hundred yards in ten hours, and another moved three hundred to four hundred yards in three hours. Similarly, males on breeding territories move very little. Schmidt found in 1967 that males had an average territory size of 19 acres,

with maximum use occurring in 5.3 acres, and in 1968, with a better sample, territories averaged 36 acres, with maximum use in a 9.5 acre area. These territorial areas were used over a 2½ month period, during the entire pair bond period.

## REPRODUCTIVE BEHAVIOR

### *Prenesting Behavior*

Virtually all that is known of the reproductive behavior of the white-tailed ptarmigan consists of the work of Schmidt (1969), which as of this writing is still unpublished. The following summary is based on Schmidt's observations.

### *Territorial Establishment*

With the return of the males from their timberline wintering areas to the alpine breeding grounds, territories were gradually established, which ranged in size from 16 to 47 acres. Within these fairly large defended areas, which overlapped slightly, males were usually to be found in areas of maximum use of from 3.2 to 15.7 acres. Males typically returned to their same territories of past years, and females usually returned to the same territory and the same male each spring. Territorial activity was not strong until the arrival of the females on the breeding areas, and males would often feed together until that time.

Males were typically monogamous, and Schmidt found that although males were sometimes found with two females, this was less common than seeing unpaired males. Territories were usually held by males at least twenty-two months old, with subadults successful in obtaining territories only if they were vacated by older birds. Territorial defense and proclamation became spirited in late April or early May when the females arrived, and the pair-forming period occurred at the same time. The most intensive territorial activity was typically in very early morning or after feeding in the evening, but during foggy periods or snow squalls activity was intense, apparently as a result of restricted visibility.

### *Male Territorial and Pair-forming Behavior*

Male displays and calls may be discussed according to whether they serve the dual purpose of warding off other males from the territory and attracting females, or whether they are performed only in a sexual situation. The basically agonistic territorial signals may be considered first.

Schmidt classified the territorial behavior of males into three general types, the "screen flight," "ground challenging," and intimidation displays, noting, however, that they form a continuum of functions and have certain merging characteristics. The male scream flight, which corresponds to the song flight of willow ptarmigan, consists of the birds' taking off and uttering a raucous call containing four syllables, *ku-ku-KIIII-KIERR*, lasting about one second and being repeated at intervals of about one to three seconds. Choate (1960) had noted that this flight was sometimes characterized by a steep rise followed by a shallow glide, which Schmidt did not see. This display clearly attracted females and warned rival males of the territorial location. However, the display was sometimes seen in midsummer after territories had been abandoned, and females sometimes uttered a homologous call while the male was calling or when defending chicks.

Ground challenging was uttered from convenient calling posts, and the associated call varied considerably in emphasis, such as *duk-duk-DAAK-duk-duk* or *DAAK-DAAK-duk-DAAK-duk-duk-duk*. Some "long ground screams" closely resemble the flight scream in their last four notes. Intimidation displays performed on the ground included two major postures. These were a flat posture assumed during running and an upright threat posture held during slow walking or while standing still. During these displays the eye-comb was exposed by raising crown feathers and low clucking sounds were typically uttered. During territorial border disputes males would usually face one another at distances of from five to thirty feet in the upright postures, sometimes making short flights while calling. Aerial chases occurred occasionally.

With the arrival of females on a territory, the responses of resident males changed. Males would chase the individual females that entered their territories and perform several specific postures and calls. The "courtship chase" and associated strutting was much like an aggressive attack toward another male, but the head was held more upright, the tail and undertail coverts were more strongly lifted, the breast feathers were fluffed, and the wings were slightly drooped. When the female attempted to escape from the approaching male, chases typically ensued.

Males sometimes varied their strutting approach to females with a "slow approach" and a rhythmic "head-bowing," that resembled the ground-pecking "displacement" display of male spruce grouse, but the bill was lowered only part way toward the ground. Frequently, a "waltzing" display was performed by the male as he approached the female and attempted to circle in front of her. While so doing, he tilted the tail toward the female and dragged both wings, with the wing nearer the female held lower than the more distant one. This waltzing display lasted from one to five seconds and

was usually repeated several times in a twenty- to forty-second interval. No calling was heard during this display.

Evidently pair-formation was achieved by the repeated performance of these displays, after which the female followed the male closely, the two birds feeding and resting at the same times. While the female fed, Schmidt heard the male utter "assurance clucks" from fifty to eighty times a minute. When the female rested near the base of a rock, the male typically stood on the top of that rock or an adjacent one.

Copulation and the associated behavior patterns were observed only a few times, and occurred just prior to the period of egg laying and incubation. On one occasion Braun (cited in Schmidt) observed an apparent instance of precopulatory invitational "tidbitting," during which the male pecked the ground and uttered a series of low-pitched clucking sounds that stimulated the female to rush over and join in the pecking. As the pair began pecking head to head, the male raised his head, exposed his eye-combs, fluffed his feathers, and drooped his wings. He then began bowing his head over the female while uttering "churring sounds." Then he walked around the female and grabbed her nape, causing the hen to drop to the ground with her neck extended forward. When mounting and during copulation the male lowered his wings and crouched down on the female. When released, the female ran forward in several short dashes, stopping between dashes to shake. The postcopulatory display of the male resembled normal strutting, but the wings were more strongly drooped, and the bird walked in slow steps. In each of four cases, the male moved from ten to fifty feet before resuming normal feeding. In one case, several short dashes were made by the male as well.

One other display noted by Schmidt was "tail-wagging," which apparently occurred as a displacement activity in times of stress. Schmidt found that it occurred in adults of both sexes and in young only six weeks old. Females typically performed tail-wagging when approached by a courting male but only when approached from the side or behind. Displacement feeding movements were also noted in stress situations.

### *Vocal Signals*

In addition to the several calls mentioned earlier, Schmidt noted several other vocal signals. Hissing sounds were emitted by females when defending the nest, and when performing distraction displays the female typically uttered a harsh *craaow* note that apparently served as an alarm call to the chicks. Females also uttered a loud *brrrt*, apparently of similar function. When the young were older, females uttered "alert calls," running to the

cheeping distress calls of young and uttering high clucks in an upright alert posture. Females also uttered soft contact calls in the presence of their broods and while pecking made cackling noises that served to attract the young. Schmidt noted that such functional tidbitting behavior had earlier been reported for both willow ptarmigan and sage grouse. It is of interest that so far only in the white-tailed ptarmigan has tidbitting been reported as an adult display pattern, where it possibly serves as a precopulatory attraction signal.

### *Nesting and Brooding Behavior*

Relatively few nesting studies have been made on this species. Choate (1963) reported on eleven nests in Montana that had from 3 to 9 eggs, averaging 5.2. Bradburry (1915) mentioned six Colorado nests containing from 5 to 7 eggs. Braun (1969) noted that nineteen nests in Colorado had from 4 to 7 eggs, averaging slightly under 6. Choate (1963) found one known instance of renesting in Montana, and Braun (1969) concluded that renesting was also probable in Colorado. He estimated an egg-laying interval of slightly under one and one-half days and an incubation period of twenty-two to twenty-three days.

Choate (1963) found an incubation success of 70 percent for nests studied in Montana, and a hatching success of 85.5 percent of eggs observed. Braun (1969) reported a nearly identical hatching success of 81.1 percent in Colorado.

The male apparently normally remains with the female until the time of hatching, judging from observations of Schmidt and Braun in Colorado, although Choate (1963) indicated that the pair bond may last only two or three weeks. Females regularly perform strong nest and brood defense displays, and Schmidt (1969) noted that males may also defend the nest site. Early in the incubation period, a female disturbed from the nest typically skitters over the ground for from ten to fifty feet, with her wings dragging and her head low in a distraction display. As hatching approaches the female is more likely to remain at the nest, hissing and spreading her wings. Schmidt never found a male defending a brood, but female brood defense may take several forms. She may attack the intruder, with expanded eye-combs and exposed white carpals, running with the wings extended and head raised and uttering hissing sounds. When the chicks were still very young the female often performed distraction behavior and lead the intruder from the brood. When the chicks were older, the female usually uttered "alert calling" or would place herself between the observer and the brood, running back and forth and hissing. When they were from ten to twenty-one

days old the chicks could fly from 20 to 150 feet, after which they would run and utter cheeping calls. Loud calls were also uttered by lost chicks, which gradually changed to hoarse *cheer-up* sounds in older birds. When captured, birds up to twelve months old would sometimes utter similar sounds.

Concentration of females with broods occurred on certain favored areas that provided a combination of rocky habitat and an abundance of low, rapidly growing herbaceous vegetation. Brood mixing commonly occurred on such areas. Hens remained with well-grown young through the autumn period, as the birds gradually moved closer to wintering areas (Braun, 1969).

### EVOLUTIONARY RELATIONSHIPS

General comments as to the ptarmigan relationships have already been made earlier (see willow ptarmigan account). Recent authorities (Höhn, 1969; Braun, 1969) appear to be agreed that the white-tailed ptarmigan must have been derived from a relatively early offshoot of ptarmigan stock that became isolated in western North America. Braun agreed with Johansen (1956), who thought that the white-tailed ptarmigan originated from ancestral stock of *Lagopus mutus* which arrived very early in North America. Judging from plumage characteristics of downy young as well as adults, I would favor the view that such a separation of *pre-leucurus* stock occurred before a subsequent splitting of gene pools that gave rise to the modern rock and willow ptarmigans; thus I believe that these two species are more closely related to one another than either is to the white-tailed ptarmigan. Differences in bill size among the three species where they occur together in Alaska and western Canada may be advantageous in reducing foraging competition; thus, indirectly, selection for differences in body size among the three species may have occurred. Weeden (1967) has already suggested that winter foods taken by white-tailed ptarmigan in Alaska may be influenced by competition from the two other species of Alaskan ptarmigans.