SWAMP HABITAT USE BY SPOTLESS CRAKES AND MARSH CRAKES AT PUKEPUKE LAGOON

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ABSTRACT

A combination of searching for nests and responses to taped calls of Spotless Crakes *(Porzana tabuensis)* was used to determine habitat use by and abundance of Spotless Crakes and Marsh Crakes *(P. pusilla)*. Spotless Crakes preferred to nest in scattered to dense tussock sedge *(Carex secta)* with an overstorey of raupo *(Typha orientalis)*. Responses to taped calls indicated that they may have also nested in dense flax *(Phormium tenax)* and dense raupo. Limited information on Marsh Crakes indicated that they nested in tussock sedge with little or no raupo overstorey.

INTRODUCTION

Ornithologists have successfully used tape recordings with Spotless Crakes and, less successfully, Marsh Crakes for over a decade as a major surveying tool (Ogle & Cheyne 1981). However, they have not been used to study the breeding status of crakes. Most of the few nests found have been the Spotless Crake nests described by Hadden (1970, 1972) in narrow swamp streams running through hilly pastures near Hamilton. In this study, my aim was to investigate the use of swamp vegetation by crakes.

STUDY AREA AND METHODS

Pukepuke Lagoon is an 86 ha Game Management Reserve of the New Zealand Wildlife Service. It lies on the coastal sand dune country of the Manawatu. The vegetation, climate, and history of Pukepuke Lagoon have been described by Ogden & Caithness (1982). The dominant emergent macrophytes of the lagoon are raupo *(Typha orientalis)*, flax *(Phormium)*, tussock sedge *(Carex secta)*, and cabbage tree *(Cordyline australis)* (see Fig. 1).

Observations were made from 13 September to 28 December 1982. At first, I tried to search all the vegetation types for nests with equal intensity, but areas of lodged raupo and of flax proved impossible to search. Later searches concentrated on areas of tussock sedge and raupo of low to medium density.

Taped calls of Spotless Crakes were played, slightly louder than normal for the birds, for 6.5 minutes at each of 45 stations about the lagoon. I approached the stations by walking on pathways about the swamp and by rowing in the lagoon, along the swamp edge. Tapes were played in the morning at stations 1-31 and at stations 32-45 usually in the evening but occasionally in the morning. Tapes were played on the least windy day in each 7-10 day period between 14 September and 14 December 1982, 13 times altogether.

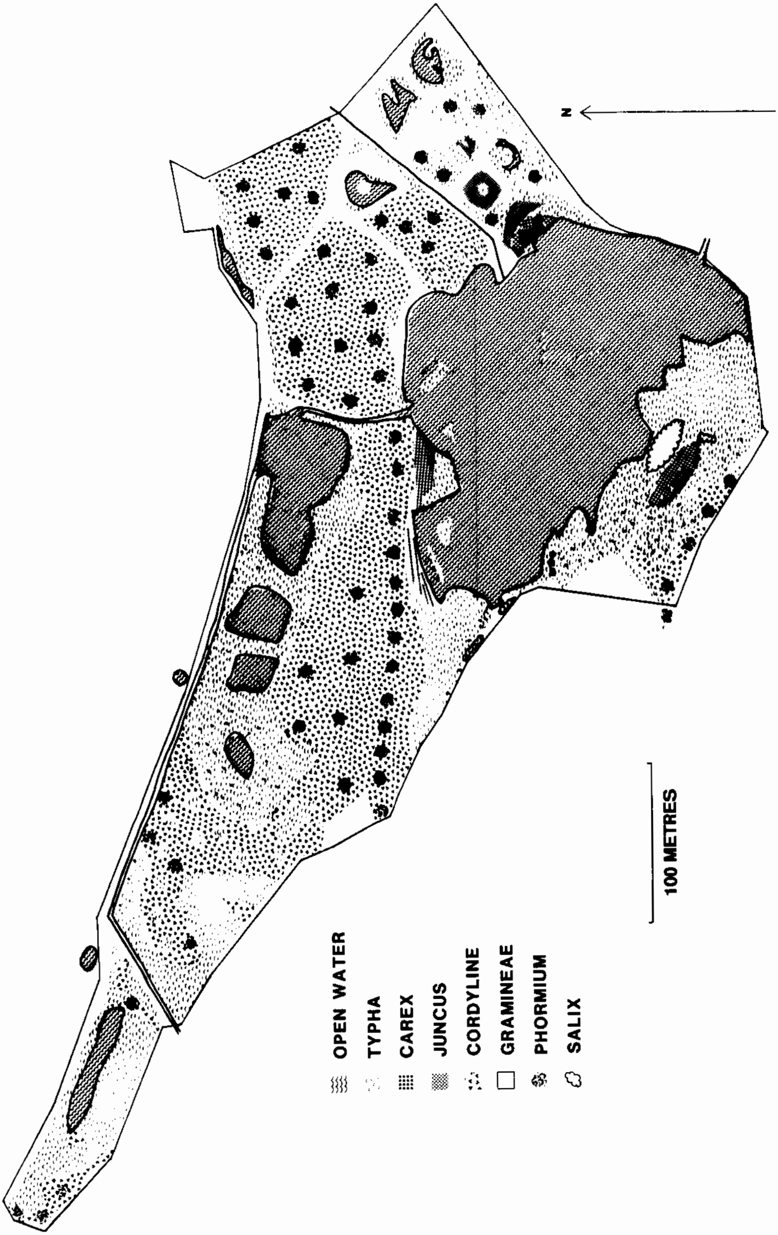

FIGURE 1 — Dominant macrophyte vegetation of Pukepuke Lagoon

RESULTS

Nests

Figure 2 shows the locations of seven Spotless Crake nests (five active, two predated), and two Marsh Crake nests (one active, one deserted). I also found 35 empty nests singly or in groups – 15 were solitary, 7 in groups of two and two in groups of three. In addition, two active Spotless Crake nests had one empty nest nearby and a third had two empty nests nearby. Groups of nests were presumed to have been made by a single pair. Empty nests I presumed had been constructed by Spotless Crakes because they had responded nearby and because they were more abundant than Marsh Crakes.

Active and empty nests of both species were in tussock sedge. The nest bowl was made of sedge, although several nests incorporated a few pieces of raupo and one a piece of wireweed *(Polygonum aviculare)*. The sedge plants used were usually shaped like a haystack, with the pedestal well covered by overhanging tillers of previous years. The nest was usually placed loosely in old tillers near the pedestal. Several nests in very dense raupo were located in the crown of less robust sedge plants.

All Spotless Crake nests were in sedges with an overstorey of raupo, often just beyond the edge of a pure stand of sedge. (See Fig. 3.) Pure stands of sedge seemed to be avoided. The density of the sedge did not seeem to be important. Areas of medium-density raupo and very scattered sedge, e.g. between stations 5 and 8, had about as many nests as did the areas of very dense sedge, e.g. between stations 8 and 10. However, more nests may have been in dense sedge stands, where my nest searching was less efficient. In the areas of scattered sedge nearly every suitably shaped sedge had a nest.

The two Marsh Crake nests were in isolated tussock sedges. The active nest was so surrounded by water that the pair walked along a single route across floating stalks, which required short hops and swims. (See Fig. 4.) The vegetation surrounding the second nest was sparse, consisting of two sedges and scattered stubble.

Reactions of Spotless Crakes to broadcast calls

I broadcast calls from stations along the approachable swamp edge. These were close enough for the calls to overlap slightly, and thus I could sample the swamp thoroughly. I cannot just state the dominant vegetation and crake responses at each station because the vegetation was so mixed and the crakes moved so much in response to the call. Spotless Crakes often walked 15-20 metres toward the broadcast station. In general, raupo was the dominant vegetation sampled and most crake responses came from raupo (see Fig. 5 and Table 1). Spotless Crakes frequently responded from some areas of dense, lodged raupo (e.g. no. 12 and 13) but rarely from other dense areas (e.g. no. 14, 15, 24, 25, and 26). Spotless Crakes did not respond from small isolated stands of raupo (e.g. no. 3, 5, 27, 30, and 35) and rarely responded from long strips of raupo (e.g. no. 2, 14, 15, 31, and 32). The greatest number of responses came from station 7, which was between two territories on a boardwalk into raupo containing tussock sedge. Most of the stations along the edge of the lagoon produced few responses, although usually where I was able to enter narrow inlets, I received more Spotless Crake (no. 39) or Marsh Crake (no. 42) responses. No calls were heard in dry raupo (no. 27 and 28).

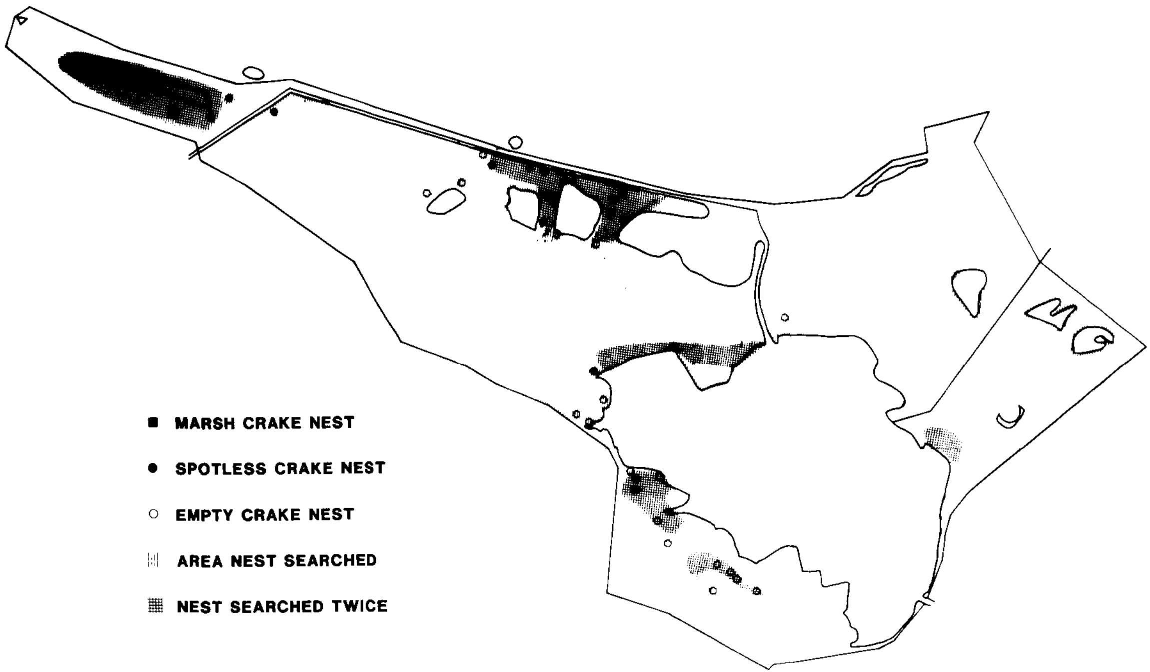

FIGURE 2 — Locations of Marsh Crake nests, Spotless Crake nests and empty nests found at Pukepuke Lagoon. Groups of nests are displayed as one.

FIGURE 3 — Tussock sedge, with dense raupo overstorey, containing a Spotless Crake nest

FIGURE 4 — Isolated tussock sedge containing a Marsh Crake nest. A sheath of tillers was removed in order to observe the nest.

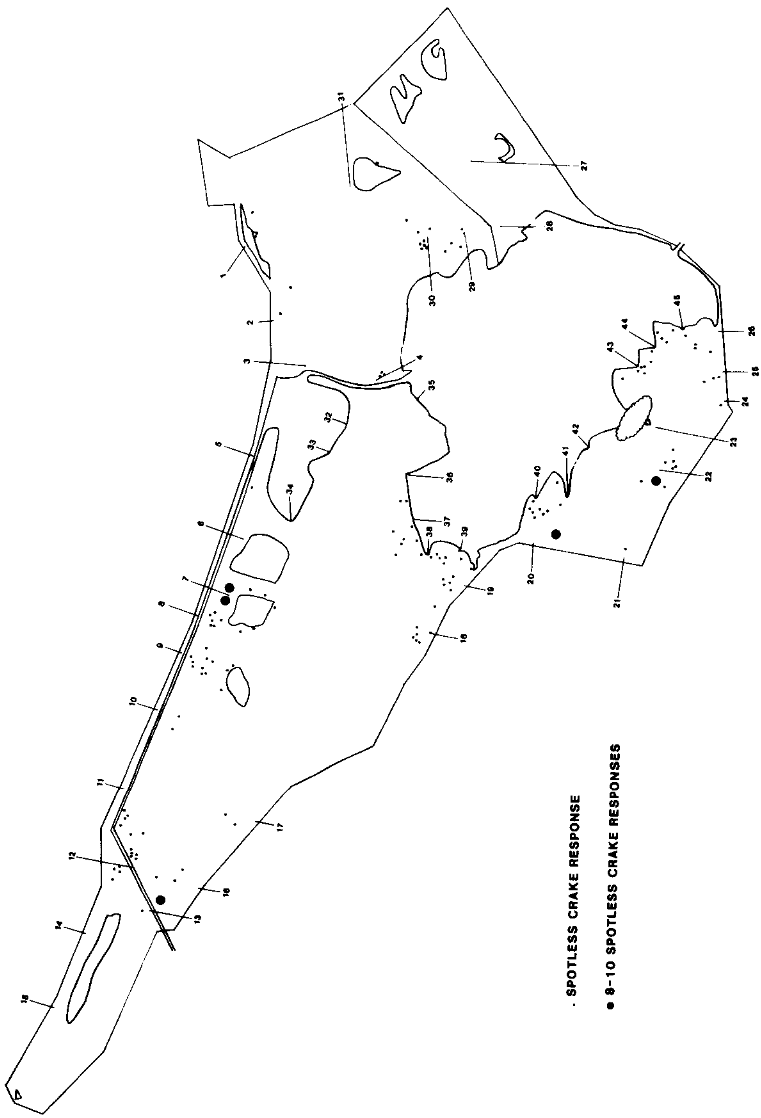

FIGURE 5. Location of Spotless Crake responses to playing a 6.5 minute tape of Spotless Crake calls at 45 stations

TABLE 1 — Number of Spotless Crakes responding to taped calls per station

STATION NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
14-18 SEP	1						3		1			1	1										
23-24 SEP	1	1					3	1				1	1					1	1	1		2	2
29-30 SEP	1						1	2	1A		1	1	2						1			2	1
6-8 OCT	1			1			2	1A	1	1	1	1	1		1	1		1	1	1		2	1
15 OCT				1			1	1	2		1						1	1	1	1		1	2A
21 OCT							2	1A				1	1						1	2		2	
27 OCT							1	1A	1			1	1A						1	1	1		
8 NOV				1			1	1A	1		1	1	1				1	2	2	1		1	1A
16 NOV				1								1	1									1	1A
30 NOV												1	1									1	1A
1 DEC					1		2		1		1	2	1										
9 DEC		1					2		1		1	1	2									1	1
14 DEC							3		2	1	1							2					

STATION NO.	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	TOTAL CRAKES
14-18 SEP										1			1	1		1		1					13
23-24 SEP		1	1			2	1				1					2				1			23
29-30 SEP			1			1	1				3			1	1	1				1		1	
6-8 OCT		1					1				1	2		1	1			1				1	26-27
15 OCT							2								1	2							17-18
21 OCT	1						1	1		1	3			1			2	2	2	2	3	1	32-33
27 OCT						1	1				1									1	1		11-13
8 NOV																							12-14
16 NOV															1				1	1			7-8
30 NOV																							
1 DEC					1				1														11
9 DEC		1																		1			13
14 DEC												1								1			12

A - Possibly same crake as heard at previous station

Few responses were received from flax/cabbage tree associations with a wet mud floor (no. 2, 3, 4, and 38). One of the two responses at station 2 was from a crake that had followed the recorder from the raupo area of station 1; I believe the responses at station 4 came from a narrow band of raupo which had a nest behind it. Most striking was the complete lack of calls from the flax/cabbage tree area at station 10 because I received a large number of responses at adjoining stations on both sides (no. 7-9, 11-13). The two calls heard at station 10 came from adjacent raupo, as did the only call heard at station 21. The young flax/tussock sedge area between stations 22 and 23 was also avoided by the crakes which responded there. R. Lavers (pers. comm.) had observed crakes nesting there in 1971 before the experimental removal of raupo and subsequent growth of flax. Yet crakes did not completely avoid flax. Stations 29 and 30 were on a boardwalk through a flax/cabbage tree/raupo association with a few centimetres of water. Spotless Crakes responded from both areas, particularly from the wetter station 30.

No responses were received from the isolated solid stand of tussock sedge near station 28. The crakes which responded from the long strip of tussock sedge between stations 36 and 38 began their calling from the flax, cabbage tree or raupo stand behind the sedge and came toward the recorder.

Reactions of Marsh Crakes to broadcast calls

Marsh Crakes responded to tapes of Spotless Crakes at stations 15 (one 30 September) and 40 (one 17 September, two 8 October, one 21 October). The Marsh Crake which responded on 21 October came out of the vegetation on to a mudflat. I then played a 5-minute tape of Marsh Crake calls. The bird flew behind me and responded vigorously and continuously. I could not find a nest near station 40 but believe that a pair nested nearby. I did find a Marsh Crake nest near the area it called from by station 15. On 25 October I played the Marsh Crake tape at Stations 5 to 15 and 18 to 23. At least two (possibly five) Spotless Crakes responded weakly at the cessation of the Marsh Crake tape recording. They appeared unstimulated, if not intimidated, by the Marsh Crake calls. No response was given to the Marsh Crake tapes played on the dark calm evening of 22 September (stations 5-8) or 26 October (stations 35-41).

Number of territories

The number of territories along the tape-playing route can be estimated from the Spotless Crake responses. Using the location of calls and the usual behaviour of several weeks of vigorous calling followed by silence or weak calling, I estimated 13 probable and 19 possible territories. Those stations which received 5-9 crake responses on 4-7 occasions were regarded as possible territories. Those stations receiving at least four consecutive vigorous responses from the same area were regarded as probable territories. (See Fig. 5 and Table 1.)

DISCUSSION

Spotless Crakes seem to need large continuous blocks of tall emergent plants with an understorey of sedge for nesting. The tall plants are raupo at Pukepuke Lagoon, but are willow (*Salix* spp.), manuka (*Baumea* spp.), and cabbage tree in the Whangamarino wetlands (Ogle & Cheyne 1981). These trees may be less suitable than raupo because the crakes at Whangamarino apparently had larger territories than at Pukepuke Lagoon, as evidenced by the greater distance they walked toward the tape recorder. The sedges used as nest sites were *Carex secta* at Pukepuke Lagoon, and probably at Whangamarino, but were *C. lessonia* in the Waingaro district (Hadden 1970, 1972; Ogle & Cheyne 1981). Many smaller stands of emergents not used in the spring were frequented by crakes in the autumn (A. Grant, pers. comm.).

The crakes favoured nesting in large, unbroken stands of emergents, a preference similar to the Sora and Virginia Rails in the United States (Kaufmann 1971). When the stands were opened, the Sora and Virginia Rail numbers were reduced by more than the simple number of territories lost. Similar results with crake numbers may occur if stands are opened in waterfowl management. Many areas of Pukepuke Marsh were sprayed with Round Up in February to control raupo growth. The effects of spraying were not evident during October but regrowth did not occur in November. Stations 5-13, 16, 18, 19, 23, 33-37, and 42-44 were slightly affected by a lack of small to moderate raupo regrowth. The "rice bowl" area near stations 14 and 15 and the triangle between stations 24, 26, and 45 were most affected. By late November, these raupo stands began to fall down and were moderately open by December. Livestock trampling may have similar effects. When I played tapes of Spotless Crakes along the north side of nearby Omanuka Lagoon, I heard only one response from a small fenced portion inaccessible to livestock.

Active crake management would require the protection of existing tussock sedge and the encouragement of new sedge stands. In 1982, many sedges were dying, probably from shading and nutrient competition by raupo or flax and possibly from prolonged inundation. Raupo has become more important in plant competition and swamp eutrophication than in the past because of its pronounced response to phosphate fertilisers (Ogden & Caithness 1982). Hand or chemical control of dense raupo could be attempted, but with caution because the sedge is vulnerable to a second spraying of Round Up by helicopter. If shading is the main factor that affects the sedge, raupo duff could be burned off, again with caution. *Schoenus nigricans*, a tussock sedge of the British Isles, is intolerant of weeds growing on its pedestal, and fires increased the number of such weeds (Dawkins 1937).

Manipulation of water levels may be a useful tool for managing rail habitat, especially sedge. Costello (1936) found tussock forms of *C. stricta* to be adapted to fluctuating water levels and described both mesic and xeric adaptations. However, prolonged high water levels weaken or kill tussock sedge as well as encourage *Typha* growth (J. Zimmerman, pers. comm.). Thus the prolonged water levels described for waterfowl nesting, brood rearing, and hunting may not be compatible with long-term sedge survival. In addition, the seeds of the flax growing high on sedge pedestals or crowns more likely floated there. Low water levels at the time of flax seed dispersal could, at least temporarily, slow the spread of seed. In 1982, the spread and growth of flax on sedge crowns was rapid. Nearly every sedge in the pool between stations 22 and 23 had 1-2 flax plants in its crown or pedestal; in 1971 none was present (R. Lavers, pers. comm.).

Few solid recommendations can be made for germinating and growing new stands of tussock sedge. Little autecological work has been done since the classical studies of Costello (1936) and Dawkins (1937). Most *Carex* species require a 3-12 month after-ripening period; light and artificial abrasion of the seed testa increases germination (Jermy *et al.* 1982). Costello believed that *C. stricta* spread primarily by rhizomes, whereas Dawkins believed that *S. nigricans* spread by seed. It might be noted that Costello studied undisturbed wetlands, whereas Dawkins studied areas of secondary succession where the peat had been previously removed. Both found that tussock sedge grew best where water levels were at ground level and that the highest pedestals were formed in deeper water. Costello noted rapid initial growth from rhizomes in the deeper water but that older sedges did not change over 6 years. He believed that sedges persist 60-80 years.

I would guess that the tussock sedges at Pukepuke Lagoon in 1982 had germinated during the 1910-1930 period of extensive drainage. The exposed bottom caused rapid nutrient release from the decomposing peat, and chemical changes caused by the oxidation of previously reduced compounds. After germination at the edge of the lake, the water levels remained low for several years, permitting the sedge to establish. Spring rains temporarily inundated the sedge and stimulated pedestal growth. Sand continued to blow and block the lagoon drainage, slowly raising the water level, stimulating the pedestal formation seen today. S. Shailer (pers. comm.) believes that the same sedges present today, especially the two in front of his maimai, were present in 1942. If this sequence is correct, management for tussock sedge requires several years of drawdown followed by slowly increasing water levels.

The swamplands of the central United States vary greatly from year to year in their conditions of cover and water, caused by periodic wet-dry weather cycles and explosion-crash population cycles of muskrats (Weller & Spatcher 1965). Wetland species of birds have adapted to this natural instability of their habitat by yearly and long-term population shifts (Weller 1979, 1980). Greater species diversity occurs when clusters of wetlands of diverse seral stages are present. Weller recommended that, for wetland management, wetlands purchased should be in the form of such clusters of swamps, including the upland between them. Such recommendations apply to New Zealand as well, even though the swamplands are more stable and have fewer species than those of North America. The purchase of a cluster should reduce the need for intensive management if the requirements of all swamp species are present and would reduce the need to take risks by experimenting with management techniques.

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