

SHORT NOTE

Unusual vocalisations from a male kakapo (*Strigops habroptilus*) imprinted on humans

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The male kakapo (*Strigops habroptilus*) "Sirocco" was hand-reared on Codfish I/Whenua Hou (46°45'S, 167°38'E), New Zealand, in 1997 after contracting an early infection as a chick. For treatment, he was held near to the island hut in Sealers Bay and as a result of hand-rearing became imprinted on humans (Balance 2010; D.K. Eason, *pers. comm.*). This led to his having an advocacy role for conservation, including being viewed in captivity by the general public during tours to several New Zealand sites. At other times, Sirocco has been maintained by the Department of Conservation in a managed but largely wild state on Maud I/Te Hoiere, Marlborough Sounds (41°01'S, 173°53'E), where he mostly roams freely, without other kakapo present.

During a visit to Maud I/Te Hoiere over 21-27 May 2012, we heard a number of unusual vocalisations from Sirocco at night while he interacted with us in and around the accommodation house (Comalco Lodge). These appeared different from any calls previously reported from other male kakapo (Williams 1956; Merton *et al.* 1984; Powlesland *et al.*

1992; Morris & Smith 1995). We digitally recorded samples of these calls using an external Sennheiser ME66 directional microphone attached to a Sony PCM-D50 solid-state recorder, set at a sampling frequency of 44.1 kHz and 16-bit sample size. For subsequent acoustic analysis, we used *Adobe Audition CS6* software for previewing the calls, which were then analysed and plotted using *Raven Pro 1.5* software (Figs. 1 & 2).

These distinctive but relatively quiet calls are unusual as avian vocalisations, instead resembling wordless 'mutterings' from a human voice, at times with an almost urgent character (Fig. 1; supplementary audio material). They constitute a series of syllables with clearly evident harmonics, mostly in the 0-2 kHz range characteristic of the human voice (Fig. 1; Marler 1970; Kuhl 1989; Doupe & Kuhl 1999; Sitt *et al.* 2008). The 'muttering' calls were given when Sirocco was with people, more persistently when he was being touched or stroked, or close (1-3 m) to a person. He also inserted into this repertoire occasional low amplitude notes of higher frequency that were somewhat like quiet and rapid 'ching' notes, at times (Fig. 2) with some overlap between syllable types suggesting possible

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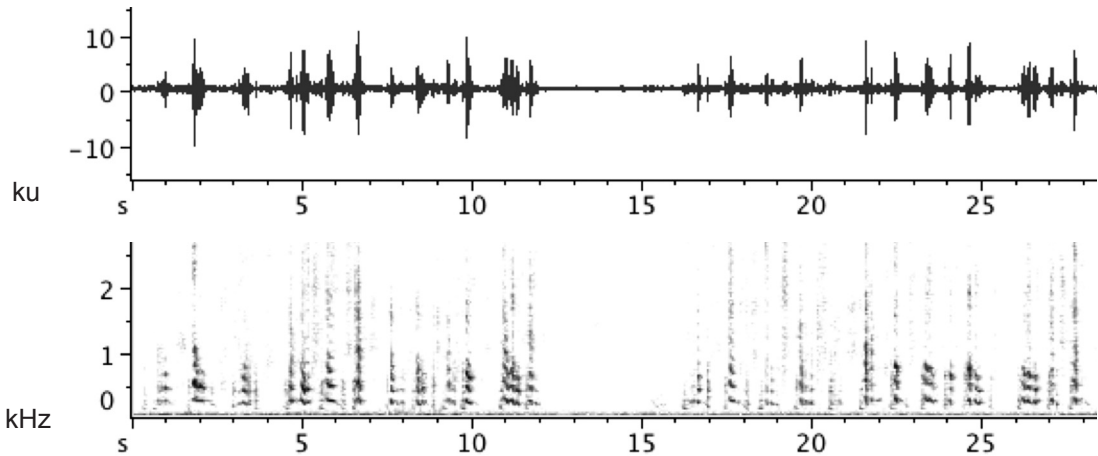


Fig. 1. Waveform (amplitude/time) plot (upper) and spectrogram (frequency/time) plot (lower) of a 28 s sample of syllables uttered by male kakapo "Sirocco" on Maud I/Te Hoiere, 25 May 2012. The distinct harmonics and frequency range (0-2 kHz) resemble the human voice.

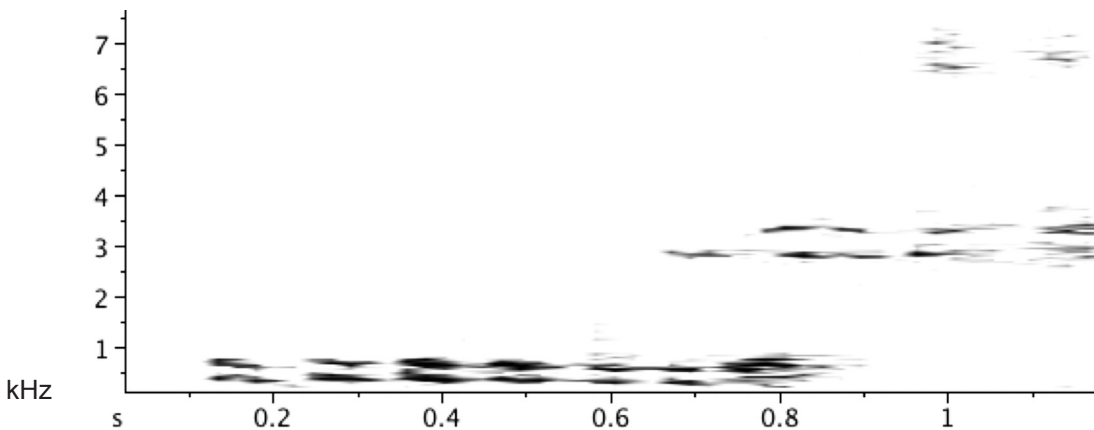


Fig. 2. Spectrogram (frequency/time) plot of 2 call types uttered by male kakapo "Sirocco" over 1.2 s on Maud I/Te Hoiere, 24 May 2012. Seven low frequency 'muttering' syllables are followed by 4 higher frequency 'ching'-like syllables, with brief overlap between the 2 syllable types (0.65-0.85 s).

'two-voicing' (*i.e.*, a sound source from each of the 2 syringes produced simultaneously; Greenwalt 1968). In a 110s sample of 'muttering' calls, he uttered these quiet 4 syllable 'ching' calls 8 times.

At night over 21-26 May he periodically gave louder and harsher 'skraark' calls as well. Powlesland *et al.* (2006) noted that playing taped kakapo calls might induce vocal activity in other kakapo. When his own 'mutterings' were played back to Sirocco, however, no response was evident. He seemed relaxed and non-aggressive when giving these 'muttering' calls, unlike his more challenging disposition when uttering 'skraark' calls.

Powlesland *et al.* (2006) noted that no specific studies of kakapo vocalisations have been made,

although they noted that the kakapo has a varied repertoire of calls, which includes a mechanical sound, and a range of calls associated with courtship activities (Williams 1956; Merton *et al.* 1984; Powlesland *et al.* 1992; Morris & Smith 1995). In general, kakapo seldom call, except during the courtship and booming season when the male's characteristic low-frequency (<100 Hz) resonant boom is given from its track-and-bowl arena, normally at night (Merton 1985; Powlesland *et al.* 2006; Eason *et al.* 2006). As well as non-directional booming, the males utter highly directional, high pitched (2 - 5 kHz) 'chinging' calls, that are metallic and nasal in quality, typically of *c.*1 s duration, and repeated at *c.*1 s intervals (Higgins 1999; Powlesland

et al. 2006). Under ideal conditions, a *chinging* male can be heard up to c.1 km away (D.V. Merton, *pers. obs.*, in Powlesland *et al.* 2006). Male kakapo also utter harsh 'skraark' calls, evidently related to territorial defence and aggression between neighbouring males (Merton 1985; Heather & Robertson 2005; Powlesland *et al.* 2006). During the courtship season sustained 'screech-crowling' from one male was also heard (Merton 1985). Powlesland *et al.* (2006) reported that outside the breeding season kakapo might call when in relatively close proximity to other kakapo. In these situations brief isolated calls may be heard, such as the characteristic 'skraark' call. Other calls include pig-like grunts and squeals, duck-like 'warks', and donkey-like braying. An additional range of vocalisations, including hisses and screeches, screech-crowling, low-amplitude humming and beak-clicking (a mechanical sound) are known from only Fiordland males (Merton *et al.* 1984; Morris & Smith 1995; Higgins 1999; Powlesland *et al.* 2006). Oliver (1955) reported that, when feeding, kakapo emit grunting noises.

While these examples illustrate the range of vocalisations of male kakapo in the wild, none of them describe the relatively low amplitude and low frequency 'muttering' calls, with extensive harmonics, which we describe from Sirocco (Fig. 1). Birds have critical periods for vocal learning, with a much greater ability to learn early in life (Catchpole & Slater 2008), so it is possible that Sirocco learned these calls when captive reared as a young bird, hearing some human voices from the nearby hut on Codfish I/Whenua Hou (C. Birmingham, D.K. Eason, G.P. Elliott, *pers. comm.*). Their resemblance to wordless mutterings of humans suggests this, and Sirocco has produced them since at least 2008 (D.K. Eason, *pers. comm.*). Although Sirocco's close association with people has increased opportunities for hearing him vocalise, the extent to which other male kakapo utter equivalent vocalisations remains uncertain, but none are reported. This is despite the intense, highly specialised and technical management of kakapo (Bell & Merton 2002) and some close encounters with male birds (*e.g.*, in the Sinbad Gully, Fiordland; Butler 1989; Hutching 2004). Steps have now been taken to avoid young birds imprinting on humans (Balance 2010), so the types of vocalisation that we have described for Sirocco may not arise in other hand-reared individuals.

Heidenreich (2012) reported similar calls from Sirocco while he was held in the Zealandia sanctuary, Wellington, in late 2011. They were heard most nights she observed him, usually after he had consumed food (macadamia nuts) and was starting to 'slow down' during behavioural training sessions. She reported that "it was at this point he would start to "talk" ... [not in] the way

we think of parrots talking, as in mimicking human sounds. Instead he would make this gentle, breathy chortling sound. He seemed to be more inclined to make the sound if people spoke gently to him or mimicked his sounds."

While parallels between human speech and bird vocalisations have been widely noted (*e.g.*, Marler 1970; Kuhl 1989; Doupe & Kuhl 1999; Sitt *et al.* 2008), kakapo have not been recorded copying human speech, although more generally some of the parrots (psittacids) are well known for this ability (Pepperberg 1990; Cruickshank *et al.* 1993; Warren *et al.* 1996; MacKay 2001). Parrots are known to produce a wide range of call types, but their functional significance has seldom been investigated quantitatively (Fernández-Juricic *et al.* 1998; Venuto *et al.* 2001; Van Horik *et al.* 2007), and so is poorly understood. The kakapo is no exception, as no specific studies of kakapo vocalisations have been made (Powlesland *et al.* 2006), and the species warrants further bioacoustic investigation.

SUPPLEMENTARY AUDIO MATERIAL

An audio file of Sirocco's 'muttering' calls is deposited on the *Notornis* website.

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LITERATURE CITED

- Balance, A. 2010. *Kakapo: Rescued from the brink of extinction*. Nelson: Craig Potton Publishing.
- Bell, B.D.; Merton, D.G. 2002. Critically endangered bird populations and their management, Pp. 105-139. *In: Norris, K. and Pain, D.J. Conserving bird diversity: general principles and their application*. Cambridge: Cambridge University Press.
- Butler, D. 1989. *Quest for the kakapo*. Auckland: Heinemann Reed.
- Catchpole, C.K.; Slater, P.J.B. 2008. *Bird song. Biological themes and variations*. Cambridge: Cambridge University Press.
- Cruickshank, A.; Gautier, J.; Chappuis, C. 1993. Vocal mimicry in wild African grey parrots *Psittacus erithacus*. *Ibis* 135: 293-299.
- Doupe, A.J.; Kuhl, P.K. 1999. Birdsong and human speech: Common themes and mechanisms. *Annual Review of Neuroscience*. 22: 567-631.
- Eason, D.K.; Elliott, G.P.; Merton, D.V.; Jansen, P.W.; Harper, G.A.; Moorhouse, R.J. 2006. Breeding biology of kakapo (*Strigops habroptilus*) on offshore island sanctuaries, 1990-2002. *Notornis* 53: 27-36.

- Fernández-Juricic, E.; Martella, M.B.; Alvarez, E.V. 1998. Vocalisations of the blue-fronted amazon (*Iamazona aestiva*) in the Chancaní Reserve, Córdoba, Argentina. *Wilson Bulletin* 110: 352–361.
- Greenewalt, C.H. 1968. *Bird song: acoustics and physiology*. Washington: Smithsonian Institution Press.
- Heather, B.D.; Robertson, H.A. 2005. *The field guide to the birds of New Zealand*. Viking, Auckland. Revised edition.
- Heidenreich, B. 2012. Sirocco the kakapo talks. Good Bird Inc. website. <http://goodbirdinc.blogspot.com/2012/01/sirocco-kakapo-talks.html>
- Higgins, P.J. (ed.). 1999. *Handbook of Australian, New Zealand and Antarctic birds. Vol. 4: parrots to dollarbird*. Melbourne: Oxford University Press.
- Hutching, G. 2004. *Back from the brink: The fight to save our endangered birds*. Auckland: Penguin Group (NZ).
- Kuhl, P.K. 1989. On babies, birds, modules, and mechanisms: a comparative approach to the acquisition of vocal communication. Pp. 379–419. In: Dooling, R.J., Hulse, S.H., (Eds.). *The comparative Psychology of audition: Perceiving complex sounds*. Hillsdale, NJ: Erlbaum.
- MacKay, B.K. 2001. *Bird sounds: How and why birds sing, call, chatter, and screech*. Mechanicsburg, PA: Stackpole Books.
- Marler, P. 1970. Birdsong and speech development: Could there be parallels? *American Scientist* 58: 669–673.
- Merton, D.V.; Morris, R.B.; Atkinson, I.A.E. 1984. Lek behaviour in a parrot: the kakapo (*Strigops habroptilus*) of New Zealand. *Ibis* 126: 277–283.
- Merton, D.G. 1985. Kakapo *Strigops habroptilus* Gray, 1845. Pp. 242–243. In: Robertson, C.J.R.R. (editor) *The Reader's Digest complete book of New Zealand birds*. Sydney: Reader's Digest with Reed Methuen (Auckland).
- Morris, R.; Smith, H. 1995. *Wild south: Saving New Zealand's endangered birds*. 2nd ed. Auckland: TVNZ & Random House NZ.
- Oliver, W.R.B. 1955. *New Zealand birds*. Revised edition. Wellington: Reed.
- Pepperberg, I.M. 1990. An investigation into the cognitive capacities of an African grey parrot (*Psittacus erithacus*). In: Slater, P.J.B.; J.S. Rosenblatt, J.S.; C. Beer, C. (eds.). *Advances in Study of Behavior*. Academic Press.
- Powlesland, R.G.; Lloyd, B.D.; Best, H.A.; Merton, D.V. 1992. Breeding biology of the kakapo (*Strigops habroptilus*) on Stewart Island, New Zealand. *Ibis* 134: 361–373.
- Powlesland, R.G.; Merton, D.V.; Cockrem, J.F. 2006. A parrot apart: the natural history of the kakapo (*Strigops habroptilus*), and the context of its conservation management. *Notornis* 53: 3–26.
- Sitt, J.D.; Amador, A.; Goller, F.; Mindlin, G. B. 2008. Dynamical origin of spectrally rich vocalizations in birdsong. *Physical Review E - Statistical, Nonlinear, and Soft Matter Physics* 78(1), 011905 (6 pp.).
- Van Horik, J.; Bell, B.D.; Burns, K.C. 2007. Vocal ethology of the North Island kaka (*Nestor meridionalis septentrionalis*). *New Zealand Journal of Zoology* 34: 337–345.
- Venuto, V.; Massa, R.; Bottoni, L. 2001. African parrot vocalisations and their functional significance. *Ostrich* 15: 224–228.
- Warren, D.K.; Patterson, D.K.; Pepperberg, I.M. 1996. Mechanisms of American English vowel production in a grey parrot (*Psittacus erithacus*). *Auk* 113: 41–58.
- Williams, G.R. 1956. The kakapo (*Strigops habroptilus*, Gray): a review and re-appraisal of a near-extinct species. *Notornis* 7: 29–56.

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