CHANGES IN BIRD NUMBERS IN SIX NORTHLAND FORESTS 1979 - 1993

By R.J. PIERCE, R. ATKINSON & E. SMITH

ABSTRACT

A survey of birds in six Northland forests in 1979 was repeated in 1993, primarily to test whether numbers of New Zealand Pigeon had changed significantly. Counts of Eastern Rosella, Grey Warbler, Fantail and Tui had changed little. Counts of New Zealand Pigeon and Silvereye were significantly lower in 1993 and those of New Zealand Pigeon are thought to reflect long-term changes in abundance. Kaka and Kokako were each recorded in only one forest in 1993 compared with four and three forests respectively in the first survey. Pied Tit and Myna had significantly higher counts in 1993 than in 1979.

INTRODUCTION

New Zealand Pigeons (*Hemiphaga novaeseelandiae*) experience high levels of nest predation and competition with introduced brush-tailed possums (*Trichosurus vulpecula*) (Clout 1990). In some regions, including Northland, the birds are hunted heavily despite being protected by law (Clout 1988, Atkinson 1993, Pierce unpubl.). These data and much anecdotal evidence suggested that New Zealand Pigeons in Northland could be in decline, but quantitative data have been lacking. To determine whether New Zealand Pigeon and other bird populations had altered over a 14-year period a bird survey carried out by the former Wildlife Service in 1979 (Moynihan 1980) was repeated in 1993.

Of the seven forests surveyed in 1979, six were resurveyed in 1993. These were Raetea, Omahuta, Puketi, Waipoua, Mataraua and Russell (Figure 1). Raetea and Mataraua are high altitude forests (mean height of survey stations 572 m and 554 m asl respectively) and the others are low altitude forests (200-300 m asl). Detailed habitat descriptions, including vegetation characteristics, were given by Moynihan (1980).

One additioinal forest remnant, an unnamed 100 ha reserve near Raetea Forest, was also surveyed. It was the only forest surveyed which was known to be free of pigeon hunting, but most other factors (including possum densities) had a moderate or high score in this reserve.

METHODS AND ANALYSES

The methodology of the 1979 survey was replicated (Moynihan 1980). This essentially involved one 5-minute bird count at each of c. 40 stations per forest. The stations were at c. 450 m intervals usually on a rectangular grid, except for Raetea and Omahuta, where stations were mainly on ridges for both counts. Maps of station locations are held at the Department of Conservation, Whangarei, on file RCH 102.

All birds seen or heard were counted as described by Dawson & Bull (1975). That is, the minimum number of individuals of each species seen

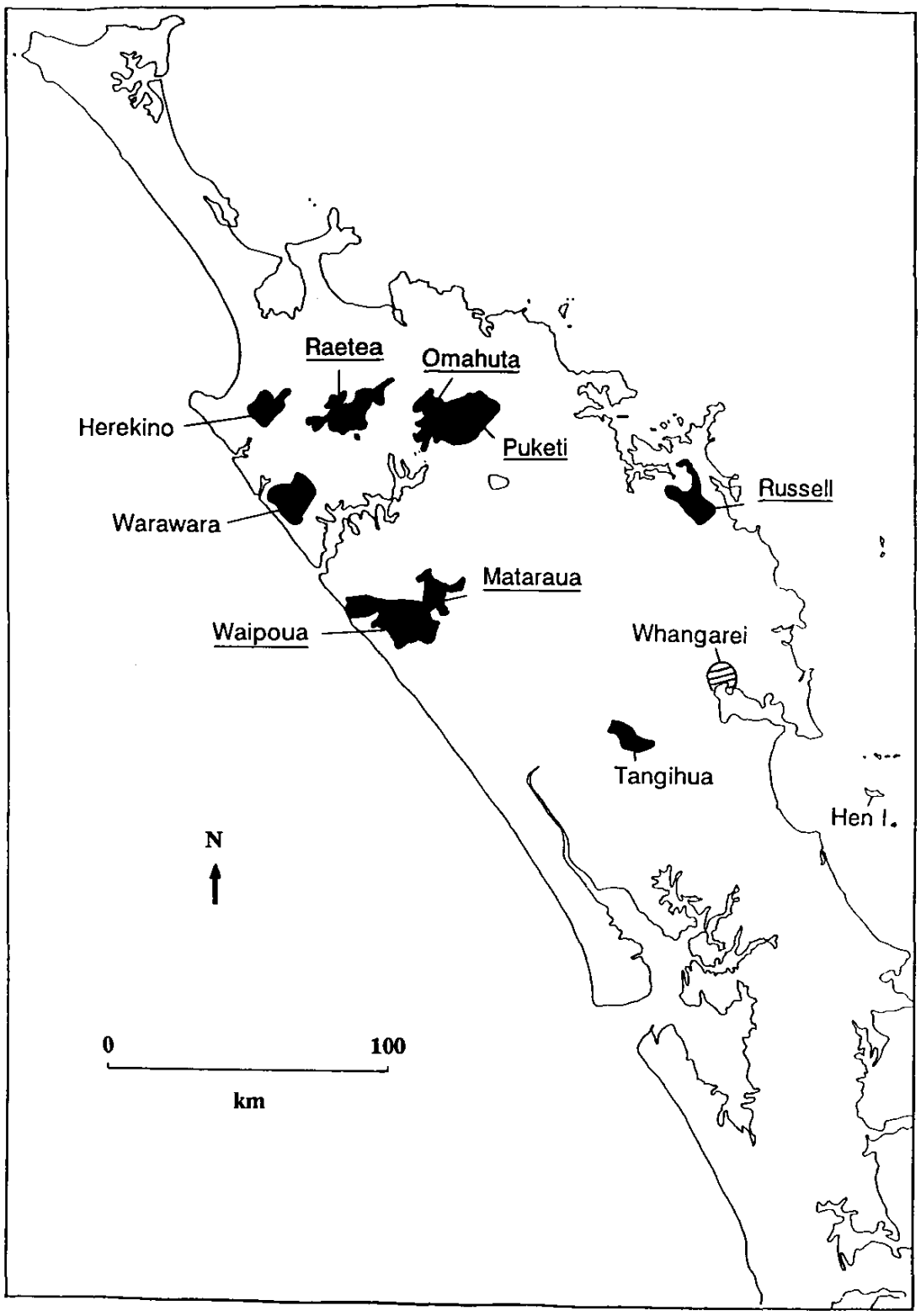

FIGURE 1 — Location map. Underlined localities indicate forests surveyed in 1993.

TABLE 1 — Details of forests surveyed

Forest	Year	No. of Stations	Dates Surveyed	Noise Levels : Range (and Mean)
Raetea	1979	41	6-7,15-16 January	0-2 (0.35)
	1993	41	6-7 January	0-2 (1.00)
Omahuta	1979	41	13-14 January	0-2 (0.50)
	1993	41	19 January	0-2 (1.00)
Puketi	1979	39	11-12 January	0-2 (0.55)
	1993	40	20 January	0-2 (0.95)
Waipoua	1979	40	21-22 January	0-2 (0.45)
	1993	30	23 January	0-1 (0.60)
Mataraua	1979	37	22-23 January	0-2 (0.85)
	1993	33	24 January	0-1 (0.40)
Russell	1979	40	25-26 January	0-2 (1.10)
	1993	37	26-29 January	0-2 (1.05)

or heard was recorded. Mammal sign (droppings, scratchings, footprints etc.) was assessed for each forest on a 0-3 scale for each species. Recent New Zealand Pigeon hunting sign (such as spent cartridges, feather caches and cleared undergrowth below miro (*Prumnopitys ferruginea*) trees was also ranked on a 0-3 scale. Species of tree with ripe fruit were noted.

In the 1993 survey, weather conditions, dates of survey (Table 1) and time of day closely matched those of 1979. One of the original surveyors from 1979 (P. Anderson) took part in the first of the 1993 surveys. At the beginning of each day two test counts were made to assess inter-observer variation. No corrections were required.

Means per station were calculated for the total birds of each species. For each species in each forest chi-square tests for significance were carried out between the 1979 and 1993 total counts. When fewer stations were counted than in 1979, comparisons were made only between the stations which were counted in both surveys. Common names and the order listed in Appendix 1 follow Turbott (1990).

RESULTS

NEW ZEALAND PIGEON

In all six forests the New Zealand Pigeon population indices were less than those recorded in 1979 (Table 2). Greatest reductions (3-5x) were in Russell, Raetea and Omahuta Forests. These three forests also had the highest pigeon hunting indices (both for recent sign and historical knowledge), and two of them (Russell and Omahuta) also had high possum indices (Table 3). In Raetea, however, possums were at low density.

In the hunting-free reserve adjacent to Raetea, the New Zealand Pigeon index (0.83) was highest of all the forests surveyed, despite a moderate density of possums.

TABLE 2 — Mean numbers of New Zealand Pigeon counted per 5 minutes

	Raetea	Puketi	Mataraua	Russell	Omahuta	Waipoua	Unnamed Reserve
1979	0.80	0.72	0.67	0.57	0.44	0.27	-
1993	0.24	0.58	0.52	0.11	0.15	0.13	0.83
1993/1979[1]	30%	81%	78%	19%	34%	48%	-
χ^2 test[1]	**	NS	NS	••	*	NS	-

Note 1 : 1993 counts as percent of 1979 count
Note 2 : NS = not significant; * = P <0.05, ** = P <0.01

TABLE 3 — Animal sign scored on a 0-3 scale during survey

	Raetea	Puketi	Mataraua	Russell	Omahuta	Waipoua
Possum	1	1*	2*	3+	3	1*
Poachers (recent)	3	1	0	2	2	0
Goats	1	1	2	1	1	1
Pigs	2	2	0	1	2	1-2
Cattle	2	0	0	1	0	0
Sheep	1	0	0	0	0	0

Note: 0 = no sign, 1 = little sign, 2 = moderate, 3 = much sign

* Aerial poisoning for possums occurred in Waipoua-Mataraua in 1990 and in Puketi in 1992. No other major possum operations have been undertaken in these forests.

KAKA *Nestor meridionalis*

A single bird was heard in Waipoua in 1993 compared with one to several birds being recorded in each of four forests in 1979 (Appendix 1).

EASTERN ROSELLA *Platycercus eximius*

Mean counts of Eastern Rosella closely approximated those in 1979. Lowest counts were recorded in the two high altitude forests, Raetea and Mataraua.

TABLE 4 — Mean numbers of Eastern Rosella counted per 5 minutes

	Raetea	Puketi	Mataraua	Russell	Omahuta	Waipoua
1979	0.14	0.51	0.29	0.22	0.29	0.40
1993	0.12	0.55	0.18	0.27	0.55	0.40
1993/1979	86%	108%	63%	123%	190%	100%
χ^2 test[1]	NS	NS	NS	NS	NS	NS

Note 1: NS = not significant

GREY WARBLER *Gerygone igata*

Mean counts of Grey Warbler were remarkably similar between forests, all of which showed a slight (statistically not significant) increase over the 1979 counts.

TABLE 5 — Mean numbers of Grey Warblers counted per 5 minutes

	Raetea	Puketi	Mataraua	Russell	Omahuta	Waipoua
1979	1.02	0.97	1.13	1.15	1.02	1.07
1993	1.12	1.17	1.61	1.27	1.20	1.10
1993/1979	110%	120%	142%	110%	118%	103%
χ^2 test[1]	NS	NS	NS	NS	NS	NS

Note 1 : NS = not significant

FANTAIL *Rhipidura fuliginosa*

There was wide variation in Fantail population indices, both among forests and between surveys. The 1993 index was significantly lower at Raetea than in 1979, but in Puketi it was significantly higher.

TABLE 6 — Mean numbers of Fantails counted per 5 minutes

	Raetea	Puketi	Mataraua	Russell	Omahuta	Waipoua
1979	0.56	0.62	0.37	0.32	0.56	0.70
1993	0.22	1.03	0.61	0.57	0.65	0.63
1993/1979	39%	165%	164%	177%	116%	90%
χ^2 test[1]	*	*	NS	NS	NS	NS

Note 1 : NS = not significant, * = $P < 0.05$

PIED TIT *Petroica macrocephala*

Pied Tit numbers varied widely among forests, in two of which (Puketi and Mataraua) counts were significantly higher than in 1979.

TABLE 7 — Mean numbers of Pied Tit counted per 5 minutes

	Raetea	Puketi	Mataraua	Russell	Omahuta	Waipoua
1979	1.68	0.62	1.39	0.60	0.54	0.90
1993	1.34	1.03	2.67	0.62	0.70	0.70
1993/1979	80%	165%	192%	104%	130%	78%
χ^2 test	NS	*	*	NS	NS	NS

Note 1 : NS = not significant, * = $P < 0.05$

SILVEREYE *Zosterops lateralis*

Mean Silvereye counts ranged from 0.6 to 1.9 birds per 5 minutes, compared with 1.35 to 2.79 during 1979, being down in each forest and significantly so in four of them.

TABLE 8 — Mean numbers of Silvereyes counted per 5 minutes

	Raetea	Puketi	Mataraua	Russell	Omahuta	Waipoua
1979	2.54	2.13	2.79	1.78	2.56	1.35
1993	1.76	1.60	1.28	1.54	1.90	0.60
1993/1979	69%	75%	46%	87%	74%	44%
χ^2 test[1]	*	NS	**	NS	*	*

Note 1 : NS = not significant, * = P <0.05, ** = P <0.01

TUI *Prosthemadera novaeseelandiae*

Except for Russell Forest, average Tui counts were very close to those in 1979. As in 1979, highest counts were in Mataraua and lowest counts (with the greatest decline) were in Russell Forest.

TABLE 9 — Mean numbers of Tui counted per 5 minutes

	Raetea	Puketi	Mataraua	Russell	Omahuta	Waipoua
1979	1.73	1.54	2.68	1.73	1.58	1.50
1993	1.63	1.63	2.64	0.84	1.54	1.37
1993/1979	94%	106%	98%	48%	97%	91%
χ^2test[1]	NS	NS	NS	*	NS	NS

Note 1 : NS = not significant, * = P<0.05

MYNA *Acridotheres tristis*

Myna population indices were higher in 1993 than in 1979 for all forests, significantly so for Mataraua, Russell and Omahuta (Table 10). As in 1979, lowest densities were in the two high altitude forests, Raetea and Mataraua.

TABLE 10 — Mean numbers of Myna counted per 5 minutes

	Raetea	Puketi	Mataraua	Russell	Omahuta	Waipoua
1979	0.12	0.77	0.08	0.35	0.85	1.65
1993	0.17	1.18	0.33	0.81	1.50	1.97
1993/1979	142%	153%	412%	232%	176%	119%
χ^2 test[1]	NS	NS	*	*	*	NS

Note 1 : NS = not significant, * = P <0.05

KOKAKO *Callaeas cinerea*

Two Kokako were recorded in Mataraua in 1993 compared with several birds in each of Mataraua, Puketi and Raetea Forests in 1979.

DISCUSSION

For the 1993 survey, the principal variables of observer ability, time of year, time of day and weather (especially wind noise) closely matched those of the 1979 survey. One variable that was not measured in 1979 was that of fruiting and flowering phenology. It was clear, however, that fruit was readily available in all forests during both surveys. Local variations in food availability should not have influenced the outcome of these surveys because they covered a large proportion of each forest. Thus, although the two sets of counts 14 years apart cannot show population trends, they do give a reasonable measure of net change over that time period.

Numbers of New Zealand Pigeons have clearly decreased since 1979. The main ecological changes brought about in Northland forests since 1979 have been due to an increase in possums. Possums not only compete for food with New Zealand Pigeons, but also prey on their eggs (R. Pierce, unpubl.). Of the six forests surveyed in 1993, Russell Forest is the one worst affected by possums, including the loss of most rata trees (*Metrosideros robusta*) and heavy browse on a range of other tree species. Whereas possums may have had some impact on New Zealand Pigeon in Russell Forest, the same cannot be said for Raetea Forest. Of the forests surveyed, Raetea Forest has the lowest density of possums and possums did not begin arriving there until the 1980s (Julian 1984). However, New Zealand Pigeon numbers have crashed in Raetea. As in Russell, New Zealand Pigeon in Raetea currently experience high hunting pressure. The small unhunted reserve near Raetea, however, had the highest counts of any forest in 1993 (similar to the highest counts in 1979) and in the face of a moderate possum density.

Except for Puketi Forest, observations on other forest surveys suggest that the 1993 New Zealand Pigeon counts for each forest were generally representative of that forest as a whole (pers. obs., N. Miller, A. Walker, pers. comm.). In Puketi the block of stations counted were in an isolated, untracked part of the forest and farthest from the main sources of pigeon hunters (A. Walker, pers. comm.). In this respect the results from Puketi may overestimate the population status of New Zealand Pigeons in that forest.

The ability of some New Zealand Pigeon populations to maintain numbers in non-hunting areas and in the presence of possums (M.Clout, pers. comm.) suggests that hunting may be the more important limiting factor in Northland. This contention is supported by studies on population dynamics and breeding success in the Whangarei area (R Pierce, pers. obs.) suggesting that, on average, an adult New Zealand Pigeon in a hunted area will die before it can replace itself.

Apart from occasional scattered sightings (especially in Puketi), most Kaka in Northland are seasonal in the Whangarei area, where they are probably visitors from the Hen and Chickens and/or Little Barrier Islands. Specific surveys for Kokako (R. Parrish, unpub.) have confirmed that they have declined in both Puketi and Raetea and that their density is highest (but still only a few pairs) in Mataraua Forest (Pierce & Montgomery 1992). The disappearance of Kokako from Raetea is surprising considering the local scarcity of possums. The possibility that some of the birds have been shot

cannot be ruled out because their 1979 range (J. Kendrick, pers. comm.) coincided with an area currently intensively hunted for New Zealand Pigeons.

Kokako and Silvereye were the only native passerines to show significant changes in population indices between 1979 and 1993. Silvereye counts in 1993 were down in all forests, significantly so in four. This may simply reflect differences in adult survival and breeding success between 1978-79 and 1992-93. Spring 1992 was one of the coldest and wettest on record in Northland and many Silvereyes captured in Whangarei in July-September 1992 were in very poor condition, including individuals with extensively defeathered heads and/or bodies (R. Pierce, pers. obs.). Silvereyes are productive breeders, however, and can recover in numbers more quickly than slow-breeding species such as the New Zealand Pigeon.

Insectivorous passerines showed no consistent changes, except for the Pied Tit, which increased in Puketi and Mataraua. Over the same period range extensions of Pied Tits were noted in several parts of eastern Northland and Aupouri Peninsula (P. Anderson, pers. comm.). The significant decline in Tui numbers in Russell Forest may partly reflect the extensive (possum-induced) loss of rata, on which Tui frequently feed in January each year. Some rata was flowering in all forests surveyed in January 1993 and probably all of those surveyed in 1979 (P. Anderson, pers. comm.).

Increasing numbers of Mynas in Northland's forests and on offshore islands (R. Pierce, pers. obs.) raises questions on the levels of impact that these birds may be having on other biota. There is a need for an intensive study on the predatory behaviour of Mynas and also the degree to which foraging flocks deplete berries of certain trees, e.g. kahikatea.

ACKNOWLEDGEMENTS

We thank P. Anderson, S. McManus, R. Parrish, and A. Walker who helped with the survey; K. Moynihan, who made data available from the 1979 survey, M. Clout, who reviewed the manuscript, and J. Roberts, who typed the manuscript.

LITERATURE CITED

ATKINSON, R. 1993. Killing the kereru. Forest and Bird 267:18-23.
CLOUT, M.N. 1988. Kereru hunting. Forest and Bird 19(3):9.
CLOUT, M.N. 1990. The kereru and its forests. Birds International 2(4):10-19.
DAWSON, D.G.; BULL, P.C. 1975. Counting birds in New Zealand forests. Notornis 22: 101-109.
JULIAN, A. 1984. Possum distribution and recent spread in northern Northland: with observations on the vegetation. Lands & Survey Dept, Wellington, unpub. report.
MOYNIHAN, K. 1980. Birdlife in seven state forests surveyed in Northland. Fauna Survey Unit Report No. 22, New Zealand Wildlife Service, Wellington.
OGLE, C.C. 1982 - Wildlife and wildlife values of Northand. Fauna Survey Unit Report No. 30, New Zealand Wildlife Service, Wellington.
PIERCE, R.J.; MONTGOMERY, P.J. 1992. The fate of birds and selected invertebrates during a 1080 operation. Science & Research Internal Report No. 121. Department of Conservation, Wellington.
TURBOTT, E.G. 1990. Checklist of the Birds of New Zealand (3rd edn.). Auckland: Ornithological Society of New Zealand.

R.J. PIERCE, R. ATKINSON, E. SMITH, *Department of Conservation, P.O. Box 842, Whangarei*

APPENDIX 1: — Mean values for 5-minute bird counts in 1979 (upper value) and 1993 (below)

P = present, * = significant difference, ** = highly significant

Forest		Raetea	Puketi	Mataraua	Russell	Omahuta	Waipoua
Harrier	1979	P	P	P			
	1993			P	P		
Pheasant	1979	P				P	
	1993						
New Zealand Pigeon	1979	0.80	0.72	0.67	0.57	0.44	0.27
	1993	0.24**	0.58	0.52	0.11**	0.15*	0.13
Kaka	1979	P	P	P	P		
	1993						P
Parakeet sp.	1979						P
	1993	P					
Eastern Rosella	1979	0.14	0.51	0.29	0.22	0.29	0.40
	1993	0.12	0.55	0.18	0.27	0.54	0.40
Shining Cuckoo	1979	P	P	P		P	
	1993	P		P			
Morepork	1979	P				P	
	1993	P					P
Kingfisher	1979	0.15	0.52	0.21	0.39	0.50	0.23
	1993	0*	0.28	0.12	0.41	0.27	0.17
Welcome Swallow	1979						
	1993	P				P	
Blackbird	1979	0.51	0.15	0.24	0.16	0.22	0.13
	1993	0.76	0.08	0.06	0.16	0.05	0.07
Dunnock	1979		P		P		
	1993					P	
Fernbird	1979					P	P
	1993						
Fantail	1979	0.56	0.62	0.37	0.32	0.56	0.70
	1993	0.22*	1.03*	0.61	0.57	0.65	0.63
Pied Tit	1979	1.68	0.62	1.39	0.60	0.54	0.90
	1993	1.34	1.03*	2.67*	0.62	0.70	0.70
Grey Warbler	1979	1.02	0.97	1.13	1.15	1.02	1.07
	1993	1.12	1.17	1.61	1.27	1.20	1.10
Silvereye	1979	2.54	2.13	2.79	1.78	2.56	1.35
	1993	1.76*	1.60	1.28**	1.54	1.90*	0.60*
Tui	1979	1.73	1.54	2.68	1.73	1.58	1.50
	1993	1.63	1.63	2.64	0.84*	1.54	1.37
Chaffinch	1979	0.51	0.43	0.70	0.26	0.41	0.27
	1993	0.41	0.20	0.24*	0.62*	0.22	0.10
Goldfinch	*1979*					P	
	1993					P	
Myna	1979	0.12	0.77	0.08	0.35	0.85	1.65
	1993	0.17	1.18	0.33*	0.81*	1.50*	1.97
Yellowhammer	1979						P
	1993						
Kokako	1979	P	P	P			
	1993			P			