# Chick mortality in the absence of predation: on the breeding strategy of red-crowned kakariki (*Cyanoramphus novaezelandiae*).

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Order Psittaciformes: Parrots and Cockatoos

- More than 50% of the species threatened with extinction (Juniper and Parr, 1998)
- Only about 8% of the species have been studied in the wild (Masello and Quillfeldt, 2002)
- Breeding patterns vary within the order. Therefore, few generalizations can be made
- Conservation efforts benefit from a better understanding of particular breeding strategies

M. Baling

S. Greif

S. Westmorland/CORBIS

Order Psittaciformes: Predation

• 62% of nest failure in palm cockatoos ( *Probosciger atterrimus*) attributed to predators (Murphy *et al*., 2003) between 1999-2002

•61% of nest failure in lilac-crowned amazon (*Amazona finschi*) (Renton and Salinas-Melgoza, 2004) between 1996-2003

• 45% of nest failure in eclectus parrots (*Eclectus roratus*) due to predation (Heinsohn and Legge, 2003) between 1997-2000

K. Oceguera

Order Psittaciformes: Predation

• 37% of nest failure due to predation in black-billed parrot and yellow-billed parrot (*Amazona agilis* and *A. collaria)* between 1996-1998 (Koenig, 2001)

• 4% of nest failure due to predation in the Ouvea parakeet (*Eunymphicus cornutus uvaeensis*) (Robinet and Salas, 1999) between 1994-1996

• 0% predation documented for the burrowing parrot (*Cyanoliseus patagonus*) (Masello

and Qullfeldt, 2002) between 1999-2000

M. Baling

The New Zealand case: Exotic predators and native parrots

• Stoats (*Mustela erminea*) kill nesting female kaka (*Nestor meridionalis*) and Rats (*Rattus* spp.) prey upon chicks (Beggs and Wilson, 1991)

• Cats (*Felis catus*) and stoats have caused severe decline of kakapo (*Strigops habroptilus*) (Elliot *et al*., 2001)

Dom Mason/CORBIS

D. Robert & Lorri Franz/CORBIS

The New Zealand case: Exotic predators and native parrots

•Yellow-crowned kakariki (*Cyanoramphus auriceps*) in Fiordland are vulnerable to predation when nesting (Elliot *et al*., 1996)

• Red-crowned kakariki (*Cyanoramphus novaezelandiae*) forages and nest at low levels in forests making them vulnerable to predation (Greene, 1998; Greene, 2003)

J. McDonald/CORBIS

L. Ortiz Catedral

The study: Breeding biology of red-crowned kakariki in a predator-free island

What happens when exotic predators are absent?

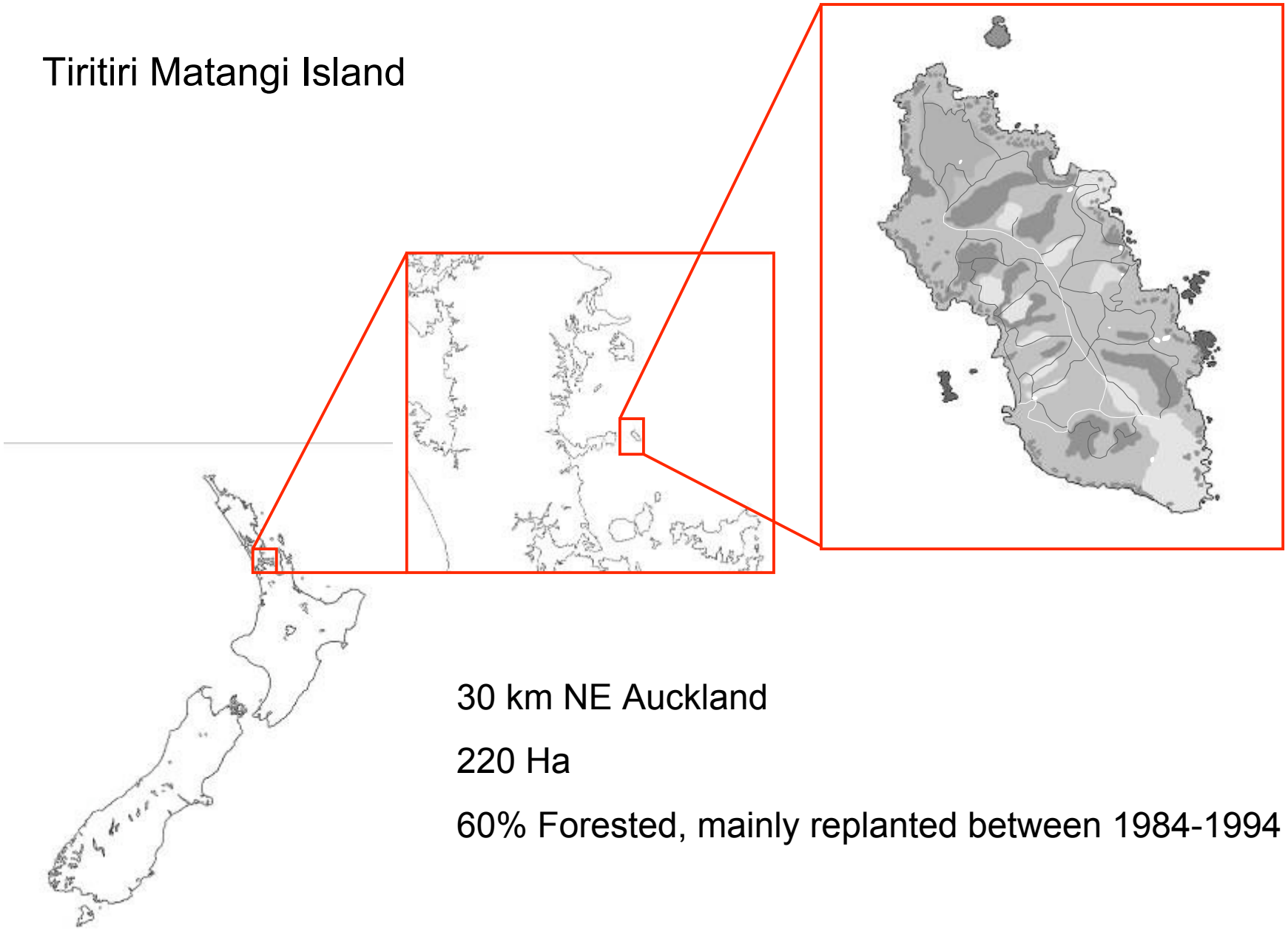
What are the causes of mortality between nestlings?

Is mortality related to hatching rank?

R. Seaman

E. and D. Hosking/CORBIS

# Tiritiri Matangi Island



30 km NE Auckland

220 Ha

60% Forested, mainly replanted between 1984-1994

Maps by P. Barnett

L. Ortiz Catedral

The study: Breeding biology of red-crowned kakariki in a predator-free island

- Red-crowned kakariki translocated between 1974-1976 to Tiritiri Matangi Island
- Occurs in high numbers;  Use of nest boxes and natural cavities

S. Fordham

L. Ortiz Catedral

Methods: Nest Monitoring 2004-2005 breeding season

• 41 nests were localized

• 27 followed (easy access, localized before first egg was laid)

• Nest monitoring daily during laying and hatching

• Every second day after hatching until death or fledgling (weight, culmen, wing chord and tarsus length)

L. Ortiz Catedral

L. Ortiz Catedral

Results: Clutch size, hatchability and mortality

- Average clutch size=6 (range 1-9)
- In 19 out of 27 nests at least one chick hatched (70% of nests)
- 8 nests failed during laying or soon before hatching (30% of nests)
- 40% of all eggs produced hatched (65 out of 160 eggs)

L. Ortiz Catedral

Results: Clutch size, hatchability and mortality

•Mortality started by the youngest chick in 11 of 13 nests with more than one chick (85%)

• In only two cases other chick died first (15% of the cases; 1st chick in one case and 2nd chick in the other)

• 97% of deaths caused by starvation. One chick died due to exposure to rain (full crop)

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Results: Predation of chicks or parents

All nests were visited consistently and no signs of predation were noticed (i.e. chick remains etc.)

Both parents were sighted in or around the nest in most visits (if parents were not seen in one visit they were always noticed in subsequent visits)

Sexes of feeding adults were determined by beak morphology

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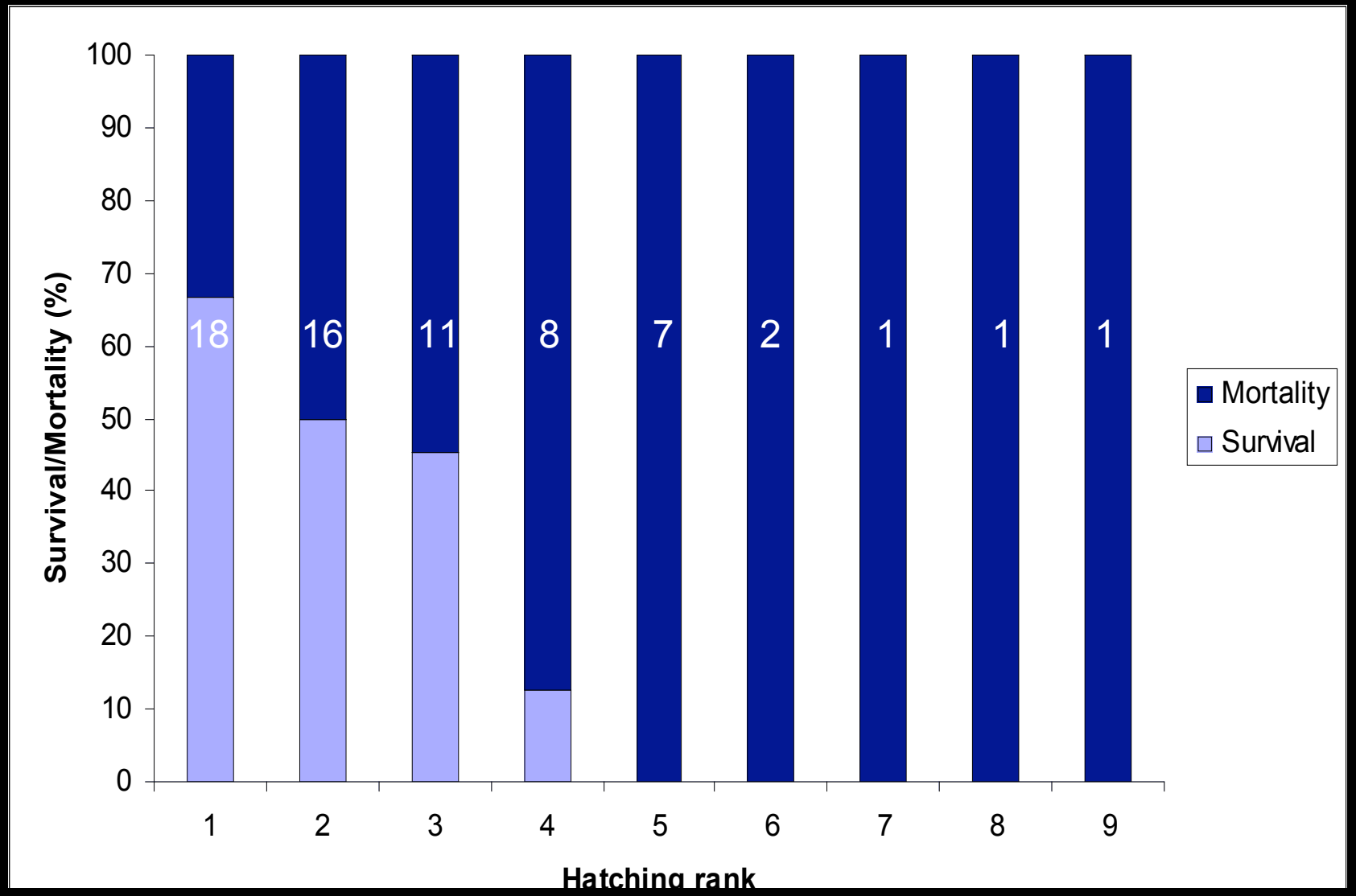
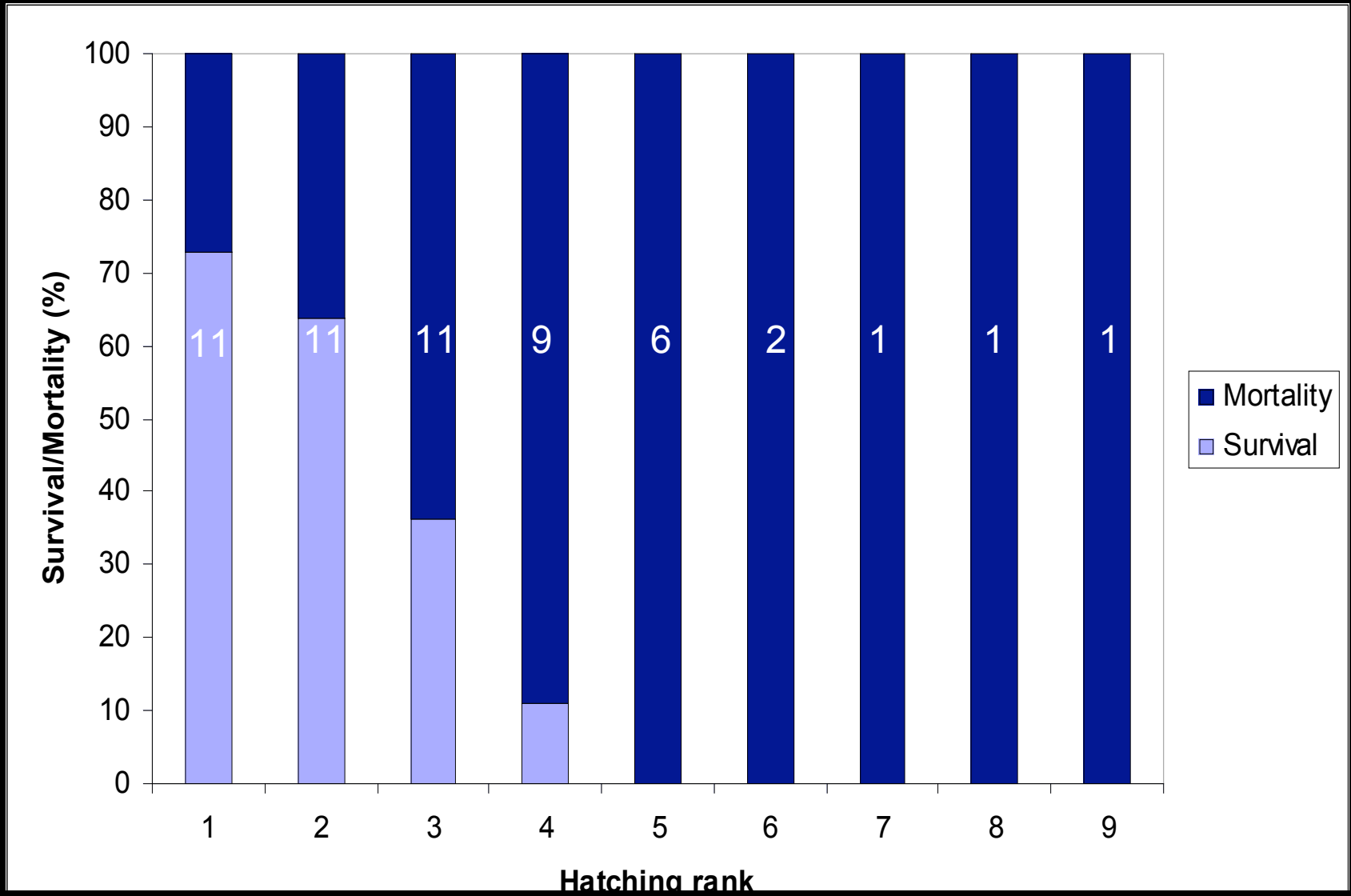
Results: Fledglings

- In 13 nests at least one chick fledged
- Overall probability of an egg resulting in a fledgling 16%
- Probability of a nestling resulting in a fledgling 40%






Overall mortality including all nests with at least one chick (15 nests)




Overall mortality including only nests with at least three chicks (11 nests)

| | Mortality in nest | Hatchability |
|---|---|---|
| Greene, 2003 | 60% n=117 nestlings | 83.6% n= 140 eggs laid |
| This study | 59% n= 64 nestlings | 40% n= 160 eggs laid |

Mean fledgling mass First= 89.32 ±10.3 g Middle= 78.61 ± 13.2 g Last= 80.93 ± 16.0 g

Kruskal-Wallis Test $K$ = 10.722, d.f.=2 P=0.01

Remarks

• Parent-offspring dynamics of food solicitation and delivery not assessed

• Who is breeding? Parental quality and experience can determine foraging efficiency and food delivery to the brood

• New nest…new breeding pairs?

• Post-fledgling survival does not seem to be strongly dependent of weight at fledgling in other parrot species (Rowley and Chapman, 1991; Stoleson and Beissinger 1997; Krebs, 1999)

• Changes in asynchrony and survival due to environmental quality (Wiebe and Bortoloti, 1994; Krebs, 1999; Wunderle, 1999; Masello and Quillfeldt, 2004; Renton and Salinas-Melgoza, 2004)

Other studies about hatching asynchrony in parrots

T. Hamblin/CORBIS

Budgies (*Melopsittacus undulatus*): Food allocation under parental control, not only mass hierarchies

M. B. Withers/CORBIS

Crimson Rosellas (*Platycercus elegans*): equal mortality rates between chicks after hatching (Krebs, 1999); Selective feeding by parents (Krebs and Magrath, 2000)

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