

## 'Hakawai' aerial displaying by three populations of subantarctic snipe (genus *Coenocorypha*)

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**Abstract** The "hakawai" is a rarely-heard but dramatic nocturnal aerial display performed by *Coenocorypha* snipe. Although much has been written about the hakawai formerly heard on islands off Stewart Island (performed by the extinct Stewart Is snipe *C. aucklandica iredalei*), there are few documented reports from other populations. We describe hakawai aerial displays heard on Adams I (Auckland Is snipe *C. aucklandica aucklandica*), Antipodes I (Antipodes Is snipe *C. aucklandica meinertzhagenae*), and Campbell I (Campbell Is snipe *Coenocorypha* undescribed sp.) between 2001 and 2006. These include the 1st records of hakawai on Adams I and Campbell I. Based on characteristic tail feather damage believed to be caused by the display, Campbell Is snipe of both sexes performed hakawai aerial displays more frequently than has been recorded for all other *Coenocorypha* snipe populations. Male snipe from all 6 populations assessed exhibited a higher frequency of tail feather wear than females, and for the 3 populations with adequate data, males also had lower wing-loadings, indicative of greater flying ability. However, there was no apparent correlation between the frequency of "hakawai" feather wear and wing-loadings when comparing between populations.

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**Keywords** New Zealand snipe; *Coenocorypha aucklandica*; Auckland Islands; Antipodes Island; Campbell Island; hakawai; aerial display

### INTRODUCTION

The "hakawai" is a dramatic nocturnal aerial display performed by *Coenocorypha* snipe, most famously by the extinct Stewart Is snipe (*C. aucklandica iredalei*; Miskelly 1987). The eerie quality of the sound produced, plus the fact that the displaying bird was never seen, contributed to the legendary status of the hakawai, which features prominently in the folklore of the Muttonbird (Titi) Is around Stewart I (Beattie 1954; Reed 1961; Jenkin 1970; Wilson 1979; Miskelly 1987). The hakawai has not been heard near Stewart Is since the early 1960s, about the time that ship rats (*Rattus rattus*) invaded Taukihepa (Big South Cape I), the last stronghold of Stewart Is snipe (Bell 1978; Miskelly 1987). However, since 1983 there has been increasing evidence that other forms of *Coenocorypha* snipe also perform the hakawai aerial display.

Miskelly (1987) speculated that the most spectacular part of the hakawai display – a noise similar to a jet aircraft passing overhead – was caused by vibration of tail feathers as the bird dived at speed, homologous with the drumming or bleating displays of *Gallinago* snipes (Tuck 1972; Sutton 1981). The vibration of feathers during the display was presumed to be the cause of characteristic damage to the rectrices (shafts snapped near the tips, creating a v-shaped tip to rectrices) observed in the field and on museum specimens (illustrated in Miskelly 1987, 2005). This tail feather wear has been noted on Chatham Is snipe (*C. pusilla*), Auckland Is snipe (*C. aucklandica aucklandica*), Antipodes Is snipe (*C. aucklandica meinertzhagenae*) and Snares Is snipe (*C. aucklandica huegeli*) (Miskelly 1987, 2005), and the display has been heard on Rangatira and Mangere Is in the Chatham Is, on Enderby and Ewing Is in the Auckland Is, and on Antipodes I

(Miskelly 1987, 1990, 2005; Tennyson 1999). The only extant *Coenocorypha* snipe for which there was no evidence of hakawai aerial displaying was the recently-discovered Campbell Is snipe (*Coenocorypha* undescribed sp.), for which only 2 birds had been handled up until the end of 2005 (Miskelly 2000; Barker *et al.* 2005).

We present further records of hakawai aerial displaying by Auckland Is snipe and Antipodes Is snipe, including the 1st records of hakawai on Adams I (Auckland Is), and present a sonogram of the 1st recording made of aerial displaying by Auckland Is snipe. We also present the 1st record of hakawai aerial displaying by Campbell Is snipe, and assess relative flying ability of the 5 extant *Coenocorypha* snipes by comparing wing-loadings.

## METHODS

Hakawai displays were only heard at night, and so were generally only detectable during nocturnal field work, or when personnel were living in field camps in areas with high densities of snipe. However, the frayed tail feathers caused by hakawai displaying are potentially visible whenever adult snipe are handled, as on Rose I (75 ha) in Dec 2000, Enderby I (710 ha) in Jan 2006, and Adams I (10,119 ha) in Jan-Feb 2001 and 2006 (all in the Auckland Is), Antipodes I (2025 ha) in Oct 1990 and Jan-Feb 2001, and Campbell I (11,268 ha) in Jan 2006.

The observations reported here were made by the authors and co-workers during the following visits to the islands: 12-16 Oct 1990 Antipodes I (CM), 7-16 Dec 2000 Rose I (Dave Barker, Jeremy Carroll, Murray Willans), 19 Dec 2000 - 14 Feb 2001 Antipodes I (GE & KW), 29 Dec 2000 - 7 Feb 2001 Adams I (Sheryl Hamilton, Al Wiltshire), 24 Apr-10 Jun 2001 Antipodes I (EB), 15-25 Jun 2001 Adams I (GE, KW), 13 Dec 2001 - 3 Feb 2002 Adams I (GE, KW), 14 Dec 2002 - 7 Feb 2003 Adams I (GE, KW), 15 Dec 2004 - 15 Jan 2005 Adams I (GE, KW), 4 Jan-16 Feb 2006 Adams I (GE, KW), 6 Jan 2006 Enderby I (CM, James Fraser), and 7-15 Jan 2006 Campbell I (CM, James Fraser). Most of the Antipodes I and all of the Adams I observations were made during long-term studies of Antipodean wandering albatross (*Diomedea exulans antipodensis*) and Gibson's wandering albatross (*Diomedea exulans gibsoni*) (Walker & Elliott 1999, 2005, 2006; Elliott & Walker 2005).

On nights when hakawai displays were heard, notes were made on the numbers of birds displaying, and qualitative descriptions made of the displays. A digital audio recording of a hakawai display was made on Adams I on 15 Jul 2001.

A total of 63 adult snipe was handled during these visits: 35 Auckland Is snipe (15 on Adams I, 16 on Rose I, 4 on Enderby I), 16 Antipodes Is snipe,

and 12 Campbell Is snipe. Standard measurements were taken of all adult snipe handled, and all birds were checked for tail feather wear indicative of "hakawai" aerial displaying (Miskelly 1987, 2005). Blood samples were collected from 39 birds (5 Rose I, 2000, 9 Antipodes I, 2001; 9 Adams I, 2001, 4 Enderby I, 2006; 12 Campbell I, 2006) and feather samples were collected from 14 birds (8 Rose I, 2000; 6 Adams I, 2006), allowing genetic sexing of 53 birds (Allan Baker & Oliver Haddrath, pers. comm.). The 10 remaining birds were sexed from measurements (7 ♂♂ Antipodes I, 1990; 2 ♂♂, Rose I) or egg palpation (1 ♀, Rose I).

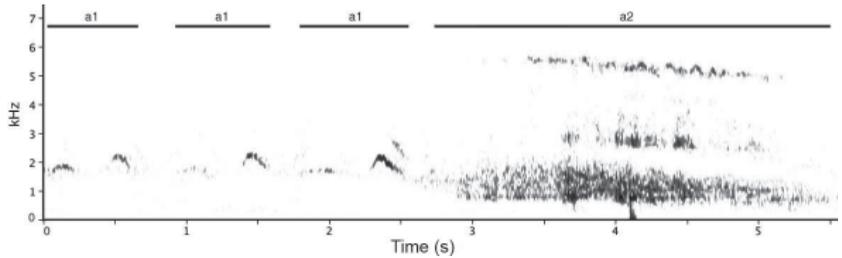
Left wing outlines (primaries slightly spread) of 19 live adult snipe (4 Antipodes Is, Oct 1990; 3 Auckland Is, Enderby I, Jan 2006; 12 Campbell, Jan 2006), were traced on to paper to allow calculation of wing-loadings (which may be correlated with flying ability; Miskelly 1990). Wing areas were determined from wing outlines using a polar planimeter (mean of 2 measurements from 2 pole positions). None of the birds handled was in wing moult. Wing-loadings ( $\text{Nm}^{-2}$ ) were calculated by multiplying the body mass (kg) of each bird by  $g$  ( $9.8 \text{ ms}^{-2}$ ) then dividing by twice its measured wing area plus the dorsal area between the wings ( $\text{m}^2$ ) (Pennycuik 1987, Miskelly 1990). Wing-loadings for Antipodes Is snipe, Auckland Is snipe, and Campbell Is snipe were compared with wing-loadings for 29 Chatham Is snipe and 29 Snares Is snipe previously calculated (Miskelly 1990). Differences in weights, wing areas, and wing-loadings between sexes were compared using a Welch modified 2-sample *t*-Test (assuming unequal variances; S-plus™ 2005). Within each sex, differences between populations were compared by an analysis of variance, using the Sidak method to make multiple comparisons (95% confidence limits; S-plus 2005).

## RESULTS

### "Hakawai" aerial displaying

The form of the display on all 3 islands (Adams, Antipodes, Campbell) was identical to that described previously for Stewart Is snipe, Chatham Is snipe, and Auckland Is snipe (Miskelly 1987, 1990; Tennyson 1999). A series of 3-6 disyllabic whistles variously described as "queeyoo queeyoo queeyoo" or "hakawai hakawai hakawai" was given by unseen birds high (10s of m) above the ground, followed immediately by a "roar" or undulating whistle of air rushing through feathers (Fig. 1), that we likened to a jet aircraft passing close overhead. The vocal part of the display was identical to the high intensity territorial call given by male *Coenocorypha* snipe on the ground (Miskelly 1987, 1990; Higgins & Davies 1996). Although we could not pick out the birds in our lights, we had the impression that birds lost height rapidly during the display, then gained

**Fig. 1** Sonogram of a "hakawai" aerial display performed by an Auckland Is snipe (*Coenocorypha aucklandica aucklandica*), Adams I, 15 Jun 2001. Labelling matches that of fig. 2a in Miskelly (1987): a series of 3 disyllabic vocal phrases (a1) followed by a non-vocal 'roar' (a2).



height again without calling before starting another display sequence about 2 min later. Hakawai were heard on at least 5 occasions: at least 3 nights on Adams I, 1 night on Antipodes I, and 1 night on Campbell I.

*Adams I* The hakawai was 1st heard soon after dark (1815 h) on the calm, frosty night of 15 Jun 2001, in tussock (*Chionochloa antarctica*) grassland above the tree-line (400 m a.s.l.) on the northern slopes of the island. Later that night it was heard from near the hut, which is among southern rata (*Metrosideros umbellata*) forest at 5 m a.s.l. Many birds were displaying in the tussock, but probably only 2 birds were heard from the hut, and both were up hill, near the tree-line (c.150 m a.s.l.). Birds gave the 2-syllable call 3-6 times, often followed by the non-vocal roar (Fig. 1). At times the vocalisation appeared to be given by itself, but we were uncertain whether this was because the displaying birds were too far away and the non-vocal roar was lost in the distance. Whenever we heard the jet-like roar it was preceded by a series of the 2-syllable vocal call. The same displays were also heard the following night.

GE & KW next heard the hakawai at 0300 h on 23 Dec 2001 from a tent camp at 400 m a.s.l. on the southern slopes of the island. The roaring noise was identical to that heard in Jun 2001, but the vocalisation sounded higher-pitched and less staccato. Fewer birds were displaying than in Jun, and the displaying birds were mostly in a tall-tussock-filled basin east of, and below, the camp despite the high abundance of snipe around the camp.

A small hut was placed in the albatross study area in Dec 2002, allowing observers to be present more frequently during the short austral summer nights. The disyllabic calls described above were often heard from the hut in the summers of 2002-03, 2004-05, and 2005-06, but always in the distance, and we cannot recall hearing the associated roaring noise. We did not record every night that we heard snipe aerial displaying, but generally if conditions were calm, and we were awake after midnight, the disyllabic calls would be heard from birds in the air. We estimate that we heard these calls on at least 3 nights each season.

Before winter 2001 we had not camped in the albatross study area on the southern slopes of Adams

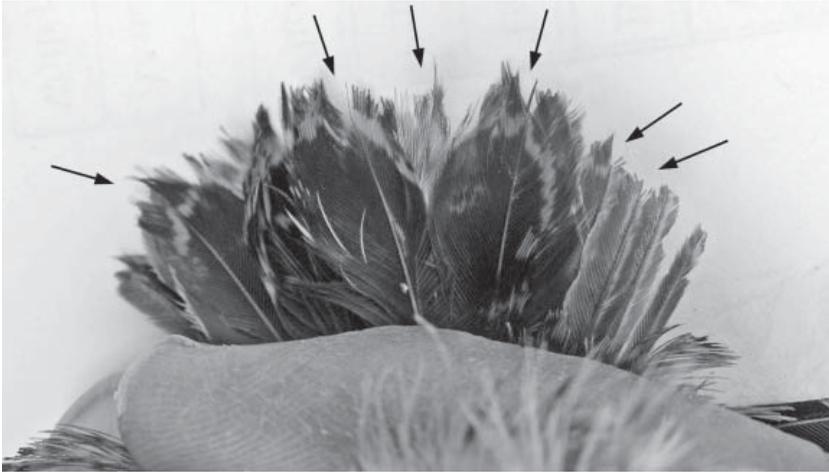
I and had not heard the hakawai. We had, however, camped by the coast for 6 previous summer seasons (dates in Miskelly, Walker, *et al.* 2006); our failure to hear the hakawai near the coast was either because snipe were less common there, or because they only rarely performed the hakawai display there. Snipe were certainly present near the coast, but it is our impression that they were less common there than in the higher altitude tussock grasslands.

*Antipodes I* A single hakawai display was heard soon after dark (c.1800 h) on the North Plains on 10 May 2001. This was the only night that the hakawai was heard, despite working at night on 5-6 occasions, and another 6 nights spent camping in that area.

*Campbell I* At least 3 birds performed hakawai displays simultaneously near the head of Six Foot Lake between 2330 h and midnight on 14 Jan 2006. The birds started the display a few seconds apart, so that the displays were overlapping. It is likely that at least 3 birds were flying over the area, and that initiation of displaying by 1 bird triggered displaying by the others. At least 3 additional snipe called excitedly from the ground ("chep" and "trerk trerk trerk" calls; Miskelly 1990; Higgins & Davies 1996) while aerial displays were being performed.

### Damaged tail feathers

A relatively high proportion of birds from all taxa of subantarctic snipe had damaged tail feathers indicative of hakawai aerial displaying (Fig. 2). For birds handled in the field (mainly during the summer months), overall rates of hakawai feather wear ranged from 19% for Antipodes Is snipe to 67% for Campbell Is snipe (Table 1). In all 3 taxa there was a tendency for males to show a higher frequency of feather damage than females (Tables 1, 2), but a surprisingly high proportion of female Campbell Is snipe and Auckland Is snipe had tail feather wear in comparison to females of other *Coenocorypha* snipe (Table 2; Miskelly 1987). As some snipe populations display predominantly or solely during autumn and winter, and the feathers showing the physical effects of the display are then moulted (Miskelly 2005), a low frequency of tail feather wear from a sample of birds handled at only 1 time of year does not necessarily mean that the hakawai display is



**Fig. 2** Tail feather wear indicative of 'hakawai' aerial displaying on a Campbell Is snipe (*Coenocorypha* sp.). Note snapped shafts near tips of rectrices, creating a v-notch. Photo: James Fraser.

**Table 1** "Hakawai" tail feather wear detected on Antipodes Is snipe *Coenocorypha aucklandica meinertzhagenae*, Auckland Is snipe *C. aucklandica aucklandica*, and Campbell Is snipe *Coenocorypha* sp. handled in the field between 1990 and 2006. Number of birds observed with damaged rectrices in parentheses.

Island	Date	Male	%	Female	%	Total	%
Antipodes	Oct 1990	7(3)	43	-	-	7(3)	43
Antipodes	Jan-Feb 2001	7(0)	0	2(0)	0	9(0)	0
Total <i>meinertzhagenae</i>		14(3)	21	2(0)	0	16(3)	19
Enderby	Jan 2006	3(0)	0	1(0)	0	4(0)	0
Rose	Dec 2000	7(0)	0	9(2)	22	16(2)	13
Adams	Jan-Feb 2001	6(4)	67	3(3)	100	9(7)	78
Adams	Jan-Feb 2006	4(3)	75	2(0)	0	6(3)	50
Total <i>aucklandica</i>		20(7)	35	15(5)	33	35(12)	34
Campbell	Jan 2006	6(5)	83	6(3)	50	12(8)	67

rarely performed by the population. However, a high frequency of feather damage is considered to be a reliable indicator that a high proportion of the population performs the display.

#### Wing-loadings

Female snipe were significantly heavier than male snipe in all populations where we had adequate samples (Table 3). Females also tended to have larger wing areas and higher wing-loadings, i.e. females were heavier in relation to wing area than were males; for these reasons, we analysed the 2 sexes separately when comparing weights, wing areas, and wing-loadings between populations.

Separate analyses of variance revealed that there were significant differences in wing-loading between island populations for females ( $F_{3,30} = 16.9, P < 0.001$ ) and males ( $F_{4,38} = 24.5, P < 0.001$ ). Multiple pairwise comparisons within sexes showed that Chatham Is

snipe had distinctly lower wing loadings than snipe from all other islands for which data were available (Table 3; Fig. 3). There were only minor differences in average wing loadings of snipe from other islands for which data were available.

#### DISCUSSION

Our observations confirm that all 3 forms (i.e. Auckland Is; Antipodes Is; Campbell Is) of subantarctic snipe perform nocturnal aerial displays that include both vocal and non-vocal acoustic components. These displays were acoustically very similar or identical to those performed by Chatham Is snipe (CM pers. obs.) and those previously described for Stewart Is snipe and Auckland Is snipe (Miskelly 1987, 1990; Tennyson 1999). Although an Antipodes Is snipe had been seen aerial displaying before (Horning, in Miskelly 1987), we provide the 1st description of

**Table 2** "Hakawai" tail feather wear detected on Chatham Is snipe, Stewart Is snipe, Snares Is snipe, Antipodes Is snipe, Auckland Is snipe and Campbell Is snipe, combining field observations and museum skins. Number of birds observed with damaged rectrices in parentheses. Data for museum skins from Miskelly (1987). Samples for live Chatham Is snipe increased since 1987 following fieldwork in May 2001 (7 ♂♂, 7 ♀♀; Miskelly & Barlow 2001). Samples for live Snares Is snipe increased since 1987 following fieldwork in Nov-Dec 1987 (40 ♂♂, 36 ♀♀; Miskelly 1989) and Apr 2005 (15 ♂♂, 15 ♀♀; Charteris & Miskelly 2005, Miskelly 2005).

Snipe taxon	State	Male	%	Female	%	Total	%
Chatham Is	Live	43(6)	14	46(2)	4	89(8)	9
	Skins	36(3)	8	36(0)	0	72(3)	4
	Total	79(9)	11	82(2)	2	161(11)	7
Stewart Is	Skins	4(2)	50	3(0)	0	7(2)	29
Snares Is	Live	375(2)	0.5	308(0)	0	683(2)	0.3
	Skins	7(0)	0	6(0)	0	13(0)	0
	Total	382(2)	0.5	314(0)	0	696(2)	0.3
Antipodes Is	Live	14(3)	21	2(0)	0	16(3)	19
	Skins	5(1)	20	4(0)	0	9(1)	11
	Total	19(4)	21	6(0)	0	25(4)	16
Auckland Is	Live	20(7)	35	15(5)	33	35(12)	34
	Skins	7(3)	43	15(0)	0	22(3)	14
	Total	27(10)	37	28(5)	18	57(15)	26
Campbell Is	Live	6(5)	83	6(3)	50	12(8)	67

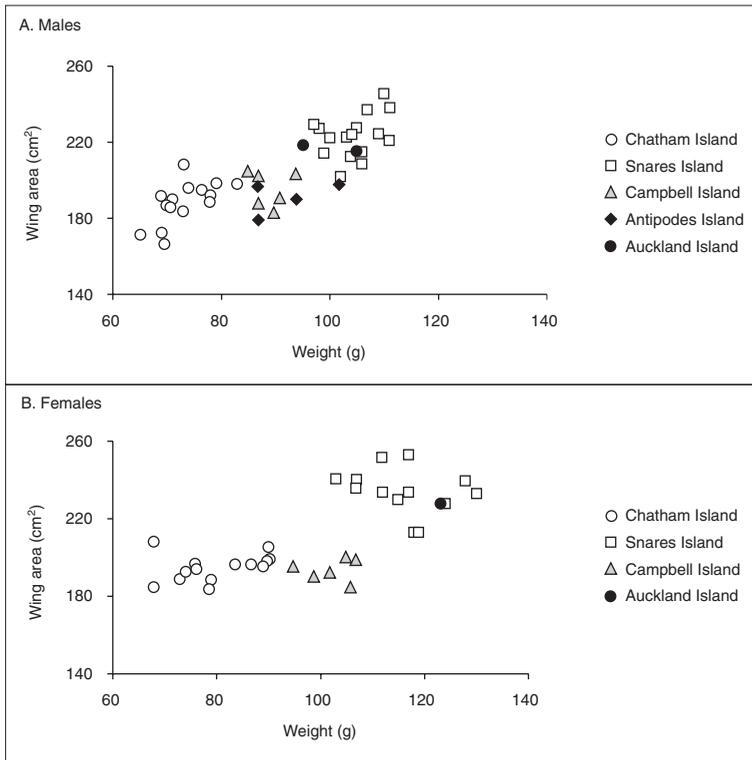
**Table 3** Weight (g), wing area (cm<sup>2</sup>), and wing-loading (Nm<sup>-2</sup>) for 77 *Coenocorypha* snipe from 5 populations; all mean  $\pm$  SD. For the 3 populations where samples sizes were 6 or more sex<sup>-1</sup>, females were significantly heavier, and had higher wing-loadings than males. Sexes compared using a Welch modified 2-sample *t*-test.

	Weight (g)		Wing area (cm <sup>2</sup> )		Wing-loading (Nm <sup>-2</sup> )	
	Male	Female	Male	Female	Male	Female
Chatham Is (15♂♂, 14♀♀)	73.2 $\pm$ 4.8	80.1 $\pm$ 8.0	188.4 $\pm$ 11.2	194.9 $\pm$ 6.9	38.1 $\pm$ 2.0	40.3 $\pm$ 3.7
	<i>t</i> = -2.76, <i>d.f.</i> = 21, <i>P</i> = 0.012		<i>t</i> = -1.89, <i>d.f.</i> = 24, <i>P</i> = 0.071		<i>t</i> = -1.89, <i>d.f.</i> = 20, <i>P</i> = 0.074	
Snares Is (16♂♂, 13♀♀)	104.5 $\pm$ 4.5	116.1 $\pm$ 8.1	223.2 $\pm$ 11.4	234.2 $\pm$ 11.9	46.0 $\pm$ 2.6	48.7 $\pm$ 4.7
	<i>t</i> = -4.62, <i>d.f.</i> = 18, <i>P</i> < 0.001		<i>t</i> = -2.52, <i>d.f.</i> = 25, <i>P</i> = 0.019		<i>t</i> = -1.91, <i>d.f.</i> = 18, <i>P</i> = 0.072	
Antipodes I (4♂♂)	92.5 $\pm$ 7.1		190.3 $\pm$ 8.6		47.6 $\pm$ 3.0	
Auckland Is (2♂♂, 1♀)	100.0 $\pm$ 7.1	123.0	217.0 $\pm$ 2.3	228.1	45.2 $\pm$ 3.7	52.8
Campbell I (6♂♂, 6♀♀)	89.0 $\pm$ 3.3	102.3 $\pm$ 4.6	194.5 $\pm$ 9.1	192.8 $\pm$ 5.7	44.9 $\pm$ 2.8	52.0 $\pm$ 2.7
	<i>t</i> = -5.75, <i>d.f.</i> = 9, <i>P</i> < 0.001		<i>t</i> = -0.38, <i>d.f.</i> = 8, <i>P</i> = 0.71		<i>t</i> = -4.43, <i>d.f.</i> = 10, <i>P</i> = 0.001	

the acoustic properties of the display by that taxon. Our records of hakawai aerial displaying are the 1st for Auckland Is snipe on Adams I (Tennyson 1999 reported the display on Enderby and Ewing Is at the northern end of the group), and the 1st for Campbell I. Together with the diagnostic "hakawai" tail feather wear reported for 2 male Snares Is snipe by Miskelly (2005), our observations reveal that all living *Coenocorypha* snipe, plus the recently-extinct Stewart Is snipe, included the hakawai aerial display as part of their display repertoire. The function of the display remains unknown. It can be performed in any season. Although it is performed predominantly by male snipe, the characteristic wear of the tail feathers has been found on females from 3 of the 6 taxa.

The recording that we obtained of hakawai aerial displaying by Auckland Is snipe is the 1st acoustic recording of the display of any taxon of *Coenocorypha* snipe other than the Chatham Is snipe. The sonogram we present for the Auckland Is snipe aerial display is essentially the same as those presented for Chatham Is snipe (Miskelly 1987, 1990; Higgins & Davies 1996).

All *Coenocorypha* snipe are reluctant to fly during the day, and generally do so only when disturbed by people (Miskelly 1990). Recent dispersal and recolonisation events (John Dowding & Nathan McNally in Miskelly, Bester *et al.* 2006; Miskelly & Fraser 2006; Miskelly, Walker *et al.* 2006) indicate that at least 3 of the *Coenocorypha* taxa can



**Fig. 3** The relationship between wing area and body weight for *Coenocorypha* snipe. Individuals on the lower edge of the clusters had higher wing-loadings. A, males; B, females.

cross water gaps of up to 2 km. Our observations of aerial displaying by 3 subantarctic *Coenocorypha* populations confirm that these cryptic birds have greater flying ability than is apparent from daytime encounters, and we suggest that dispersal of these snipe occurs mainly at night.

Contra Miskelly (1990), sampling from an additional *Coenocorypha* population did not support a correlation between wing-loadings (area of wings in relation to bodyweight) and the frequency with which aerial displays were performed. The population with the highest frequency of aerial displaying (Campbell Is snipe – assessed by the 83% occurrence of distinctive tail feather wear in males, and 50% in females), had some of the highest wing-loadings of any population. However, our analysis was still based on a small sample.

The high wing-loadings of Campbell Is snipe do not seem to limit their dispersal ability. Their recolonisation of Campbell I from Jacquemart I (1 km offshore) following the eradication of rats in 2001 has been remarkably rapid (Miskelly & Fraser 2006).

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#### LITERATURE CITED

- Barker, D.; Carroll, J.W.A.; Edmonds, H.K.; Fraser, J.R.; Miskelly, C.M. 2005. Discovery of a previously unknown *Coenocorypha* snipe in the Campbell Island group, New Zealand subantarctic. *Notornis* 52: 143-149.
- Beattie, H. 1954. *Our southernmost Maori*. Dunedin, Otago Daily Times and Witness Newspapers Co.
- Bell, B.D. 1978. The Big South Cape Islands rat irruption. pp 33-40 In: Dingwall, P.R.; Atkinson, I.A.E.; Hay, C. (ed.) *The ecology and control of rodents in New Zealand nature reserves*. New Zealand Department of Lands & Survey information series 4.
- Charteris, M.; Miskelly, C. 2005. *Snares Island snipe (tutukiwi) translocation to Putauhinu Island, April 2005*. Wellington, Department of Conservation. 28 p.
- Elliott, G.; Walker, K. 2005. Detecting population trends of Gibson's and Antipodean wandering albatrosses. *Notornis* 52: 215-222.
- Higgins, P.J.; Davies, S.J.J.F. 1996. *Handbook of Australian, New Zealand & Antarctic birds, Vol. 3 Snipe to pigeons*. Melbourne, Oxford University Press.
- Jenkin, R. 1970. *New Zealand mysteries*. Wellington, Reed.
- Miskelly, C.M. 1987. The identity of the hakawai. *Notornis* 34: 95-116.

- Miskelly, C.M. 1989. Social and environmental constraints on breeding by New Zealand snipe *Coenocorypha aucklandica*. Unpubl. PhD thesis. University of Canterbury, Christchurch.
- Miskelly, C.M. 1990. Aerial displaying and flying ability of Chatham Island snipe *Coenocorypha pusilla* and New Zealand snipe *C. aucklandica*. *Emu* 90: 28-32.
- Miskelly, C.M. 2000. Historical records of snipe from Campbell Island, New Zealand. *Notornis* 47: 131-140.
- Miskelly, C.M. 2005. Evidence for 'hakawai' aerial displaying by Snares Island snipe (*Coenocorypha aucklandica huegeli*). *Notornis* 52: 163-165.
- Miskelly, C.; Barlow, K. 2001. *Chatham Island snipe research and management trials, Rangatira/South East Island, April-May 2001*. Wellington, Department of Conservation. 31 p.
- Miskelly, C.M.; Fraser, J.R. 2006. Campbell Island snipe (*Coenocorypha* undescribed sp.) recolonise subantarctic Campbell Island following rat eradication. *Notornis* 53: 353-359.
- Miskelly, C.M.; Bester, A.J.; Bell, M. 2006. Additions to the Chatham Islands' bird list, with further records of vagrant and colonising bird species. *Notornis* 53: 215-230.
- Miskelly, C.M.; Walker, K.J.; Elliott, G.P. 2006. Breeding ecology of three subantarctic snipes (genus *Coenocorypha*). *Notornis* 53: 361-374.
- Pennycuik, C.J. 1987. Flight of seabirds. pp. 43-62 *In*: Croxall, J.P. (ed.) *Seabirds: feeding ecology and role in marine ecosystems*. London, Cambridge University Press.
- Reed, A.W. 1961. *Myths and legends of Maoriland*. 3rd ed. Wellington, Reed.
- S-plus 2005. *S-PLUS 7; Guide to Statistics, vol. 1*. Seattle, Washington, Insightful Corporation.
- Sutton, G.M. 1981. On aerial and ground displays of the world's snipes. *Wilson bulletin* 93: 457-477.
- Tennyson, A.J.D. 1999. Confirmation of a nocturnal aerial display by Auckland Island snipe (*Coenocorypha aucklandica aucklandica*). *Notornis* 46: 241-242.
- Tuck, L.M. 1972. *The snipes: a study of the genus Capella*. Ottawa, Canadian Wildlife Service monograph no. 5.
- Walker, K.; Elliott, G. 1999. Population changes and biology of the wandering albatross *Diomedea exulans gibsoni* at the Auckland Islands. *Emu* 99: 239-247.
- Walker, K.; Elliott, G. 2005. Population changes and biology of the Antipodean wandering albatross *Diomedea antipodensis*. *Notornis* 52:206-214.
- Walker, K.; Elliott, G. 2006. At-sea distribution of Gibson's and Antipodean wandering albatrosses, and relationships with longline fisheries. *Notornis* 53: 265-290.
- Wilson, E. 1979. *Titi heritage: the story of the Muttonbird Islands*. Invercargill, Craig.

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## SHORT NOTE

### A high-altitude bar-tailed godwit (*Limosa lapponica*) on Mt Ruapehu, North Island, New Zealand

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On 11 Jan 2006 while climbing Mt Ruapehu (an active volcano, and at 2797 m the highest peak in the North Island, New Zealand), CH discovered the frozen carcass of an unfamiliar bird at an altitude of 2610 m (NZ Metric Grid reference 2731960E,

6211385N). Digital images of the bird (Fig. 1) were sent to PFB, who identified it as a bar-tailed godwit (*Limosa lapponica*). The wear on the central tail, primary and some tertial feathers and the presence of breeding plumage indicated that the bird was an adult and the long bill relative to the head length showed that it was a female. The upperparts were in post-breeding moult, with a mixture of retained