

# Sudden death of Weka (*Gallirallus australis*) on Kawau Island, New Zealand

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## ABSTRACT

Eighteen sub-adult and five adult North Island Weka (*Gallirallus australis greyi*) were found dead on Kawau Island in the Hauraki Gulf, between 7 March and 20 April 1996. Weka initially collapsed losing leg control, and died within two days. All dead birds had ample fat reserves. No common cause of death was found in seven autopsies. No long term impact on the population is predicted.

**KEYWORDS:** Disease, Weka, *Gallirallus australis*, demography.

## INTRODUCTION

The Weka (*Gallirallus australis*) is a flightless endemic New Zealand rail. It lives in many habitats from coastal beaches to the sub-alpine shrublands. Weka populations have drastically declined on both the North and South Island of New Zealand, during the last 100 years (Beauchamp 1997). The reasons for these declines are poorly understood.

Disease is frequently cited as a cause of Weka decline (Myers 1923, McKenzie 1971, Falla *et al.* 1979), but no disease or parasite has been identified (Heather & Robertson 1996). Dead Weka have been reported infrequently, even during declines. N. McConochie reported many Weka carcasses, less than two months old, on Mt. Owen in February and March 1913 (letter to P. Moncrieff of 12 December 1929). McKenzie (1971) reported Weka carcasses under rocks and in cover at Parua Bay, Northland.

Carroll (1963) suggested that ticks caused the rapid decline at Waipu, Northland in the late 1930s. Coleman *et al.* (1983) speculated that granulomas formation in the livers of female Weka could reduce reserves for egg laying and incubation, and hence prevent breeding or kill females. Aspergillosis and coccidiosis were important aviary diseases of Weka chicks, and young were also lost to avian pox in the North Island Weka recovery programme (Beauchamp, unpubl. data). Aspergillosis killed aviary reared young Weka after the age of potential fledging (G. Stables, pers. comm.), and is suspected to have killed an adult female at Opuia in 1992 and a sub-adult male on Kawau Island in 1995 (Beauchamp, unpubl. data).

This paper reports on the sudden and unexpected deaths of Weka in a banded population on Kawau Island during March and April 1996, and assesses the impact of these losses on the population.

TABLE 1 – Total survivorship (%) of Weka cohorts on Kawau Island. The number of individuals alive at the end of year  $x$  is in parentheses.

Age (years)	Cohort				
	1991-92 n=5*	1992-93 n=36*	1993-94 n=28*	1994-95 n=32*	1995-96
1	100 (5)	72 (26)	50 (12)	57 (16)	25 (8)
2	80 (4)	42 (15)	33 (8)	11 (3)	
3	60 (3)	25 (9)	33 (8)		
4	60 (3)	11 (4)			
5	60 (3)				

\* number of individuals banded as <12 months old

### STUDY SITE AND METHODS

The study site was in the Department of Conservation's Mansion House Historic Reserve (200 ha) on the south-western side of Kawau Island (2,350 ha; 174°50'E, 36°27'S) in the Hauraki Gulf. The area is covered with a mix of mature pines (*Pinus radiata*), kanuka (*Kunzea ericoides*), grassland, palms, exotic trees and weeds. There are two species of wallabies on the island (*Macropus parma*, *M. eugenii*), and the dominant vegetation is comprised of species unpalatable to them.

Since 1991, all adult Weka on the two ridges that surround the Mansion House lawn (22 ha) were individually colour-banded. Weka were aged and sexed using leg, bill and wing measurements, and sexing was confirmed using copulation positions and the pitch of spacing calls (Beauchamp 1987a, 1997, unpubl. data.). Unbanded adult Weka were individually colour banded when they entered this area. Young were banded with metal bands when 40-70 days old, and with colour bands when over 10 months old (after September of the following year). All Weka in a cohort were assumed to have a common birth date of 1 November (Table 1).

The survival of young Weka was monitored by trapping during monthly and bimonthly visits. Adult survival was confirmed by sight or recapture each breeding season (September-February) because adult Weka were secretive at other times. Weka were assumed to have died or left the area, if their bodies or bands were recovered, or if they were not recorded there for two years.

Eight sites in the Mansion House Historic Reserve were surveyed between 1992 and 1997 on two consecutive nights. Spacing calls were counted, and the positions of Weka were mapped during the half hour before and after dusk (Beauchamp 1997). The combined total count gave a minimum density because all the reserve was not covered.

Weka were shipped to and autopsied at Ruakura Animal Health Laboratory, Hamilton. Analyses included histology of internal organs muscle and brain tissue, general microbiology of the liver, lung and air sacs, necropsy, haematology, faecal parasitology, and an analysis of lead in the liver.

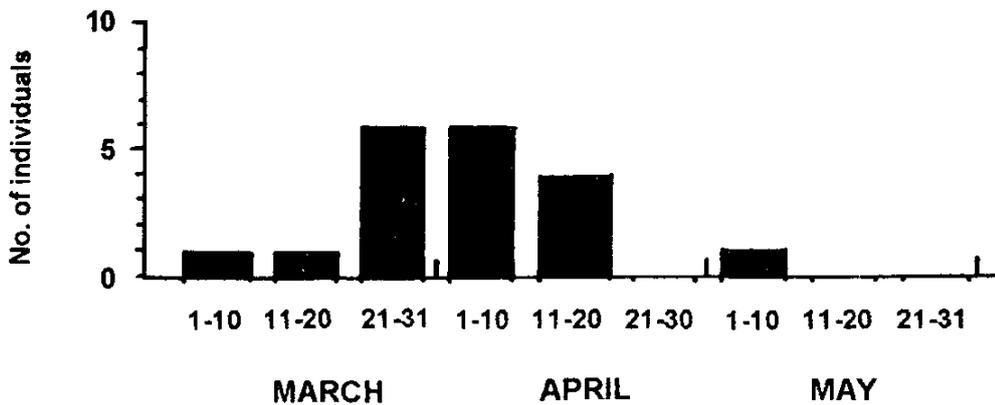


FIGURE 1 – Seasonal distribution of observed Weka deaths at Mansion House, Kawau Island, in 1996.

## RESULTS

### Observation of diseased birds and symptoms

The first Weka death was registered on 7 March 1996, and most occurred between 23 March and 6 April (66.6%,  $n=18$ , Fig. 1). The last death was on 20 April 1996. Seven birds were found dying on the Mansion House lawn, and corpses were found throughout the study area. Most Weka collapsed after losing control of their legs and were found sitting upright and alert. Two of the corpses were also found in this sitting posture. Only one Weka showed evidence of attack. This bird had head injuries and flystrike while still alive. Another Weka had blow fly (*Lucilia* sp.) infection alive but was otherwise uninjured. No corpses showed signs of feeding by Weka or mammalian predators.

One adult Weka was recovered with bleeding around the bill. This male lived near the workshop where a brodifacoum poison (Talon®) was kept, and may have eaten a poisoned rat. This bird recovered and was released after 5 days.

During March newly dead or dying Weka were found at three other locations on Kawau Island. At South Cove, 2.5 km from Mansion House, 11 of the 14 young Weka disappeared in two weeks. More young Weka were found dying at the Pump House lookout and at Schoolhouse Bay.

Similar deaths were occasionally recorded previously. Two Weka lacking leg control were found near Mansion House in June 1993. These Weka died but were not autopsied because they were in good condition (>690 & 940 g), and were found at the bottom of steep banks where they were thought to have fallen when chased.

### Weka condition and food supply in March-April 1996

Poisons were not used in the grounds of Mansion House in March or April 1996. Brodifacoum (Talon®) was set in the buildings in early March and two sick-looking rats (*Rattus rattus*) were seen outside the buildings on 3 March. After the first Weka deaths these baits were removed.

The summer was wetter than the preceding four summers. The forest leaf litter in low lying sites was dry until heavy rain on 18 February. From then until 4 March it dried, and then remained damp or wet until May. The drains along the Mansion House lawn held water from 4 March until late April.

The weights of Weka were 60 -100% above critical starvation levels (Beauchamp 1987a) immediately before death. Three females weighed 850 g, 650 g, and 900 g, 4, 23, and 7 days before death, and a male weighed 830 g 23 days before he died. The weights of other sub-adult Weka trapped at Mansion House prior to and on 20 - 21 March 1996 were increasing, and averaged 1,000 g (S.E. = 114, n = 9) for males, and were 900 g and 750 g for females.

### Autopsy results

Seven of the 18 dead Weka were autopsied. All died rapidly and had not eaten for 12 - 24 hours before death. No single cause of death was identified. Three Weka had bacterial or viral infection, or parasite damage in the lung. One Weka had lung damage consistent with parasitic nematode infection by a *Copillaria* sp., and had eggs in its faeces. Two other birds had chronic bronchiolitis, and heart myocarditis. Three of the 7 Weka had liver granulomas and foci. Two were of unknown cause, and the third had a an adiaspore of the fungus *Emmonsia crescens* which had initiated an immune response. One Weka had seeds of the potentially poisonous inkweed (*Phytolacca octandra*) in its stomach.

At least 5 of the dead Weka were very fat. The males weighed 1,050 g, 786 g, 790 g and >820 g, and the female was >650 g. The two other Weka were found dead and partly decayed so could not be weighed, but were obviously fat.

### Mortality rates

The mortality of sub-adult Weka in 1996 was higher than during the previous 4 years ( $\chi^2 = 7.43$ , d.f. = 1,  $p < 0.01$ ), and mortality of 1 year old Weka was also significantly higher ( $\chi^2 = 6.08$ , d.f. = 1,  $p < 0.02$ , Table 1). One 2 year old, and another 5 year old Weka died during April and May 1996, and six other, older than 2 years old Weka disappeared between February and November 1996 and may also have died then. However, six >2 year old Weka survived, although they fed with most of the sub-adult birds that died during March and April 1996.

### Impact on the population

The long term impact of this decline on the study population is probably minor, because the impact was predominantly on the younger cohorts. During 1996 pairs declined from 18 to 14, and only 8 sub-adult Weka survived to replace adult losses. However, the drought of 1990-91 had a greater impact on the study population, as well as the rest of Kawau Island (Beauchamp, unpubl. data). Only 20 Weka were present in the study area in April 1991, significantly fewer ( $\chi^2 = 11.4$ , d.f. = 1,

$p < 0.01$ ) than in subsequent seasons; and only two Weka (probably sub-adult birds, Beauchamp, unpubl. data) were seen on the Mansion House lawn in April 1991 (R. Chambers, pers. comm.).

The impact of losses on the population in the surrounding area also appears minor. Annual surveys of during March-April 1992-1997 in the Mansion House Historic Reserve have shown a consistent increase in site-attached Weka from  $< 90$  birds to  $> 135$  birds (R. Chambers, pers. comm., Beauchamp, unpubl. data.).

### DISCUSSION

There are few records that support disease as a critical factor in the decline of any Weka population. The autopsies in this study found several potential death factors, but did not identify a common factor. However, some potential mortality factors, like viral infection, were not investigated.

A disease or parasite is the most likely explanation for the deaths because of the short time span of the occurrence of the deaths, the symptoms observed, and because it affected mainly Weka 2 years or younger. Many adults were unaffected and all the adults with considerable contact with the young Weka in February and March 1996, survived. Earlier exposure to a similar mortality factor may have rendered these adults immune.

Other possible causes of Weka death were poisoning by rodenticides or eating toxic food. However, no such factor is known to have a disproportionate effect on the younger cohorts. The poisonous inkweed, found in one Weka stomach, was an uncommon weed on Kawau Island, but was a common food at Opuia (Beauchamp, unpubl. data.). This plant is probably not toxic to Weka. A water-borne or water-transmitted agent can also be excluded, because all Weka and other birds drank from the drains, but there was no similar mortality among Peafowl (*Pavo cristatus*) or Grey Ducks (*Anas superciliosa*).

In the last 20 years, several Weka populations were monitored intensively: Kapiti Island (1979-1988, Beauchamp 1987a, unpubl. data.), Double Cove, Marlborough Sounds (1984-86, Beauchamp 1987b), Mt. Bryan O'Lynn, Westland (1976-78, Coleman *et al.* 1983), Parekura Bay, Bay of Islands (1991-95, Beauchamp, unpubl. data), Opuia, Bay of Islands (1991-94, Beauchamp unpubl. data), Rakauroa, Gisborne (1992-94, Bramley 1994) and on Kawau Island (1991-97, Beauchamp, unpubl. data.). No mass mortality associated with disease or parasites was found until 1996. The deaths reported here are the best indication to date that disease or parasites can reduce Weka populations rapidly.

The level of mortality appears to have had little long term impact on the population. However, further work is required to find the cause of the deaths, because the Weka population on Kawau Island comprises about 67% of the remaining North Island Weka (Beauchamp 1997).

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