CORELLA

(formerly The Australian Bird Bander)

Journal of the Australian Bird Study Association

VOLUME 2 DECEMBER, 1978 NUMBER 5

The age of Breeding in the Stubble Quail and Japanese Quail

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Among Stubble Quail *Coturnix novaezealandiae pectoralis* collected in late summer and autumn 1968 and 1969 in the Mudgee district, N.S.W. there were young birls still showing some juvenile plumage and which were apparently breeding or had done so. Morris and Kurtz (1977) stated that when heavy rain in this district produced a growth of grass on the stubble fields at a rate faster than stock could eat it down, the number of button quail *Turnix* spp. built up. They also observed this for Stubble Quail (pers. comm.).

Disney (1969, 1974) stated that under suitable conditions Stubble Quail may breed at the age of four months. Evidence for this is presented here and supported by recent observations on the related Japanese Quail *C. c. japonica* in the Taronga Zoo, Sydney.

Table 1 contains data on young Stubble Quail in breeding condition collected in 1968 and 1969. Three females still had juvenile primaries No. 6 and 7 and some juvenile feathers on the breast. (See illustration in Disney 1969, 1974). Two of those collected in February, 1969, were breeding with heavily convoluted oviducts and one had a large egg in the oviduct. The third, taken in April, 1969, had bred, the oviduct was down and convoluted and the largest oocyte measured 1 mm. Four males still with juvenile primaries No. 6 and 7 had testes between 15-21 mm x 8-11 mm. Three of these still retained some juvenile breast feathers and the others taken in March, 1968, had the black patch on centre of the breast very similar to that of a fully grown adult bird. Sixteen young males collected between November, 1968, and March, 1969, had juvenile primary No. 7 still present and usually some juvenile feathers on the breast; all had large testes, the largest ranging from 14-24 mm x 6-13 mm. Twelve females, collected between November, 1968, and April, 1969, still with juvenile primary No. 7 and occasionally some juvenile breast feathers had convoluted oviducts and had thus laid eggs. One bird collected on 20 March 1969 had a shelled egg in the oviduct.

True quail (family Phasianidae) develop in much the same way as the other members of the family. The initial down of the chick is followed by the juvenile plumage of true feathers. This is followed by a moult into first-year plumage and sometimes a further moult of body plumage into adult plumage or the fully grown plumage of the second-year bird. If this further moult takes place in the first year it may be only partial and involve mainly the breast and head feathers before the breeding season.

TABLE 1

Young Stubble Quail breeding at an estimated age of four months or less.

	Date Collected	*Breast*	*Gonads*
	BIRDS WITH JUVENILE PRIMARIES Nos. 6 & 7 RETAINED		
Females	20 Feb. 1969	Still a few juvenile feathers, but mainly first year.	Oviduct heavily convoluted, large egg in oviduct.
	22 Feb. 1969	A few juvenile feathers, mostly first year.	Oviduct heavily convoluted, bred. Largest oocyte 8.0 mm.
	25 Apr. 1969	First year with new feathers coming as pins.	Oviduct down, convoluted, bred. Largest oocyte 1.0 mm.
Males	29 Feb. 1968	All first-year feathers.	? x 8.7 mm; 16.5 x 7.6 mm.
	29 Feb. 1968	Still with some juvenile feathers.	15.6 x 10.8 mm; ? x 9.9 mm.
	28 Mar. 1968	A few juvenile feathers. Black centre patch close to full grown.	17.6 x 11.8 mm; 21.5 x 9.1 mm.
	16 Jan. 1969	A few juvenile feathers.	14.9 x 11.0 mm; 19.0 x 9.6 mm.
	BIRDS WITH JUVENILE PRIMARY No. 7 RETAINED		
11 Females	Nov.-April 1968-69	First year, sometimes with a few juvenile.	Oviducts convoluted.
1 Female	20 Mar. 1969	First year, still with a few juvenile.	Oviduct heavily convoluted. Shelled egg in oviduct.
16 Males	Nov.-April 1968-69	Usually still with some juvenile.	14-24 mm x 6-13 mm.

It would appear that most quail of a similar size to the Stubble Quail take 4-5 months to obtain full first-year plumage (Johnsgard 1973). In the genus *Coturnix*, however, it appears to take only 3½ months (McKechnie 1951, pers. obs.). Juvenile primary No. 8 is not normally replaced and together with juvenile primaries Nos. 9 and 10 remains unmoulted until the first complete postnuptial moult. Most other quail moult juvenile primary No. 8 and only the outer two primaries, Nos. 9 and 10, are retained until the next complete moult. Not having to replace juvenile primary No. 8 could explain the slightly shorter time in which *Coturnix* attains full first-year plumage. In most cases as soon as juvenile primary No. 10 emerges, juvenile primary No. 1 is shed and the new first-year feather starts to grow. This takes place in wild Stubble Quail (pers. obs.) and captive Japanese Quail. This sequence is also found in the Californian Quail *Lophortyx californicus* (Raitt 1961). The chicks are usually 3-4 weeks old at this time. Juvenile primaries Nos. 8-10 were completed in 7-8 weeks in Japanese Quail observed at Taronga Zoo.

Table 2 shows the age in weeks at completion of growth in the juvenile primaries and their shedding and replacement by first-year feathers on two male and two female Japanese Quail at Taronga Zoo.

Because of energy requirements, breeding and moulting generally take place at different times of the annual cycle (Kendeigh 1949). If, how-

TABLE 2

Age in weeks of primaries in Japanese Quail at Taronga Zoo, Sydney.

	Primary Number									
	1	2	3	4	5	6	7	8	9	10
Juvenile primary fully grown	2	2	2	3	3	3-4	3-5	6	6-7	7-8
Juvenile primary shed	3-4	4-5	4-6	5-10	6-10	9-11	10-12	Not Shed		
First-year primary fully grown	5-7	6-7	6-8	7-12	8-12	12-14	13-15	Fully grown juvenile primary retained		

ever, a species receives a stimulus to breed while moulting, the moult will usually be interrupted, although any new feathers growing will complete their growth (Payne 1972: 102). During its first six weeks of rapid growth the nutritional requirements of the chick are greater than at any other time (Scott 1973: 48) and therefore if conditions are suitable to stimulate it to breed, the growth of its juvenile feathers will be discontinued. In some galliform birds the production of eggs has been shown to require 20-30 per cent additional daily energy requirements (King 1973: 101). Renewal of juvenile primaries and laying of eggs could not readily occur simultaneously.

Lyons (1962) gave the time of shedding of juvenile primary No. 6 by captive Japanese Quail at 6-12 weeks of age. The Taronga Zoo specimens shed juvenile primary No. 6 between 9-10 weeks of age and the 7th between 10-12 weeks of age. Similarly sized North American quail shed juvenile primary No. 6 between 8-11 weeks and the 7th between 9-12 weeks of age, (Johnsgard, 1973: 40). Thus under good conditions (as existed in 1968 and 1969 in the Mudgee district) Stubble Quail which bred while retaining juvenile primary No. 6 or No. 7 must have received the stimulus to breed before 6-12 weeks of age and almost certainly had laid by the time they were four months old, if not earlier. That *Coturnix* can lay at an early age in Australia is shown by the Japanese Quail at the Taronga Zoo, where two eggs were found in the cage occupied by two pairs known to be only 7-8 weeks old in which juvenile primary No. 10 was fully grown. Juvenile primary No. 4 was still present in one female and No. 6 in the other. It is not known if the eggs were laid by only one or both females, but it is possible that egg laying may have delayed the shedding of juvenile primary No. 4 in the one female. The other three birds shed their 4th primary when 5-6 weeks old, but this female did not do so until the tenth week. The eggs were thought to be fertile and placed in an incubator, but did not hatch.

When five months old, one male and one female were killed and examined. The female had an unshelled egg in the oviduct and the male testes were full size, 24 x 11.5 mm and 19.5 x 12.8 mm. The birds had completed a third body moult into full adult plumage, but the wings had not moulted again, nor had juvenile primaries No. 8-10 been replaced.

Chura and Stickel (1965) reported that Japanese Quail given 14 hours daylight from the age of 50 days produced eggs in 66-68 days. This may not have been directly due to light stimulus, but to the fact that the birds exposed to longer daylight ate more food. A bird on only an eight hour regime also produced eggs. It has been shown in the Australian Zebra Finch *Poephila guttata* that there is no juvenile refractive period and gametogenesis starts while the birds are still in the nest continuing gradually until full maturity is reached in less than three months (Immelman 1973: 205).

Thus it is clear that during good seasons a rapid build up of the quail population can take place partly as a result of young birds breeding at, or even before, they are four months old. Miller (1940) reported a similar rapid build up of quail in 1939 in Victoria after two years of bad breeding conditions, and a chick banded in August 1939 was shot in November 1939, apparently mothering a brood of chicks.

Acknowledgements

I wish to thank Mr A. K. Morris and Mr N. Kurtz for providing specimens and information from the Mudgee District, Mr L. Clayton, Head Keeper of the Bird Section of Taronga Zoo, and his staff for kindly making available the Japanese Quail for weekly examination.

Dr C. N. Smithers and Mr W. E. Boles kindly commented on an earlier draft.

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