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## LITERATURE CITED

- ANDERBERG, M.R. 1973. Cluster analysis for applications. New York: Academic Press, 359pp.  
 BIONDINI, M.E.; MIELKE, P.W., Jr; BERRY, K.J. 1988. Data-dependent permutation techniques for the analysis of ecological data. *Vegetatio* 75:161-167.  
 DIXON, K.R.; CHAPMAN, J.A. 1980. Harmonic mean measure of animal activity area. *Ecology* 61:1040-1044.  
 WILLIAMS, M.J. 1979. The moult gatherings of Paradise Shelduck in the Gisborne – East Coast District. *Notornis* 26: 369-390.  
 WILLIAMS, M.J. 1981. Recoveries of Paradise Shelducks banded in the Taihape, Nelson, Marlborough, Waitaki and Southland Districts. *Notornis* 28:11-27.

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## SHORT NOTE

## Chick expulsion by a Fiordland Crested Penguin

The crested penguins (*Eudyptes*) usually lay two eggs but raise only one chick to independence (Warham 1975). If the second and larger egg hatches, it almost always becomes the successful chick. The smaller sibling dies from a combination of parental neglect and an inability to compete for food with its larger nestmate (Lamey, in press; St. Clair 1990; pers. obs.).

In some crested penguin species, the parents may actively cause brood loss by kicking eggs from nests (Warham 1975; Lamey, in press). However, for those species in which both eggs often hatch, there is no evidence that parents actively cause chick loss. Here I describe an observation of a parent Fiordland Crested Penguin (*Eudyptes pachyrhynchus*) kicking the smaller chick out of the nest.

At 1535 h on 15 September 1989, I was watching a nest containing two small chicks on Taumaka I., Open Bay Islands (near Haast). The chicks, which had been marked with red or blue dye on the breast, were being guarded by the male. (Males guard the chicks for the first three weeks after hatching Warham 1974.) The chick marked blue, which was obviously smaller, had hatched from the smaller egg (C. St. Clair, pers. comm.). The chicks were about 4 days old. My field notes (slightly edited) read:

Blue had somehow slipped outside the male's foot and peeped. Then red peeped as blue walked around, and in the ensuing attempt to beg by red, blue climbed half onto the male's foot with its bill pointed out of the nest. The male jerked his foot and blue flipped over the side of the nest to land 0.5 m away. The male stretched out towards the chick. [Males do not leave the nest during the guard stage.] Blue lay there for 30 s, then started crawling back towards the nest with the male watching. When at 0.3 m from the nest, a weka came by and tried to grab the chick. The male growled and lunged and the weka ran off. Blue kept crawling but the weka circled and attacked again. Weka was bitten by male but grabbed the chick and carried it off.

The male appeared to jerk his foot as a reaction to the chick climbing on to his foot. He certainly did not appear to expel the chick deliberately, and he attempted to protect it from the Weka (*Gallirallus australis*). However, chicks constantly climb on their parents' feet and otherwise harass parents. If foot jerks resulting in expulsion of chicks were common, many penguins would soon lose both chicks to Weka, which patrol by penguin nests about once an hour. Also, penguins generally lunge at any Weka that comes by, and these lunges could be interpreted as protection for chicks in the nest rather than for any chick outside the nest.

It is noteworthy that the small chick was the one expelled. Although more observations are needed to show whether parents consistently expel the smaller rather than the larger chick from nests where a chick is expelled, it appears that expulsion of chicks may be one means by which the brood is reduced to one.

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#### LITERATURE CITED

- LAMEY, T.C. In press. Hatch asynchrony and brood reduction in Penguins. *In* Penguins (L.S. Davis & Darby, J., eds). New York: Academic Press.
- ST.CLAIR, C. 1990. Mechanisms of brood reduction in Fiordland Crested Penguins (*Eudyptes pachyrhynchus*). Unpubl. MSc thesis, University of Canterbury.
- WARHAM, J. 1974. The Fiordland Crested Penguin. *Ibis* 116: 1-27.
- WARHAM, J. 1975. The crested penguins. Pages 189-269 *in* The Biology of Penguins (Stonehouse, B., ed.). London: MacMillan.

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