

## FROM FIELD AND STUDY

**Evidence of Double-brooding in Gambel Quail.**—The Gambel Quail (*Lophortyx gambelii*) is the only abundant resident game bird on the hot, arid, shrub desert of southern Nevada, western Arizona, and southeastern California. It normally raises one brood of young a season, if it nests at all (Macgregor and Imlay, Calif. Fish and Game, 37, 1951:218-219). Gorsuch (Univ. Ariz. Biol. Sci. Bull., 2, 1934:25-27) points out that time limitations make two broods in a single nesting season out of the question, assuming that the brood will be kept intact and with its parents until the chicks are fully grown. Gorsuch's statement is valid under normal environmental conditions. However, food conditions on the Mohave Desert ranges of Clark County, Nevada, developed so favorably in the fall of 1951 and the winter of 1952, when 7.09 inches of precipitation fell at Searchlight, that Gorsuch's basic assumption did not hold.

The first indication that something other than normal productivity was occurring came to my attention on June 6, 1952, when a flock of 54 Gambel Quail chicks of age class III were flushed from a cave beside a wash below Granite Springs, on the Nevada-California border, 12 miles southwest of Davis Dam, Nevada. In spite of careful pursuit and examination of this flock of chicks, not an adult quail could be found among the lot. Then, on June 28, at quail guzzler MO-6, in the Mormon Mountains, 26 miles north of Overton, all three broods coming in to the guzzler were accompanied only by single adult males; one was a group of 30 class III young, another a brood of 10 class II young, and the third a brood of one, a class II young.

Several additional observations made at other guzzlers in early July, 1952, shed further light on this matter (table 1). These observations were part of the standardized water hole counts, used by Nevada Fish and Game Commission personnel, to determine population trends. They commence one-half hour before sunrise and end five hours after sun-up.

Table 1  
Brood Composition at Guzzlers in Southern Nevada in 1952

Site <sup>1</sup>	Date	♂ and ♀ with jvs.		♂ with jvs.		♀ with jvs.		♂ and ♀ without "Weaned"		Average brood sizes with adults	
								young	young		"weaned"
MO-6	6/28	0	....	3	41	0	....	5	0	13.6	.....
N-4	7/3	7	77	1	14	5	48	12	142	10.7	11.8
GB-4	7/8	4	48	2	17	2	11	6	80	9.5	13.3
D-2	7/11	3	39	5	53	0	....	15	260	11.5	17.3
D-16	7/12	1	11	2	12	1	12	2	92	8.7	?
Totals		15	175	13	137	8	71	40	574	10.6	14.4

<sup>1</sup> Location of guzzlers: MO-6, 26 mi. N Overton; N-4, 5 mi. E Searchlight; GB-4, 22 mi. SSE Overton; D-2, 10 mi. WSW Davis Dam; D-16, 12 mi. NW Davis Dam.

Nesting commenced in February, 1952, with the first peak of hatching in mid-April. This early hatching peak was at the height of productivity of the 1952 food crop, and apparently many adults took advantage of this condition to bring off another brood. The second nestings were just a week or two later than the normal nesting timetable for southern Nevada's desert regions, with the second hatching peak coming in early July.

Adults had to free themselves of their earlier broods if they were to renest while feed conditions were still favorable. Two methods appeared to be in use in 1952 to achieve this end: (1) to delegate the care of broods to the males, or (2) to "wean" the chicks and let them take care of themselves. This latter method seemed to be the most prevalent; even broods about four weeks old were "weaned" and left in the "care" of groups of older birds of the year. Of 979 young quail counted at five guzzlers in southern Nevada between June 28 and July 12, 1952, 59.9 per cent had been "weaned" and were apparently completely independent of any parental care (table 2).

The observation was repeatedly made that earliest arrivals at water in the morning (4:40 to 5:20 a.m. PST; sunrise about 4:30 a.m.) were paired quail without broods. These pairs seldom spent more than five to ten minutes in the vicinity of the guzzler and departed by the same route by which

they had approached. These were believed to have been nesting birds, most probably incubating their second clutch of the season. Next, about 5:30 a.m., the groups of independent juvenal quail began swarming in to water. They came in flocks of as few as 2 to as many as 73 birds. Generally the larger flocks included young quail of two or three age classes. Unlike the nesting birds, these young had nothing to do but loaf around the water, and oftentimes over 100 young quail would be loafing within

Table 2

## Age Classes of Young Quail at Guzzlers in Southern Nevada in 1952

Age classes <sup>1</sup>	Chicks with parents				"Weaned" chicks		
	I	II	III	IV	II	III	IV
MO-6	0	11	30	0	0	0	0
N-4	23	41	28	48	0	43	99
GB-4	17	42	24	2	0	8	80
D-2	32	60	0	0	0	54	206
D-16	35	0	0	0	9	33	54
Totals	107	154	82	50	9	138	439
Percentage of total young	10.9	15.7	8.4	5.1	0.9	14.1	44.9

<sup>1</sup> Age classes: I, newly hatched to 2 weeks old, downy young, no feathers, no tail, very little if any plume, flightless; II, 2 to 4 weeks old, one-third to one-half grown, wing and some body feathers developed, short tail, small plume, light faced, flying; III, 5 to 8 weeks old, three-fourths grown, body well feathered, tail and plume one-half grown, light face and head; IV, 9 to 12 weeks old, adult proportions to plumage but still notably smaller, still short plumed, gray faced, with males showing developing black faces and red caps.

a few dozen feet of the guzzler. Later, usually about 6:30 a.m., pairs with broods began appearing at water. Adults with broods invariably came directly in to water, methodically clearing the unit of all the independent juveniles to enable their brood to water unmolested. Once watering was completed, the brood was taken away from the guzzler.

Computing the average size of broods with parents, a figure of 10.6 chicks per brood was obtained (table 1). Further assuming that the "weaned" chicks had belonged to the adults coming to water without broods, an average figure of 14.4 chicks per brood was obtained, which compares favorably with average sizes of known broods.

The fact that 13 cocks brought broods to water alone, whereas only 8 hens did this, is believed to be significant, indicating a certain number of hens reneesting while care of the earlier brood was delegated to the cocks. This seemed especially true at guzzlers MO-6 and D-2.

The data presented in table 2 are believed to be further evidence supporting the double-brooding thesis. Almost 45 per cent of the quail chicks counted in late June and early July, 1952, had been hatched in April and were independent, whereas only 40.1 per cent of the chicks were still in broods with their parents, and nearly two-thirds of these were less than about one month old.

Unfortunately, the conclusive proof, that of two broods being produced by individually marked quail in one season, has not been obtained. The evidence is entirely circumstantial, based upon the data presented here.

This condition of probable double-brooding existed over most of the desert ranges of Clark County in 1952, but it seemed to be most common in the southern part of the county, from Searchlight south through the Dead Mountains to the California state-line north of Needles. There was no evidence of "weaning" or double-brooding among Gambel Quail that occupied valley habitats in southern Nevada. On the desert ranges where double-brooding was evident the average production was nearly 15 chicks per adult pair, whereas it amounted to only about 10 chicks per pair in the valley areas. The response of the quail population was irruptive on the desert ranges, there being about 800 quail in mid-July, 1952, where there had been only 100 quail four months earlier.

No evidence of double-brooding was noted in southern Nevada in 1950, 1951, 1953, or 1955, but there was some evidence of "weaning," and perhaps double-brooding, at four different watering sites in 1954. This was too infrequent to be of importance in overall quail population dynamics in 1954, since the average desert range productivity was only 475 young per 100 adults.

One interesting sidelight of the early nesting season in 1952 was the observation, at guzzler D-16, of three adult males (one a tagged transplant released at this site on December 13, 1950) paired to nearly fully grown class IV females. There was no evidence that this "pairing" was any more than a short-lived companionship.—GORDON W. GULLION, *Nevada Fish and Game Commission, Elko, Nevada, January 14, 1956.*

**A Fossil Guan from the Oligocene of South Dakota.**—It is of much interest to record another fossil species of the strictly American family Cracidae of the order of gallinaceous birds, especially since this record extends the historical distribution of the Cracidae back into the Upper Oligocene. The specimen, while only a fragment, is typical in the form of the condyles of the humerus and in their relation to one another. Dr. James D. Bump who collected the type informs me that it was found alone without association with other fossils. The characters shown in the bone are of such a nature that it does not fall within the limits of the genera previously known. Its detailed description follows:

**Palaeonossax new genus**

*Characters.*—Distal end of humerus similar to *Ortalis* Merrem, but with entepicondyle reduced in size, and with more definite separation from internal condyle; internal condyle relatively smaller; external condyle relatively shorter and slightly broader; entire distal end more delicate, less swollen.

*Type.*—*Palaeonossax senectus*.

**Palaeonossax senectus new species**

*Characters.*—Distal end of humerus (fig. 1) similar to that of living *Ortalis vetula* (Wagler), but less inflated; internal condyle smaller, more rounded; external condyle slightly shorter and definitely broader; other characters as indicated in the generic diagnosis.

*Type.*—Distal end of right humerus, South Dakota School of Mines and Technology, Museum of Geology no. 457, from Upper Oligocene (Upper Brule formation): Protoceras Channel Sandstone, 5 miles south of Scenic, South Dakota.

*Measurements.*—Transverse breadth across trochlea 11.1; smallest transverse breadth of shaft 6.3 mm.

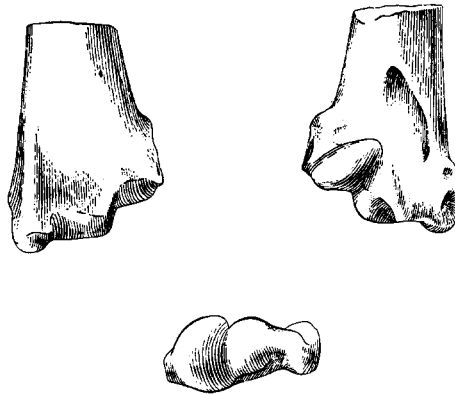


Fig. 1. Distal end of right humerus of type of *Palaeonossax senectus*,  $\times 2$ .

This specimen, although fragmentary, is definitely representative of the family Cracidae in the order Galliformes and is the most ancient record of this group that has been found. The 11 genera of living forms range from the lower Rio Grande valley in Texas and northern México south through Central America and South America to northern Argentina. Four fossil species have been described previously from Tertiary deposits in Nebraska, South Dakota, and Florida, as follows: *Ortalis phengites* Wetmore, Lower Pliocene, Nebraska; *Ortalis tantala* Wetmore, Lower Miocene (Lower Harrison beds), Nebraska; *Ortalis pollicaris* A. H. Miller, Lower Miocene (Rosebud beds), South Dakota; *Boreortalis laeslei* Brodkorb, Lower Miocene (Hawthorn formation), Florida.