Table 1 Estimated timing of breeding by Fiordland crested penguins (*Eudyptes pachyrhynchus*) at various sites across the species range in 1995. The sites are listed from south to north. The value for timing is an arbitrary number that indicates relative placement in the timing order over a 5-week period; it does not indicate a timing unit such as weeks. Details in text.

Location	Latitude	Nesting habitat	Timing
Codfish I.	46°S 45'	Burrows, dugouts	3
Preservation Inlet	46°S 03'	Cave	1
Chalky Sound	46° S 0'	Burrows	2
Dusky Sound	45° S 45'	Cave	1
Breaksea Sound	45° S 34'	Site 1: burrows	
		Site 2: open nests, dugouts	4
Doubtful Sound	45° S 15'	Burrows (2 sites)	4
Martins Bay	44° S 15'	Caves & under boulders	4
Taumaka I.	43° S 50'	Caves & under overhangs	5

Table 2 Proportion of Fiordland crested penguin (*Eudyptes pachyrhynchus*) nests hatching 1 or 2 eggs; the proportion of nests hatching no eggs was not usually available and is not included here (1 nest and a likely 0 nests hatched 0 eggs in 1990 and 1995 respectively). Unk.=unknown.

	No.(%) of nests hatching			
Year	1 egg	2 eggs	Unk.	Source
1969	12(32)	25(68)		Warham (1974)+
1970	8(17)	38(83)		Warham (1974)+
1988	34(42)	47(58)		Phillipson (1992)#
1989	12(36)	21(64)		St Clair (1991)
1990	10(42)	14(58)	4	IGM
1995	0(0)	15(100)*	2*	IGM.

+Estimates based on the number of nests retaining 2 eggs from laying to a stated date in early September rather than to hatch *per se*. Other data in Warham (1974) suggest that failure or loss of one or both eggs was high late in incubation (>47%), indicating that the estimated proportion of nests hatching 2 eggs given here is high.
#Phillipson presented data based on survival of eggs rather than hatch rate for nests, thus these values reflect back-calculation using stated sample sizes.
*Of two nests not yet hatched when I left the island, 1 contained 1 egg and 1 contained 2 eggs, thus a more conservative estimate of the proportion of nests hatching two eggs is 96%.

that they were any different to the 17 nests that were monitored closely, as all hatched during the same period as the nests that were checked (indicated by peeping calls of small chicks). The 25 nests represent all nests likely to be active at the study site in 1995 based on records of nest locations for the previous three years, indicating that few if any nests failed completely in 1995. All 15 nests that hatched produced two chicks, and only 1 of 17 nests was clearly going to hatch only one chick. A 96-100% hatch rate of two eggs is unprecedented (Table 2).

Two chicks from one nest?

Two chicks can occur at one nest for the following reasons: i) creching, ii) adoption, and iii) survival of both siblings. Creches had formed in all the colonies visited in October. However, some nesting habitats limited the potential for chicks to locate each other, as some chicks in isolated burrows had to cross open ground in order to enter another burrow (burrows can contain one or more nests). At these sites, many chicks of creching age were standing alone on or near a nest.

I located 5 nests where one large and one small chick were standing together as a "pair" (Table 3). In each case, the smaller of the two chicks was considerably larger than a 7-10 day-old chick (the age by which most nests have lost the smaller chick), and was at about minimum size for creching. I discount the Codfish I. pair because they were close to a creche of 4 chicks, and the Martin's Bay pair because of a second nest in the cave that had clearly been active but contained no chick. However, three of the pairs were isolated from all other chicks in the colony by being in burrows (2 pairs) or in a dugout under a tree (1 pair). These pairs were in locations where chicks would have to leave the burrow and travel across several metres of open ground to reach another burrow containing a chick in order to form a creche. Such movements are possible, but unlikely for burrow-living chicks early in the creching period (pers. obs.)

For the isolated nests, it is likely that the two chicks were both raised in the nest at which they were found. Although not definitive, these observations suggest that about 12% of nests produced two chicks on the Johns (2 of 16) and Passage Is (1 of 9) in 1995. It is worth noting that at all other visited locations, colony topography and nest distribution meant that nests producing two chicks were undetectable even if they existed, because there were few or no isolated nests.

DISCUSSION

Unusually high hatching success, as indicated by the 1995 data for Taumaka I., does not necessarily predict higher per capita nest production. The cause of brood reduction in a nest that hatches two chicks is either that the female does not feed the smaller chick (in which case it dies in 3-6 days), or apparently that she cannot provide enough food for two chicks once they are 7-10 days old (males provide no food until chicks are about 3 weeks old) (Warham 1974; Phillipson 1992). Unusually good hatching success may indicate that birds were more

Table 3 Locations and nesting habitat of sites at which two chicks were found standing at a nest as a "pair".

Location	Nesting habitat	Total no. chicks	No. "pairs"	Creche or vacant nest nearby?
Codfish I.	Burrows; dugouts	>20	1	Yes
Passage I., Chalky Sd	Mostly burrows	10	1	No
Johns Is, Breaksea Sd	Mostly burrows	18	2	No
Martins Bay	Cave	2	1	Yes

effective incubators in that year, perhaps because they were more alert to egg-predators (such as weka *Gallirallus australis*, see St Clair & St Clair 1992).

More important is what happens after hatching. Although most brood reduction occurs when the two chicks are <10 days old, Warham (1974) estimated one sibling pair to be 19 days and Phillipson (1992) recorded survival of both chicks to >12 days in 11 of 49 nests, with maximum survival of 21, 22 and 30 days. [Some of Phillipson's nests were manipulated with the prediction that the survival of both chicks would be extended, perhaps explaining these unusually long periods of survival.] Phillipson (pers. comm.) monitored one unmanipulated nest (of 114 nests in total) that fledged two chicks, indicating that such success may be very rare, but it is not impossible. Such a result may be of little interest if it happens to an occasional pair. But if survival of two chicks happens occasionally on a population-wide basis, it may help to explain the maintenance of the two-egg/one-chick brood reduction system. The likely mechanism is that food is unusually readily available in rare years, allowing the female to keep both chicks alive for three weeks after which the additional support of the male could result in both chicks surviving. Clearly, these comments have little bearing on the problem of why some species lay two eggs, but reject the smaller egg early in incubation.

A corollary of this hypothesis is that "good" years should occur very rarely for those *Eudyptes* species that never hatch both eggs. More technically, species that sometimes hatch two eggs should experience greater resource variability than species that hatch only one egg.

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SHORT NOTE

The return of the Australasian crested grebe (*Podiceps cristatus australis*) to the Wakatipu region, South Island, New Zealand

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In 1865 Walter Buller published his "Essay on the Ornithology of New Zealand". In this pioneer work Buller wrote about 'a large crested grebe hitherto undescribed and inhabiting the lakes of the South Island' (Buller 1865). This dark-breasted specimen on which he based his original description '*Podiceps hectori*' was found by James Hector on the 'Whakatipu Lake' accompanied by young (Buller 1873). The precise locality is unknown. What is known, however, is that in April 1863, before setting out on his major expedition to Fiordland in the *Matilda Hayes*, Hector journeyed to Lake Wakatipu where he got in touch with a local runholder, Nicholas Von Tunzelmann. Hector and Von Tunzelmann crossed the lake to the western shore at Whites Bay, from where they tramped up the bed of the Von River to the Mararoa and beyond, returning the same way. Westerskov (1977) speculated that 'it is possible that Hector collected adult crested grebe specimens at Lake Wakatipu on this trip, either crossing or recrossing the lake or staying at it'.

Another reference to the occurrence of Wakatipu area grebe is found on the plate prepared from the watercolour of the crested grebe by George Edward Lodge which is labeled, 'L. Wakatipu, Otago, New Zealand'; the specimen from which the painting was made was further labeled "Otago, originally from Anatole von Hugel Collection, via Matthews" and referred to as a female from Lake Wakatipu, December 1874 (Fleming 1982).

This historical evidence may not be substantial but is sufficient to prove that Lake Wakatipu and perhaps the smaller lakes and lagoons in the area (Fig.1) were suitable habitat for what is now known as the Australasian crested grebe, *Podiceps cristatus australis*, more than a century ago. In recent years, however, ornithologists have been unaware of the presence of crested grebes in the Wakatipu area. In fact a national census of grebes conducted in 1980 recorded a zero count in Otago and Southland (Sagar 1981).

My first knowledge of grebes being in the Wakatipu area came at the end of 1995, when Dawn Palmer of the Department of Conservation, Queenstown, reported that "a pair of southern crested grebe have successfully bred in the reeds at the southern end of Lake Hayes while another pair have been sharing water space" (Anon. 1995).

More was to follow in a letter received by Peter Schweigman from Don Haddon who had observed a pair of grebe on Moke Lake, a small mountain lake just west of Queenstown, on 23 January 1996. After careful searching he found their nest with three eggs. I found the birds on 9 February but, as they did not return to a nest all day, I presumed that their nesting attempt had failed. On 25 February there was no sign of the grebes. Later I also checked nearby Lake Dispute for sign of them without success.

In late January of 1997 a pair of grebe returned to Moke Lake and I observed them building a nest on 3 February 1997. As time passed the lower foundation of the nest moved forward into the lake and repairs were made with weed and raupo, the latter gathered some distance from the nest. Unfortunately the whole structure and the eggs it contained was swamped by a southerly storm on 23 February 1997. When I returned to Moke Lake on 18 March 1997 they had left the area. These breeding attempts on Moke Lake were preceded by the sighting of a single adult in the spring of 1991 (Derek Onley, pers. comm.).

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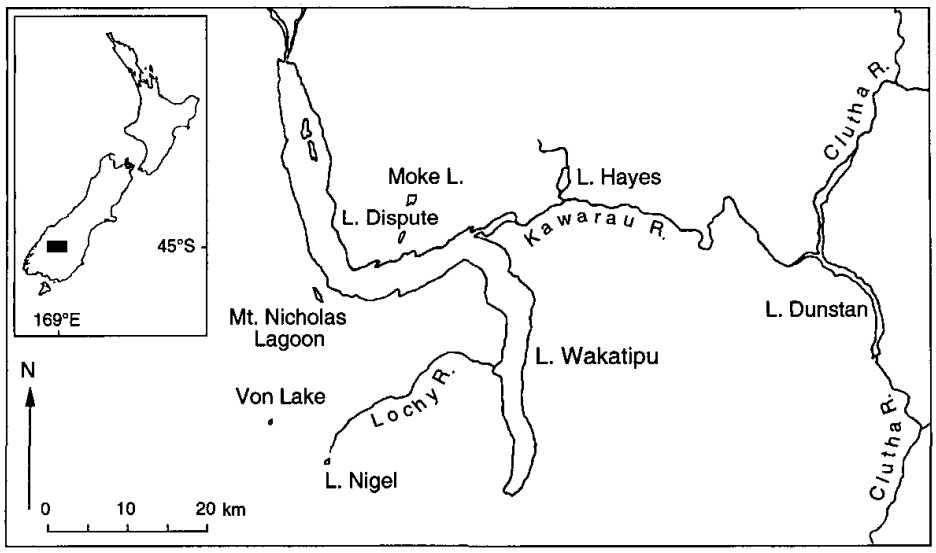

Fig. 1 Map of the Wakatipu region of the South Island, New Zealand, showing the location of the various lakes mentioned in the text.

On 11 February 1996 I also located an adult grebe and three juveniles on Lake Hayes and later three adults with the juveniles. Further checks of various parts of the lake up to early March eventually revealed a total of four breeding pairs, which had produced seven young.

Following this breeding success I decided to survey this area on a regular basis during the 1996-97 season (Fig. 2). The first visit made on 20 September 1996 disclosed that four pairs were holding territory. There was no sign of any immature birds. The number of breeding birds increased slowly to nine pairs by 10 March 1997. At that time one pair, which had been displaying, had built in an exposed position, attached to a submerged willow, a structure of lake weed and raupo, possibly for use as a platform for copulation. Two days later this site was abandoned. On an earlier occasion (4 February 1997) another pair built a similar structure, which they later left to build a nest closer to the edge of the lake. The nest was much more difficult to see from the water than their platform had been. Their efforts were rewarded as they eventually produced two chicks.

The first chicks were hatched about 1 December 1996 and the last on 22 March 1997. All eight original pairs were eventually successful and produced twelve young. On 17 May 1997 I was able to observe all twelve juveniles, three of which were in immature plumage. The number of adult birds, however, had reduced to thirteen indicating that the presence of both adults is not essential when the young reach the immature stage.

Dawn Palmer and Brian Ahern of the Department of Conservation made an independent survey of Lake Hayes on 29 July 1997 and found eighteen adults and seven

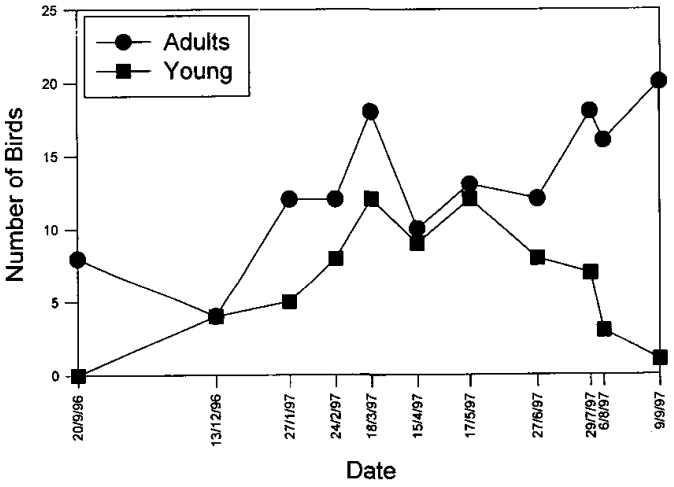

Fig. 2 Numbers of Australasian crested grebe on Lake Hayes, September 1996 to September 1997.

immatures. By 8 August 1997 the numbers appeared reduced, to eleven adults and five immatures. The young birds formed a cluster at the inflow area and two took flight, flying without effort to the outlet.

A survey I made on Lake Hayes 9 September 1997 completed a year's observations made on a monthly basis (Fig. 2). At this time ten pairs were involved in courtship display (Fig. 3). One of the courting pairs was accompanied by an immature.

By the age of six months immatures start to disappear from the lake. I have never found any evidence of the demise of these birds, so they presumably depart for elsewhere. There is a constant presence of birds, however, since by the time the immatures reduce in numbers in July, adult birds are already displaying. The drop in