

bill depth, and nares-to-tip length (Craig 1974, Craig *et al.* 1980). Male Pukekos are larger than females, but these methods require the capture of the birds for measuring.

I have recently finished a study of the vocal behaviour of the Pukeko (Clapperton 1982), using a population from which measurements of these features were taken and analysed to determine the sex of the birds. During this study it became evident that the loud crowing call of the Pukeko shows distinct sexual dimorphism.

The crowing call, given as a territorial advertisement call, is a loud drawn-out call heard frequently during the day and night. The call of the male is a clear sound, whereas that of the female has a harsh, guttural quality. This difference in quality is due to differences in the structure of the second part of the calls — in the male the second part is at a low fundamental frequency with little or no frequency modulation (Fig. 1a), whereas the female's call does not drop in frequency and the frequency is modulated widely (Fig. 1b).

This difference can, with practice, be easily distinguished by ear and can be used as a quick guide to the sex of birds in the field.

LITERATURE CITED

- CLAPPERTON, B. K. 1982. The role of vocalisations in the social organisation of the Pukeko (*Porphyrio porphyrio melanotus* Temminck). Unpubl. MSc thesis, University of Auckland.
 CRAIG, J. L. 1974. The social organisation of the Pukeko, *Porphyrio porphyrio melanotus* Temminck. Unpubl. PhD. thesis, Massey University.
 CRAIG, J. L.; McARDLE, B. H.; WETTIN, P. D. 1980. Sex determination of the Pukeko or Swamphen. *Notornis* 27 (3): 287-291.
 WILLIAMS, G. R.; MIERS, K. H. 1958. A field method of sexing the Swamp-hen or Pukeko. *Emu* 58: 125-127.

B. KAY CLAPPERTON, *Department of Botany and Zoology, Massey University, Palmerston North*



WINTER FLOCKING OF CHAFFINCHES IN NORTHERN NEW ZEALAND

When the nesting season is over, flocking and migration are part of the normal way of life of many species of finches and buntings. In Europe, Chaffinches (*Fringilla coelebs*) have attracted attention for more than two centuries because quite often large flocks seem to be composed almost entirely of birds of one sex. Hence their scientific name given by Linnaeus, which means literally, Bachelor Finch.

In Gilbert White's *Natural History of Selborne* there is a well-known passage in Letter XIII dated 22 January 1768 and written to Thomas Pennant: "For many years I have observed that towards Christmas vast flocks of chaffinches have appeared in the fields; many more, I used to think, than could be hatched in any one neighbourhood. But when I came to observe them more narrowly, I was amazed to find that they seemed to me to be almost all hens. I communicated my suspicions to some intelligent neighbours, who after taking pains about the matter, declared that they also thought them mostly females —

at least fifty to one. This extraordinary occurrence brought to my mind the remark of Linnaeus that "before winter all their hen chaffinches migrate through Holland into Italy." Again, in Letter XV dated 30 March 1768, G.W. notes that "flocks of female chaffinches have not yet forsaken us." More than two years later in Letter VIII written to Hon. Daines Barrington on 20 Dec. 1770 he again mentions "those vast flocks of hen chaffinches that appear with us in the winter without hardly (*sic*) any cocks among them."

In New Zealand the Chaffinch is recognised as one of the most successful introduced European passerines. Its numbers certainly run into hundreds of thousands, possibly into millions. Although its distribution and breeding are reasonably well known, little attention seems to have been paid to behaviour outside the nesting season, i.e. in autumn and winter. However, Oliver (1955) terminated his account with the words "After the breeding season the Chaffinches gather together in large flocks sometimes comprising up to 600 birds."

In northern New Zealand flocks of Chaffinches first came to my notice one spring in the eastern Bay of Plenty. Near Cape Runaway on 23 August 1940 many were feeding in a weedy field of roots. Next day at Hicks Bay I found c.80, together with a few Greenfinches and Yellowhammers, feeding on the beach and among the tidewracks, sometimes advancing almost into the waves and retreating just in time. On 26 August while cocks were singing evidently on their chosen territories along the Oweka valley, up above c. 300 m a.s.l. in partly broken country among charred logs and stumps and luxuriant but trampled inkweed, there was a loose rambling flock numbering many scores. Inland there stretched range upon range of heavy rainforest. Perhaps the flocks were slowly heading for the high country after wintering in the warmer coastlands. When I later mentioned to Charles Fleming and Peter Bull that I had been finding flocks of Chaffinches, they expressed their surprise and could not recall any such occurrences near Auckland.

I do not know if winter flocking of Chaffinches as far north as Auckland occurs with annual regularity; but the following observations show that it is far from unknown.

Bethells 10/8/47: Two small flocks in the scrub back from the beach.
Mangere 18/6/51: Flock of c.20 in a vegetable field; yet on the day before a cock had been 'rattling' repeatedly as if claiming a territory.

Middlemore 24/7/54: Flock of c.15, although at least three cocks were already singing locally on territories.

An instructive note appeared in *Notornis* 10: 182-183, after H. R. McKenzie and M. J. Blundell had watched mixed flocks of finches attracted by the millions of small black seeds produced by a 'new' weed *Amaranthus retroflexus* on cropping land. For five successive winters 1958-1962, introduced birds came in thousands, especially

Goldfinches, Greenfinches and House Sparrows. On 26/7/61 there were also an estimated 450 Chaffinches and on 27/5/62 150.

From Beth Brown's notebooks comes further evidence. At Opoutere on 22/1/72, c.50 Chaffinches in a flock were feeding over a weedy fire-break in a forest of exotic pines. Also at Opoutere c.100 on 24/4/73 among young pines and on 16-19/4/76 many in flocks. Evidently flocks may be formed as soon as the nesting season ends. At Miranda on 20/6/80 a flock of c.30 feeding on saltings contained some males.

On 28/8/68 my wife and I paid a short visit to Tongariro National Park at a time when Chaffinches appeared to be taking up or returning to nesting territories in the high forests dominated by Mountain Beech (*N. cliffortioides*). On the short turf of the golf course in front of The Chateau, we counted 13 brightly plumaged cocks, while others were already singing in the forests. We saw no hens. Next day as occasional bursts of song came from the forest around Rotopounamu, males but no females were seen flying singly bushwards from the vicinity of Rotoaira. 300 kilometres to the north at sea level most males have already occupied territories by the end of July, as is made clear by their frequent singing.

For climatic reasons New Zealand Chaffinches are likely to be more sedentary than their palearctic congeners, which are forced to leave their summer haunts at the onset of winter's frost and snow. Since many Chaffinches have nests in mountainous country well above the 1000-metre contour, there is certainly altitudinal migration. When winter comes, where do they go and how far? Do, for example, Chaffinches from the Tongariro National Park make for the coast? In the lowlands Chaffinches seem to favour arable land, rough country near the sea and saltings where *Salicornia australis* is a much-appreciated food of, for example, Goldfinches and Greenfinches. The common use of herbicides in cropping areas may be severely limiting the supply of weed seeds available for itinerant finch flocks. Is there any northward movement? Do some Chaffinches cross Cook Strait? Is there any traffic across Foveaux Strait?

The composition of Chaffinch flocks deserves study. Autumn assemblages ought to contain birds of both sexes; but after about mid-winter the composition changes and there seems to be a marked segregation of the sexes.

R. B. SIBSON, 26 *Entrican Avenue, Auckland 5*