Distribution and Abundance of the Striated Caracara *Phalcoboenus australis* in the Falkland Islands - 2006

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Striated Caracara adult investigating surveyors on Sedge Island

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Summary

A comparison between early reports of the Striated Caracara as 'very numerous' and the recent surveys of breeding birds shows that the population is now a very small proportion of what it was two centuries ago. Given its rarity, the Government and people of the Falkland Islands have an obligation to protect this globally, *Near Threatened* species. It may only be surviving in the Falklands because adequate prey and suitable nesting habitat exist on the outer uninhabited islands, where it is free from persecution. The 2006 survey has shown that the breeding population of the Striated Caracara is not increasing despite the protection given by the 1999 legislation. Further research is essential. The Striated Caracara is important within the biodiversity of the Islands and should be investigated fully so that its future can be assured.

Background

The Striated Caracara (known locally as 'Johnny Rook') is a natural inhabitant of the Falkland Islands. Radio-carbon dating of sub-fossil bones found in peat deposits on West Point Island proves that it was present in some numbers 5,500 years ago, about five millennia before sheep were introduced. It was recognised as a very unusual bird of prey from the earliest days of settlement in the 18th century. Barnard (1812) said the species was very numerous on New Island and during his two visits to East Falkland in March and April 1833 and 1834, Charles Darwin found it to be not only 'exceedingly numerous' but 'extraordinarily tame and fearless'. He said that it 'constantly haunted the neighbourhood of houses to pick up all kinds of offal' and described it as 'very mischievous and inquisitive, quarrelsome and passionate'.

In 1908 it was officially classed as a pest of sheep farming when it was included in an Ordinance for the Destruction of Birds of Prey. However, by 1922, the Government Naturalist (James E Hamilton) stated that it had been subjected to 'a remorseless process of extermination' and its numbers on East and West Falkland were very low. Hamilton pointed out to the Falkland Islands Government (FIG) that ceasing the payment of bounties 'would remove from Government the liability to reproach from scientists that

encouragement was given to the extermination of one of the ornaments of the local avifauna' (Woods and Woods 1997). Bounty payments by FIG ceased about 80 years ago but the relationship between 'Johnny Rooks' and the sheep farming industry has remained controversial.

A Striated Caracara Survey was carried out in 1997 and 1998 at the request of FIG to record, as far as possible, their distribution and abundance within the Falklands and to establish a basic methodology for monitoring the status of this species in future. The survey report was taken into account when drawing up new conservation legislation.

BirdLife International (2000) classified this species as *Near Threatened* due to its restricted geographic distribution and small population and it now receives official protection under Falkland Islands law, through the legislation of the Conservation of Wildlife and Nature Ordinance 1999. Clauses exist which allow limited killing following written application to FIG and the granting of a licence but these have not been widely used. Opinions on the detrimental/beneficial effects of 'Johnny Rooks' on sheep farming/tourism still differ widely between landowners.

Introduction

Due to time and funding limitations a complete survey was not possible. The 2006 fieldwork was planned to investigate some of the islands surveyed in November 1997 or November 1998 and a few not previously visited. Consideration was given to carrying out the survey from late December to late January, when nestlings would be growing, becoming vocal at nests and probably easier to locate. However, availability of the charter boat was limited to November so the results of the two surveys were directly comparable.

Three surveyors were involved for the whole month: Michael Morrison and Robin Woods, both of whom carried out the 1997 and 1998 survey and Gavin Harrison, a volunteer from Edinburgh Zoo which has supported Falklands Conservation financially. Giselle Botha, a yachtswoman from South Africa, came for the first fortnight while Jonathan Meiburg, who

participated throughout the 1997 survey and had since completed graduate studies on Striated Caracaras at the University of Texas, joined us for the last fortnight. Rikki Evans, crew from the *Condor,* helped on North Fur Island. In the same breeding season, Michael and Jeannette Clarke and Adrianna Merrey counted nests with chicks on Saddle Island.

Gavin, Giselle and Mike following an adult; bull Elephant Seal hauled out

The *Condor,* owned and skippered by Michael Clarke, collected us from Carcass Island on 2 November. On 3 November, Harpoon, Outer and Double Islands in Queen Charlotte Bay were visited and checked for any signs of rats since rat eradication work by Falklands Conservation in 2001 and *Condor* reached Bird Island off Port Stephens camp on 4 November. Here the team camped in tents for three nights before travelling north and visiting The Twins off Carcass Island on 9 November. Two large islands,

Elephant Jason (10-13 November) and Grand Jason (13-18 November) were surveyed from temporary camps. Two nights were spent on Flat Jason (20-21 November), four nights on Steeple Jason and two of the team camped from 30 November to 2 December on South Jason. Other islands were visited on day voyages from West Point or Carcass Islands. Partial surveys of West Point and Carcass Islands were made up to 4 December and Saddle Island was surveyed on 20 January 2007.

Condor *off Twins North with Carcass Island behind*

Equipment

Island sketch maps were copied, enlarged and coastlines traced from the appropriate 1:50,000 DOS map, published in 1960 or 1961. For ease of use, maps were drawn to different scales to fit A4 sheets and were carried in Weatherwriter® cases with an attached pencil and eraser. We also had two Global Positioning System (GPS) units, spare batteries, two small compasses, a portable 2m transceiver for communication with *Condor*, a video camera from Edinburgh Zoo, digital cameras and sealable sample bags for collecting prey remains. Other personal equipment included field notebooks, sun block UV protection cream, a small First Aid kit, painkillers, binoculars, extra warm and waterproof clothing, food and water.

Data Collection

Traversing rugged coasts on uninhabited islands is potentially dangerous and we therefore worked mostly in pairs or with three or four together. The mapping methods used in 1997 and 1998 were modified slightly, though surveyors again where possible, walked the coastlines of islands looking for adult birds. On some islands with deep gulches or steep cliffs it was necessary to divert inland through the tussac, while still trying to retain views of coastal nest sites. Surveyors continually watched and scanned with binoculars for evidence that adults were standing in territories. When an adult was sighted, surveyors approached carefully, often having to push through dense tussac, looking for the probable mate and any territorial behaviour. Immature birds were noted, particularly when they were interacting with adult pairs; usually being chased away from nest sites.

Nest sites were numbered sequentially for each island separately, rather than in a continuous sequence as before. A GPS reading was taken of pairs or sites wherever possible and this was usually recorded simultaneously on a map and in a notebook. In areas with a dense population (where several adults were visible at any one time) great care was needed to distinguish adjacent pairs. With four observers, this was possible but it was sometimes difficult to separate adult pairs from their neighbours when some nests were as close as 50m from each other and occasionally, single adults followed the surveyors for 100m or more.

Almost all pairs were behaving territorially even though some nests were empty. Other nests were inaccessible on dangerous slopes or cliffs, but as our aim was to obtain evidence of all occupied territories, it was not necessary to see the contents of every nest. We did however, note a few locations as 'probable' sites (not included in the total) through the presence of single birds, apparently on watch in a territory, but where we could not locate a nest or see a mate.

Evidence of an occupied territory was based on the following observations:

- An empty completed nest with nearby adults obviously involved
- A nest containing one or more eggs or chicks

- An adult sitting tight on a nest
- Squeaking calls by one or both adults, with restless walking and distraction pecking at the ground
- One or both adults chasing or attacking immature birds approaching a probable nest site
- 'Head-throwing' display with very loud squawking calls; this was particularly important for identifying pairs where a nest was hidden but care was needed as this behaviour was also observed when pairs met away from their nest sites.

Striated Caracara pair displaying on Bird Island

On Steeple Jason and North Fur Islands, two teams operated separately and it was then necessary to confer on shore or the boat to check all the sites and annotations on the field maps and record them permanently in a notebook. Additional records of nest sites and materials, their aspect, height above beach level and distance behind high water mark were usually

recorded for possible comparison with previous records. We also recorded evidence of prey obtained from scattered feathers found at plucking sites.

Occupied territories were recorded in three categories.

- A nest with contents (either eggs or young birds) was plotted with a solid circle.
- An empty nest obviously in use or with an adult sitting was plotted as an open circle with a diagonal slash.
- Where a nest could not be found but a pair was acting territorially towards immatures or the surveyors, an open circle was plotted.

The number of eggs or nestlings seen was recorded on the map and in a notebook. Digital still images were made of several nest sites on each island; these images have since been labelled with site numbers. Digital video film was made at some nests by Gavin Harrison. He also recorded the island habitats and interviews with other surveyors, commenting on the purpose of the survey and the importance of some islands visited.

A UTM grid reference was noted for many sites, but unfortunately the GPS instruments automatically calculated this in Zone 20 because that is the baseline used for the western Falklands archipelago. The maps, on which our sketch maps were mostly based, used Zone 21, which meant that the UTM references were ineffective, except when both grids were marked. The latitude and longitude in degrees, minutes and decimals of minutes were recorded from the GPS readings and these were invaluable later when plotting and checking the final maps. Greatly improved outlines, showing coves, inlets and gulches, were obtained by using the Google Earth® program. Inputting the latitude and longitude co-ordinates, it was possible to locate sites more accurately than on the enlarged outlines of the old maps; therefore some maps have been redrawn using Google Earth®.

Results of the Survey

During the 2006 survey we visited 18 islands from Bird Island in the south to the Jasons. TABLE 1 comprises a list of islands with the dates visited, the duration of the visit and initials of the surveyors involved.

Appendix 1 contains copies of the final sketch maps with the 305 Striated Caracara territories plotted in the three categories described above.

Records in chronological order by islands with the site numbers and a cumulative total of sites for the whole survey are shown in TABLE 2. Data include the status of each site, any parental activity and nest contents. Co-ordinates are given in latitude and longitude for most sites and in a few cases (where a GPS reading was not possible) the UTM Zone 21, 1km-square, grid co-ordinates.

Codes used: AD = adult; AD ON = adult on nest; AGGR = aggressive behaviour; AGIT = agitated; C = chick(s); CG = calling; DISP = display; E = egg(s); IMMS = immatures; INC = incubating; JUV = juvenile; NNF = nest not found; NO AGGR = no aggression; NR = near; PR = pair.

Table 1 Islands surveyed

Islands	Date(s)	Survey period	Hours	Days	Surveyors
Harpoon	03 Nov.	1115 - 1245	1.5hrs		GB, GH, MM, RW
Outer	03 Nov.	1400 - 1645	2.75hrs		GB, GH, MM, RW
Double	03 Nov.	1715 - 1915	2hrs		GB, GH, MM, RW
Bird	04 - 07 Nov.			2.5 days	GB, GH, MM, RW
Twins (S.)	09 Nov.	1100 - 1500	4hrs		GB, GH, MM, RW
Twins (N.)	09 Nov.	1630 - 1900	2.5hrs		GB, GH, MM, RW
Elephant Jason	10 - 13 Nov.			3 days	GB, GH, MM, RW
Grand Jason	13 - 18 Nov.			5 days	GB, GH, MM, RW
Flat Jason	20 - 22 Nov.			2 days	GH, MM, RW
Sedge	23 Nov.	1015 - 1900	8.75hrs		GH, MM, RW
Hummock	25 Nov.	0900 - 1930	10.5hrs		GH, MM, RW
Steeple Islet	26 Nov.	1600 - 1830	2.5hrs		GH, JM, MM, RW
Steeple Jason	26 - 30 Nov.			3 days	GH, JM, MM, RW
South Jason	30 Nov. - 02 Dec.			1.5 days	GH, JM
West Point	01 Dec.	1015-1600; 1715-1930	7.5hrs		RW
North Fur	03 Dec.	1100 - 1530 (x2)	9hrs		RE, GH, JM, RW
Carcass	04 Dec.	1000 - 1900	9hrs		GH, JM, RW
Saddle	20 Jan. 2007	1600 - 2100 (x2)	10hrs		JC, MC, AM

Observers

GB = Giselle Botha	
GH = Gavin Harrison	RE = Rikki Evans
MM = Michael Morrison	JC = Jeannette Clarke
RW = Robin Woods	MC = Michael Clarke
JM = Jonathan Meiburg	AM = Adrianna Merrey

Table 2 List of Islands with data on territories or nests located

Date	Island	Site #	Cum. Sites	Status	Activity	Nest	Lat. & Long. & Zone 21 Grid ref.	Time
5 Nov.	Bird I.	1	1	Active nest	PR, AD ON		52° 10.22' S 60° 55.59' W	1705
		2	2	Contents seen	PR	3E	52° 10.18' S 60° 55.58' W	
		3	3	Contents seen	PR	4E	52° 10.13' S 60° 55.63' W	1745
		4	4	Site only	PR DISP, NNF		52° 10.08' S 60° 55.55' W	1815
		5	5	Site only	PR DISP, NNF		52° 10.12' S 60° 55.46' W TC325124	1837
		6	6	Active nest	PR building		304° from camp site	945
		7	7	Active nest	PR changing over		330° from camp site	
		8	8	Active nest	AD watching NR SITE		345° from camp site	
		9	9	Active nest	AD visiting SITE		024° from camp site	
		10	10	Active nest	PR visiting SITE		035° from camp site	
		11	11	Active nest	PR visiting SITE		TC328125	1050
		12	12	Active nest	PR, AD ON		52° 10.02' S 60° 55.42' W	1130
		13	13	Active nest	PR DISP, AD ON		52° 10.01' S 60° 55.44' W	
		14	14	Contents seen	PR	3E	52° 09.97' S 60° 55.55' W	
		15	15	Active nest	PR, AD ON		52° 09.88' S 60° 55.63' W	
		16	16	Active nest	AD ON		52° 09.96' S 60° 55.67' W	
		17	17	Active nest	PR		52° 09.96' S 60° 55.76' W	
		18	18	Site only	AD NNF		52° 10.01' S 60° 55.96' W	
		19	19	Contents seen	PR, AD ON	3E	52° 10.09' S 60° 55.97' W	
		20	20	Active nest	PR, new nest		TC318122	
		21	21	Contents seen	PR, nest on ground	3E	52° 10.16' S 60° 55.63' W	1755
		22	22	Site only	PR, CG, NNF		52° 10.06' S 60° 55.50' W	1205
		23	23	Contents seen	AD ON	3E	52° 10.03' S 60° 55.68' W	1311
		24	24	Contents seen	PR, DISP	3E	52° 10.05' S 60° 55.71' W	
		25	25	Site only	PR DISP NNF		52° 10.07' S 60° 55.65' W	
6 Nov.	Bird I.	26	26	Contents seen	PR	3E	52° 10.09' S 60° 55.61' W	1347
		27	27	Contents seen	AD watching	3E	52° 10.14' S 60° 55.56' W	1405
		28	28	Contents seen	AD ran off nest	3E	52° 10.12' S 60° 55.55' W	1450
		29	29	Contents seen	PR, AD watching	3E	52° 10.23' S 60° 55.61' W	1525
		30	30	Active nest	PR, AD ON,		52° 10.22' S 60° 55.66' W	
		31	31	Site only	AD watching, NNF		52° 10.29' S 60° 55.76' W	
		32	32	Contents seen	PR, AD ON, AGGR.	3E	52° 10.22' S 60° 55.78' W	1705
		33	33	Active nest	PR, AD ON, NNF		52° 10.13' S 60° 55.72' W	1730
7 Nov.		34	34	Contents seen	AD watching	3E	52° 10.16' S 60° 55.07' W	
		35	35	Site only	AD watching		TC332123	
		36	36	Site only	AD watching		TC327128	1200
9 Nov.	Twins (S)	1	37	Site only	AD watching		51° 14.81' S 60° 38.34' W	1115
		2	38	Contents seen	PR	2E	51° 14.71' S 60° 38.59' W	1225
		3	39	Site only	PR, AD watching, NNF		51° 14.59' S 60° 38.68' W	1302
		4	40	Contents seen	AD watching	2E	51° 14.60' S 60° 38.77' W	
		5	41	Active nest	AD NR; building?		51° 14.76' S 60° 38.71' W	1350
		6	42	Contents seen	PR, AD ON	3E	51° 14.76' S 60° 38.67' W	1356
		7	43	Site only	AD patrolling		51° 14.87' S 60° 38.61' W	1427
		8	44	Contents seen	AD ON	3E	51° 14.95' S 60° 38.47' W	1449
	Twins (N)	1	45	Active nest	PR, AD ON		51° 14.16' S 60° 38.83' W	1652
		2	46	Contents seen	AD ON	1E	51° 14.22' S 60° 38.91' W	1712
		3	47	Contents seen	AD ON, Mate NR	3E	51° 14.33' S 60° 39.09' W	1744
		4	48	Contents seen	AD ON	3E	51° 14.30' S 60° 39.15' W	1802
		5	49	Site only	PR DISP NNF		51° 14.25' S 60° 39.04' W	1820
		6	50	Contents seen	PR, AD ON	2E	51° 14.22' S 60° 39.00' W	1829
10 Nov.	Elephant Jason	1	51	Contents seen	AD ON	3E	51° 09.80' S 60° 50.91' W	1215
		2	52	Active nest	PR, AD ON, no view in nest		51° 09.74' S 60° 50.71' W	1250
		3	53	Site only	PR ACTIVE		51° 09.71' S 60° 50.56' W	1350
		4	54	Active nest	PR, Empty nest		51° 09.67' S 60° 49.99' W	1504
		5	55	Site only	PR waiting by empty nest		51° 09.59' S 60° 49.81' W	
		6	56	Contents seen	AD ON, PR	3E	51° 09.47' S 60° 49.70' W	1605
		7	57	Active nest	PR, nest building ?		51° 09.40' S 60° 49.67' W	1625

Date	Island	Site #	Cum. Sites	Status	Activity	Nest	Lat. & Long. & Zone 21 Grid ref.	Time
10 Nov.	Elephant Jason	8	58	Active nest	PR, Empty nest, building ?		51° 09.35' S 60° 49.68' W	1632
		9	59	Site only	PR NR, NO AGGR, NNF		51° 09.27' S 60° 49.77' W	1658
		10	60	Contents seen	AD ON	2E	51° 09.15' S 60° 50.06' W	1742
		11	61	Active nest	PR CLOSE,		51° 09.41' S 60° 50.05' W	1832
11 Nov.		12	62	Contents seen	AD ON	1E	51° 09.90' S 60° 51.02' W	956
		13	63	Contents seen	PR AD ON	1E	51° 10.10' S 60° 51.14' W	1012
		14	64	Active nest	PR, AD ON, nest empty		51° 10.14' S 60° 51.40' W	1058
		15	65	Site only	PR, AGGR NNF		51° 10.13' S 60° 51.45' W	1120
		16	66	Site only	PR, DISPCG, empty nest		51° 10.20' S 60° 51.58' W	1144
		17	67	Site only	PR, NNF		51° 10.18' S 60° 51.85' W	1349
		18	68	Site only	PR patrolling, NNF		51° 10.23' S 60° 52.33' W	1443
		19	69	Active nest	PR, AD ON		51° 10.24' S 60° 52.43' W	1505
		20	70	Contents seen	PR very AGIT, AD ON	3E	51° 10.12' S 60° 51.80' W	1738
12 Nov.		21	71	Contents seen	PR, CG	2E	51° 09.76' S 60° 51.13' W	1100
		22	72	Site only	PR, NNF		51° 09.67' S 60° 50.83' W	1133
		23	73	Contents seen	PR AGGR	3E	51° 09.12' S 60° 50.34' W	1429
		24	74	Active nest	PR, AD ON, NO AGGR		51° 09.19' S 60° 50.46' W	1445
		25	75	Contents seen	PR	3E	51° 09.26' S 60° 50.72' W	1540
		26	76	Contents seen	PR, V. AGGR	3E	51° 09.16' S 60° 51.11' W	1633
		27	77	Active nest	PR, AD ON		51° 09.38' S 60° 51.44' W	1705
		28	78	Contents seen	PR, AD ON, PETREL DIG	3E	51° 09.59' S 60° 51.54' W	1806
		29	79	Contents seen	PR	2E, 1C	51° 09.70' S 60° 51.56' W	1816
		30	80	Contents seen	PR, AGIT	3E	51° 09.80' S 60° 51.64' W	1749
14 Nov.	Grand Jason	1	81	Active nest	PR, AD ON		51° 04.85' S 61° 03.08' W	1133
		2	82	Contents seen	PR, AD ON	3E	51° 04.41' S 61° 03.27' W	1227
		3	83	Contents seen	PR, AD ON	3E	51° 04.29' S 61° 03.33' W	1240
		4	84	Contents seen	PR AD ON	3E	51° 03.86' S 61° 04.44' W	1503
		5	85	Active nest	AD ON		51° 03.73' S 61° 04.56' W	1518
		6	86	Contents seen	PR AD ON	3E	51° 03.61' S 61° 04.60' W	1531
		7	87	Active nest	AD ON, PR		51° 03.29' S 61° 04.66' W	1602
		8	88	Contents seen	PR, AD ON	2E	51° 03.06' S 61° 04.84' W	1638
		9	89	Contents seen	PR CG, AD poss. came off	0E	51° 02.91' S 61° 05.25' W	1700
		10	90	Active nest	PR, AD ON, AGGR, in oil drum		51° 02.82' S 61° 05.39' W	1711
		11	91	Contents seen	PR, DISP CG AGGR, in crate in woolshed	3E	51° 02.76' S 61° 05.48' W	1724
15 Nov.		12	92	Site only	PR DISP, AGGR to juv NNF		51° 04.06' S 61° 04.02' W	1550
		13	93	Contents seen	PR AGGR to imm	3E	51° 04.64' S 61° 04.38' W	1700
16 Nov.		14	94	Contents seen	PR, in Mag Penguin burrow	0E	51° 04.09' S 61° 04.19' W	1339
		15	95	Active nest	AD ON, Mate NR		51° 02.24' S 61° 05.70' W	1549
		16	96	Site only	3 ADS chasing, NNF		51° 01.93' S 61° 06.02' W	1654
		17	97	Contents seen	PR, AD ON, little CG	3E	51° 01.90' S 61° 06.17' W	1711
		18	98	Active nest	PR, AD ON DISP CG		51° 01.77' S 61° 07.02' W	1744
17 Nov.		19	99	Site only	PR chasing NNF		51° 04.48' S 61° 04.18' W	1035
		20	100	Site only	PR chasing NNF		51° 04.48' S 61° 04.18' W	1035
		21	101	Contents seen	PR, not INC?	2E	51° 04.45' S 61° 04.46' W	1147
		22	102	Contents seen	PR DISP	3E	51° 04.45' S 61° 04. 55' W	1209
		23	103	Active nest	PR AD ON		51° 04.42' S 61° 04. 68' W	1238
		24	104	Active nest	PR, DISP CG		51° 04.39' S 61° 04. 95 W	1313
		25	105	Site only	PR, CG,NNF		51° 04.04' S 61° 05. 60' W	1508
		26	106	Contents seen	PR, NO DISP new nest	0E	51° 03.94' S 61° 05. 96' W	1600
		27	107	Site only	AD watching, NNF		51° 03.90' S 61° 07. 10' W	1713
		28	108	Site only	PR, DISP CG, NNF		TD119347	1755
		29	109	Site only	PR watching from rock		TD118346	1805
		30	110	Contents seen	PR NR; 1 old, 1 young	0E	51° 03.96' S 61° 06. 42' W	1821
		31	111	Contents seen	PR, AD ON	2E	51° 03.95' S 61° 05. 96' W	1925
18 Nov.		32	112	Active nest	AD ON		TD154338	?
		33	113	Active nest	PR shelter NR, NO AGGR	0E	51° 01.69' S 61° 07. 32' W	1150
		34	114	Contents seen	PR, AD ON	3E	51° 01.66' S 61° 07. 78' W	1222
		35	115	Contents seen	PR DISP CG, AGGR	0E	51° 01.84' S 61° 07. 49' W	1243
		36	116	Contents seen	AD ON	2E	51° 01.90' S 61° 07 56' W	1253
		37	117	Active nest	PR, AD ON		51° 02.13' S 61° 07 38' W	1400
		38	118	Active nest	PR		51° 02.34' S 61° 07 22' W	1447

Date	Island	Site #	Cum. Sites	Status	Activity	Nest	Lat. & Long. & Zone 21 Grid ref.	Time
18 Nov.	Grand Jason	39	119	Site only	AD waiting, NNF		51° 03.00' S 61° 06 59' W	1605
		40	120	Site only	PR, NNF		51° 03.04' S 61° 06 68' W	1627
		41	121	Contents seen	PR, AD ON	3E	51° 03.30' S 61° 06 98' W	1721
		42	122	Site only	PR NR, NNF		51° 03.69' S 61° 07 77' W	1751
		43	123	Contents seen	PR, AD ON, NO AGGR	3E	51° 03.68' S 61° 07 80' W	1804
		44	124	Contents seen	PR AD ON, CG	3E	51° 03.36' S 61° 07 25' W	1837
20 Nov.	Flat Jason	1	125	Contents seen	PR, AD ON, CG	3E	51° 06.04' S 60° 53.67' W	1522
		2	126	Contents seen	PR, CG	3E	51° 05.66' S 60° 53.90' W	1619
		3	127	Active nest	AD ON, PR		51° 05.47' S 60° 54.12' W	1654
		4	128	Site only	PR, NNF		51° 05.40' S 60° 54.25' W	1750
		5	129	Contents seen	PR AD ON	2E	51° 05.35' S 60° 54.30' W	1833
		6	130	Contents seen	PR, DISP CG, NO AGGR	2E, 1C	51° 05.33' S 60° 54.76' W	1905
		7	131	Contents seen	PR, AD ON, CG	3E	51° 05.30' S 60° 55.06' W	1926
		8	132	Contents seen	PR, AD ON, NO AGGR	3E	51° 05.75' S 60° 54.37' W	2017
		9	133	Active nest	AD ON		51° 05.87' S 60° 54.16' W	2034
21 Nov.		10	134	Contents seen	AD ON	3E	51° 06.18' S 60° 53.52' W	0929
		11	135	Contents seen	PR, AD ON	3E	51° 06.41' S 60° 53.35' W	1022
		12	136	Site only	PR, NO DISP or AGGR		51° 06.50' S 60° 53.29' W	1037
		13	137	Active nest	PR, AD ON		51° 06.71' S 60° 53.27' W	1101
		14	138	Site only	PR, CG, NO AGGR		51° 07.04' S 60° 52.83' W	1201
		15	139	Site only	PR, NNF		51° 07.19' S 60° 52.44' W	1250
		16	140	Site only	PR, NO AGGR		51° 07.32' S 60° 52.37' W	1314
		17	141	Site only	PR, NO AGGR, both with pale 'trousers'		51° 07.37' S 60° 51.96' W	1450
		18	142	Contents seen	PR	2E	51° 07.29' S 60° 51.71' W	1529
		19	143	Contents seen	PR, DISP	3E	51° 06.91' S 60° 51.69' W	1657
		20	144	Contents seen	PR, AD ON	3E	51° 06.82' S 60° 52.13' W	1750
		21	145	Site only	PR, CG, DISP, NO AGGR		51° 06.68' S 60° 52.27' W	1815
		22	146	Contents seen	PR, AD ON	3E	51° 06.62' S 60° 52.53' W	1836
		23	147	Active nest	PR, AD ON, NO AGGR		51° 06.59' S 60° 52.82' W	1905
		24	148	Contents seen	PR, AD ON, NO AGGR	3E	51° 06.41' S 60° 52.99' W	1943
		25	149	Contents seen	AD ON	3E	51° 06.28' S 60° 53.13' W	2000
		26	150	Contents seen	PR, AD ON, DISP CG, NO AGGR	3E	51° 06.12' S 60° 53.11' W	2021
23 Nov.	Sedge	1	151	Contents seen	AD ON	3E	51° 08.95' S 60° 22.70' W	1215
		2	152	Active nest	PR, AD ON		51° 08.82' S 60° 22.90' W	1250
		3	153	Contents seen	AD ON	?E 1C	51° 08.70' S 60° 24.09' W	1454
		4	154	Active nest	PR, AD ON		51° 08.97' S 60° 25.76' W	1649
25 Nov.	Hummock	1	155	Site only	PR DISP, NNF		51° 36.52' S 60° 27.03' W	0954
		2	156	Active nest	AD ON		51° 36.47' S 60° 27.61' W	1115
		3	157	Site only	AD, NNF		51° 36.69' S 60° 27.39' W	1225
		4	158	Site only	PR DISP, NNF, prey taken		51° 36.90' S 60° 27.07' W	1315
		5	159	Site only	AD watching		51° 37.66' S 60° 25.24' W	1644
26 Nov.	Steeple Islet	1	160	Active nest	PR, AD ON		51° 03.40' S 61° 09.43' W	1612
		2	161	Contents seen	PR, AD ON	3E	51° 03.40' S 61° 09.54' W	1631
		3	162	Active nest	PR, AD ON		51° 03.49' S 61° 09.66' W	1655
		4	163	Contents seen	PR, AD ON	2E	51° 03.51' S 61° 09.57' W	1709
		5	164	Contents seen	AD ON	3E	51° 03.57' S 61° 09.50' W	1723
		6	165	Contents seen	PR, AD ON	2E	51° 03.67' S 61° 09.41' W	1741
		7	166	Contents seen	AD ON	3E	51° 03.53' S 61° 09.21' W	1815
27 Nov.	Steeple Jason	1	167	Active nest	AD ON		51° 01.18' S 61° 13.95' W	1028
		2	168	Site only	PR, AGGR, NNF		51° 01.14' S 61° 14.09' W	1045
		3	169	Site only	MALE only; Female dead		51° 00.96' S 61° 14.43' W	1115
		4	170	Contents seen	PR, AD ON	3E	51° 00.83' S 61° 14.81' W	1140
		5	171	Active nest	PR, AD ON		51° 00.76' S 61° 15.00' W	1204
		6	172	Contents seen	PR, AD ON (lame Left leg)	3E	51° 00.80' S 61° 15.08' W	1225
		7	173	Site only	AD watching, NNF		51° 00.80' S 61° 15.18' W	1240
		8	174	Contents seen	PR, AD ON	2E	51° 00.89' S 61° 15.12' W	1251
		9	175	Contents seen	PR, male ringed blue; AD ON	2E	51° 00.91' S 61° 15.09' W	1301
		10	176	Contents seen	AD ON	2E	51° 00.91' S 61° 15.07' W	1316
		11	177	Contents seen	PR, AD ON	3E	51° 01.06' S 61° 15.07' W	1340

Date	Island	Site #	Cum. Sites	Status	Activity	Nest	Lat. & Long. & Zone 21 Grid ref.	Time
27 Nov.	Steeple Jason	12	178	Contents seen	PR DISP CG	2E	51° 01.08' S 61° 15.05' W	1358
		13	179	Contents seen	PR CG, AD ON,	2E	51° 01.13' S 61° 15.10' W	1443
		14	180	Contents seen	PR, AD ON	3E	51° 01.19' S 61° 15.09' W	1506
		15	181	Contents seen	AD ON	2E	51° 01.32' S 61° 15.09' W	1557
		16	182	Contents seen	PR, AD ON, DISP	3E	51° 01.34' S 61° 15.09' W	1607
		17	183	Active nest	PR, AD ON [GPS 50m to South of site]		51° 01.37' S 61° 15.11' W	1635
		18	184	Contents seen	PR, AD ON, DISP AGGR	1E	51° 01.42' S 61° 15.01' W	1658
		19	185	Site only	PR, DISP, NNF		51° 01.44' S 61° 14.99' W	1722
		20	186	Contents seen	PR, AD ON, DISP CG	3E	51° 01.50' S 61° 14.98' W	1753
		21	187	Contents seen	PR, AD ON CG	3E	51° 01.60' S 61° 14.90' W	1816
		22	188	Contents seen	PR, AD ON	3E	51° 01.56' S 61° 14.78' W	1847
28 Nov.		23	189	Contents seen	PR, AD ON	3E	51° 01.59' S 61° 14.70' W	1120
		24	190	Site only	PR watching, NNF		51° 01.64' S 61° 14.70' W	1137
		25	191	Contents seen	PR, AD ON	2E	51° 01.73' S 61° 14.62' W	1159
		26	192	Site only	PR, DISP		51° 01.74' S 61° 14.58' W	1215
		27	193	Active nest	PR, AD ON		51° 01.75' S 61° 14.48' W	1232
		28	194	Site only	PR, DISP CG, NO AGGR		51° 01.75' S 61° 14.40' W	1254
		29	195	Contents seen	PR, AD ON	2E	51° 01.70' S 61° 14.35' W	1315
		30	196	Site only	PR, NNF		51° 01.74' S 61° 14.31' W	1326
		31	197	Contents seen	PR, AD ON, DISP	2E	51° 01.76' S 61° 14.19' W	1418
		32	198	Site only	PR, NNF		51° 01.84' S 61° 14.04' W	1506
		33	199	Contents seen	PR, AD ON, NO AGGR	2E	51° 01.88' S 61° 14.00' W	1519
		34	200	Contents seen	PR, DISP, AGGR	3E	51° 01.94' S 61° 13.95' W	1542
		35	201	Contents seen	PR, AD ON	3E	51° 02.07' S 61° 13.80' W	1633
		36	202	Contents seen	PR, AD ON, very AGGR	3E	51° 02.08' S 61° 13.74' W	1656
		37	203	Contents seen	PR, AD ON	3E	51° 02.19' S 61° 13.72' W	1719
		38	204	Contents seen	PR, AD ON, DISP	3E	51° 02.21' S 61° 13.66' W	1736
		39	205	Site only	PR DISP		51° 02.26' S 61° 13.48' W	1810
		40	206	Contents seen	PR, DISP, AD ON	3E	51° 02.27' S 61° 13.45' W	1816
		41	207	Active nest	AD ON, Mate watching		51° 02.31' S 61° 13.28' W	1846
		42	208	Active nest	AD with mate flew ON		51° 02.27' S 61° 13.20' W	1900
		43	209	Active nest	AD ON, Mate watching	0E	51° 02.23' S 61° 12.99' W	1921
29 Nov.		44	210	Contents seen	PR, AGGR	2E	51° 02.05' S 61° 12.84' W	1830
		45	211	Site only	PR, NNF		51° 01.92' S 61° 12.76' W	1838
		46	212	Site only	PR, NNF		51° 01.88' S 61° 12.82' W	1845
		47	213	Contents seen	PR, AD ON, DISP	2E	51° 01.64' S 61° 13.26' W	1903
		48	214	Contents seen	PR, AD ON	3E	51° 01.54' S 61° 13.34' W	1909
		49	215	Contents seen	PR, AD ON	2C	51° 01.29' S 61° 13.43' W	1343
		50	216	Site only	PR, DISP, NNF		51° 01.18' S 61° 13.54' W	c1000
		51	217	Site only	PR, DISP, NNF		51° 02.64' S 61° 12.50' W	1058
		52	218	Active nest	PR, DISP, very AGGR		51° 02.75' S 61° 12.47' W	1118
		53	219	Site only	AD watching		51° 02.81' S 61° 12.21' W	c1145
		54	220	Contents seen	PR, AD ON	3E	51° 02.90' S 61° 12.12' W	1239
		55	221	Site only	PR, AD watching, AGGR NNF		51° 02.93' S 61° 12.07' W	1255
		56	222	Active nest	AD ON, PR, very AGGR		51° 02.98' S 61° 12.05' W	1315
		57	223	Site only	AD watching, DISP, NNF		51° 03.10' S 61° 11.97' W	1345
		58	224	Site only	PR CG		51° 03.02' S 61° 11.78' W	1452
		59	225	Active nest	AD ON		51° 03.37' S 61° 11.02' W	1553
		60	226	Site only	PR mating		51° 03.27' S 61° 10.27' W	1415
		61	227	Contents seen	PR, nest material	1E	51° 02.59' S 61° 11.48' W	1202
		62	228	Active nest	AD ON, Mate watching		51° 02.43' S 61° 11.89' W	1102
		63	229	Site only	AD watching, silent		51° 02.17' S 61° 12.61' W	1015
		64	230	Site only	PR DISP, chasing IMMS		TD022389	c?
30 Nov.	South Jason	1	231	Contents seen	PR DISP, AD ON, AGGR	3E	51° 12.81' S 60° 55.93' W	1256
		2	232	Site only	PR watching, AGGR to juv		51° 12.81' S 60° 56.02' W	1309
		3	233	Contents seen	PR, AD ON, DISP, NO AGGR	3E	51° 12.85' S 60° 55.99' W	1338
		4	234	Site only	PR, DISP AGGR to juv		51° 12.78' S 60° 55.44' W	1548
		5	235	Contents seen	PR, AD ON, DISP	3E	51° 12.78' S 60° 54.88' W	1712
		6	236	Site only	PR, AGGR to juvs DISP NNF		51° 12.49' S 60° 54.57' W	1801
		7	237	Contents seen	PR watching	1C	51° 12.56' S 60° 54.87' W	1839
		8	238	Site only	PR DISP, AGGR, NNF		51° 12.69' S 60° 55.39' W	1926

Date	Island	Site #	Cum. Sites	Status	Activity	Nest	Lat. & Long. & Zone 21 Grid ref.	Time
1 Dec.	South Jason	9	239	Site only	AD watching, NNF		51° 12.78' S 60° 55.72' W	0955
		10	240	Site only	PR DISP, AGGR		51° 12.56' S 60° 53.99' W	1145
		11	241	Contents seen	PR, AD ON	2C	51° 12.58' S 60° 53.72' W	1220
		12	242	Site only	AD DISP, chasing IMMS		51° 12.57' S 60° 53.54' W	1327
		13	243	Site only	AD DISP, chasing IMMS		51° 12.58' S 60° 53.39' W	1344
		14	244	Site only	AD DISP chasing AD with prey		51° 12.54' S 60° 53.19' W	1418
		15	245	Site only	AD watching		51° 12.48' S 60° 52.95' W	1436
		16	246	Site only	PR DISP		51° 12.39' S 60° 52.51' W	1506
		17	247	Site only	PR DISP		51° 12.23' S 60° 52.31' W	1529
		18	248	Site only	PR mating & DISP		51° 12.25' S 60° 52.25' W	1538
		19	249	Site only	PR DISP chasing IMMS		51° 12.20' S 60° 52.09' W	1548
		20	250	Site only	AD watching, DISP, NNF		51° 12.04' S 60° 51.84' W	1606
		21	251	Site only	PR DISP,		51° 12.05' S 60° 53.04' W	1903
		22	252	Site only	PR DISP, chasing IMMS		nil	
1 Dec.	West Point	1	253	Site only	AD watching NR old nest, NNF		51° 20.64' S 60° 40.88' W	1113
		2	254	Active nest	PR, AD ON		51° 20.08' S 60° 41.91' W	1222
		3	255	Active nest	AD ON		51° 19.94' S 60° 42.69' W	1257
		4	256	Contents seen	AD ON	2C	51° 19.77' S 60° 43.26' W	1408
		5	257	Active nest	AD ON		51° 21.06' S 60° 40.28' W	1808
		6	258	Active nest	PR visiting site		51° 20.91' S 60° 42.56' W	
		7	259	Site only	Reported by RB Napier		51° 21.23' S 60° 40.01' W	
3 Dec.	North Fur	1	260	Contents seen	PR, AD ON	3C	51° 07.92' S 60° 45.38' W	1147
		2	261	Contents seen	PR, AD ON, DISP	3C	51° 07.92' S 60° 45.32' W	1200
		3	262	Contents seen	AD ON	1E 2C	51° 07.85' S 60° 45.36' W	1212
		4	263	Contents seen	PR, AD ON	2-3C	51° 07.78' S 60° 45.21' W	1301
		5	264	Active nest	AD ON, midges over nest	?C	51° 07.72' S 60° 44.90' W	1411
		6	265	Contents seen	PR, AD ON	3E	51° 07.63' S 60° 44.74' W	1441
		7	266	Contents seen	PR, AD ON	3E	51° 07.56' S 60° 44.42' W	1510
		8	267	Contents seen	PR, AD ON	1E 1C	51° 07.50' S 60° 44.35' W	1518
		9	268	Contents seen	PR DISP, AD ON	3E	51° 07.51' S 60° 44.22' W	1527
		10	269	Contents seen	AD ON, DISP	2E	51° 07.61' S 60° 44.25' W	1544
		11	270	Active nest	PR, AD ON		51° 07.98' S 60° 44.97' W	1132
		12	271	Active nest	PR, AD ON, Mate watching		51° 07.93' S 60° 44.83' W	1214
		13	272	Contents seen	AD ON, Mate watching	3E 1.C.	51° 07.89' S 60° 44.61' W	1333
		14	273	Active nest	PR, AD ON, CG		51° 07.85' S 60° 44.58' W	1353
		15	274	Site only	AD watching, NNF		51° 07.78' S 60° 44.36' W	1500
		16	275	Contents seen	PR, AD ON	2E 1C	51° 07.67' S 60° 44.28' W	1536
4 Dec.	Carcass	1	276	Contents seen	PR, DISP CG	2E 1C	51° 16.59' S 60° 35.76' W	1024
		2	277	Contents seen	AD ON CG	3E	51° 16.44' S 60° 35.98' W	1059
		3	278	Active nest	PR, AD ON, CG		51° 16.25' S 60° 36.27' W	1131
		4	279	Contents seen	AD ON, AGGR	1E 1C	51° 15.86' S 60° 36.03' W	1224
		5	280	Contents seen	AD ON, PR DISP	1E 2C	51° 15.65' S 60° 36.04' W	1313
		6	281	Contents seen	PR waiting off	2C	51° 14.98' S 60° 35.77' W	1417
		7	282	Contents seen	PR, AD ON	3E	51° 14.85' S 60° 35.87' W	1535
		8	283	Site only	PR, CG, NNF		TD504159	1615
		9	284	Contents seen	PR, AD ON	2C	51° 15.41' S 60° 34.57' W	1650
		10	285	Contents seen	PR	2C	51° 17.71' S 60° 33.34' W	1842
		11	286	Contents seen	3 ADS tending chicks	2C	51° 17.70' S 60° 32.30' W	c2030
20 Jan. 2007	Saddle	1	287	Contents seen		2C	TC070670	1610
		2	288	Contents seen		2C	TC069671	
		3	289	Contents seen		1C	TC068671	
		4	290	Contents seen		2C	TC067673	
		5	291	Contents seen		2C	TC068673	
		6	292	Contents seen		3C	TC069674	
		7	293	Contents seen		2C	TC070674	
		8	294	Contents seen		2C	TC070675	
		9	295	Contents seen		2C	TC071675	
		10	296	Contents seen		2C	TC072674	
		11	297	Contents seen		2C	TC073675	
		12	298	Contents seen		1C	TC074674	
		13	299	Contents seen		1C	TC075673	
		14	300	Contents seen		2C	TC075672	
		15	301	Contents seen		1C	TC075671	
		16	302	Contents seen		2C	TC075670	
		17	303	Contents seen		3C	TC074670	2030
		18	304	Contents seen		2C	TC071671	
		19	305	Contents seen		2C	TC072672	

A comparison has been made of the total numbers of confirmed sites counted on the islands that were investigated in both 1997/98 and 2006 surveys. The figures are given in TABLE 3. The population generally seemed stable on islands visited during both surveys, with maturing birds apparently colonising islands where there were few pairs in 1997. There was however, a marked, unexplained decrease on Grand Jason.

Table 3 Comparison between 1997 or 1998 counts and 2006

	1st Survey	**2nd Survey**	**Difference**	
			Increased	Decreased
Bird	50	50	0	0
Twins (S.)	2	8	6	
Twins (N.)	2	6	4	
Elephant Jason	22	30	8	
Grand Jason	67	44		23
Flat Jason	29	26		3
Sedge	0	4	4	
Hummock	2	5	3	
Steeple Islet	6	7	1	
Steeple Jason	68	63		5
North Fur	10	16	6	
Carcass	13	16	3	
Totals	271	275	35	31

As we were unable, in one month, to survey all islands where Striated Caracaras breed, records received for islands or mainland areas where they were known to breed in 1997-1998 or have since been reported, were taken into account. These are listed in TABLE 4. Although such figures may be out-of-date, there are no other data from which to make an educated guess at the unsurveyed population, which may be 40% of the total.
Calculations suggest that there are possibly about 200 more pairs, giving an estimated total Falkland population of about 520 pairs, roughly the same size as eight or nine years ago.

Table 4

Islands not surveyed in 2006: estimated 207 pairs of Striated Caracaras

Locations	Year	Pairs
1st Passage	1997	2
2nd Passage	1997	8
3rd Passage	<1988	6
4th Passage	<1988	2
Bald	?	?
Beauchene	2005	70
Beaver I	2005	2
Beef I.	2001	2
Bense	2006	1
Big Arch	1998	6
Blind	?	?
Brandy	1998	1
Calista	<1988	3
Clarke's Islet	1997	3
Clump (nr. Wolfe)	?	?
Coffin I.	2001	1
Cross	2001	2
Dunbar	1997	1
Elephant Cays	<1988	12
Emily	1998	1
Gibraltar Rock	1998	6
Gid's	1997	1
Government Islet	2001	1
Green (KG Bay)	1997	1
Green (Philomel Rds)	?	1
Gull	2001	1
Jason East Cay	<1988	2
Jason West Cay	<1988	2
Keppel Islet	?	?
Letter box	2005	1
Long Point ??	?	1
Low	1997	2
Meredith Lagoon	?	?
Middle (KG Bay)	1997	0
Natural Arch	1998	2
Total		144

Locations	Year	Pairs
New I.	2005	7
North I.	2005	6
North Swan	?	?
North Tyssen	?	?
Penn	?	?
Pitt	2001	1
Port Edgar Islet	<1988?	1
Port Egmont Cays	<1988	4
Port Stephens I	?	1
Rabbit	1997	1
Rabbit Is. Rocks	?	?
Rum	1998	1
Sand Bay	1998	1
Sandy (Tyssen group)	?	?
Sea Dog	1998	1
Sea Lion	2005	10
Sea Lion Easterly	1998	5
Seal Rocks (Jasons)	?1988	2
Seal Rocks (by New I.)	?	1
Ship Harbour I.	2001	1
South Fur	1997	4
Split (by West Point)	2001	2
Split I (Beaver)	2005	1
Staats	2005	1
Ten Shilling Bay Is.	1998	2
Ten Shilling Bay peninsula	2001	3
The Fridays	1997	4
Tussock	1998	2
Wedge	?	?
West	?	?
West Tyssen	?	?
Whisky	1998	1
Total		63

Discussion and Conclusions

We have little evidence except hearsay of the longevity of adult Striated Caracaras in the wild. Studies of other raptors suggest it is possible that the annual mortality of adults is about 5% and that they live for at least 20 years. The breeding population should be increasing given the conservation legislation that is in place and the protection to all the major sites, which are either FIG or Wildlife Conservation Society (WCS) Reserves.

Appendix 2 contains spreadsheet calculations of survival and productivity based on the total number of breeding pairs estimated in 1997 & 1998 (Tables 5 to 11). Mortality rates are based on figures published for raptors of similar size (Campbell & Lack 1985). Tables showing productivity in terms of juveniles fledged and theoretical mortality rates for juveniles and adults for the period 1997-2006 allow comparisons between different possible annual mortality rates and their effects on the size of the whole population.

Experimental calculations suggest that the size of the current breeding population can most probably be accounted for by the assumption that on average a pair raises only 1.5 chicks annually, that the mortality of juveniles is as high as 75% and that an annual mortality rate of 5% is reached in the 5^{th} year of life. If the juvenile mortality rate was 60%, there should now be more than 600 breeding pairs, using the suggested annual mortality rates and including the surviving adults. However, no evidence of a substantial increase was found so it seems that a postulated first year rate of about 75% is probably near the actual mortality rate.

Research

The 2006 survey of distribution and abundance has shown that despite the protection given by the 1999 legislation, the breeding population of the Striated Caracara has not increased since 1998 and is relatively static at about 500 pairs. The reasons for this are not understood and further investigation is required. Possible explanations include:

- lack of food, especially during the months when some of the prey species are at sea
- shortage of suitable breeding habitat in tussac grass
- continued destruction by humans.

This survey has demonstrated that research is essential to identify the factors controlling the Falkland population. The following actions should be taken:

- as a priority, the breeding population must be monitored on at least one island through a carefully planned and intensive ringing scheme including adults and fledged juveniles
- follow-up fieldwork will include detailed studies of diet, behaviour,

population dynamics, dispersal movements and the survival of individually marked birds over several years.

Of parallel importance:

- the incidence of damage to livestock by Striated Caracaras and as reported by farmers must be assessed and data on its frequency and effects obtained
- non-judgemental discussions with farmers and direct observations of Striated Caracara behaviour are essential
- the assessment of the impact of Striated Caracaras on sheep farming should involve several farms and farmers.

Aspects of the research needed to understand the population dynamics, behaviour and ecological requirements of this very unusual raptor are outlined below.

Habitat

- What are the optimum habitat requirements of the species?
- How is territory size affected by habitat and potential food-sources?
- How close must a pair be to sources of food for breeding to be successful?
- Is availability of suitable habitat limiting its distribution within the Falklands?
- Is tussac grass essential for successful breeding?
- What are the impacts of experimental reinstatement of habitat, such as tussac grass restoration?

Behaviour

- Are mates faithful from year to year?
- Do pairs re-use the same nest-sites annually?
- What is the significance of threesomes at a nest?
- At what age do they start to breed?
- Are juveniles and immatures more inquisitive than adults?
- Can a scale of attractiveness of familiar/novel objects (living, dead or inanimate) be devised by experimental methods with birds of different ages?

- Can individuals or groups be diverted away from potential prey by providing alternative food in winter?

Diet

- What are the most important prey species?
- Is there seasonal variation in preferences?
- Are there local differences in importance of prey species, for Striated Caracara populations in the Jasons group, on Bird Island and Beauchêne Island?

Population dynamics

- What effects do variations in habitat and competition with other predators have on maintenance of viable populations?
- What is the age-composition of flocks at different periods of the year e.g. in autumn, during winter, in spring and during the breeding season?
- Do maturing birds preferentially return to their natal islands?
- At what age do maturing birds start courtship, pairing and establishing potential breeding territories?

Migratory movements

- What controls dispersal or nomadism of immature birds and how does their behaviour relate to the adult breeding population?
- How long do groups of immature birds stay at settlements?
- Do maturing birds tend to return to their natal islands and at what age?

Distribution - restricted range

- Why is the species restricted to the Falkland archipelago and islands off Tierra del Fuego?
- Has it failed in competition with other, more aggressive or vigorous species or introduced predators?
- Is this limited range a function of its specialised feeding habits?
- How far is it dependent on colonially-breeding seabirds?

Sea Lions on Grand Jason: Striated Caracaras feeding on faeces

Conflict with sheep farming

- How does the apparent threat to sheep from the Striated Caracara compare, in terms of losses of livestock, with other known threats to their welfare such as exposure to inclement weather, especially when lambing or at shearing times?
- How can the perceived conflict with the interests of some sheep farmers be quantified?
- Would altering shepherding practices reduce the impact of Striated Caracaras, for example with different lambing times?
- Could acceptable measures be devised to mitigate any losses shown to be caused by Striated Caracaras?

Acknowledgements

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when transferring between *Condor,* the dinghy and slippery wet rocks on uninhabited islands; to Rob McGill of Carcass Island; to Lily and Roddy Napier of West Point Island for accommodation, food and very welcome home facilities and to WCS for use of their research station on Steeple Jason. We are also grateful to the landowners who allowed us access to Hummock, Sedge and Harpoon Islands and to FIG and WCS for granting permission for fieldwork on their Nature Reserves in the Jason Islands group.

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Appendix 1.

Copies of the sketch maps of the 15 islands visited in the Survey with territories of Striated Caracaras identified. These are listed in order of visits except that Grand Jason and Steeple Islet are on the same map but were surveyed on different days.

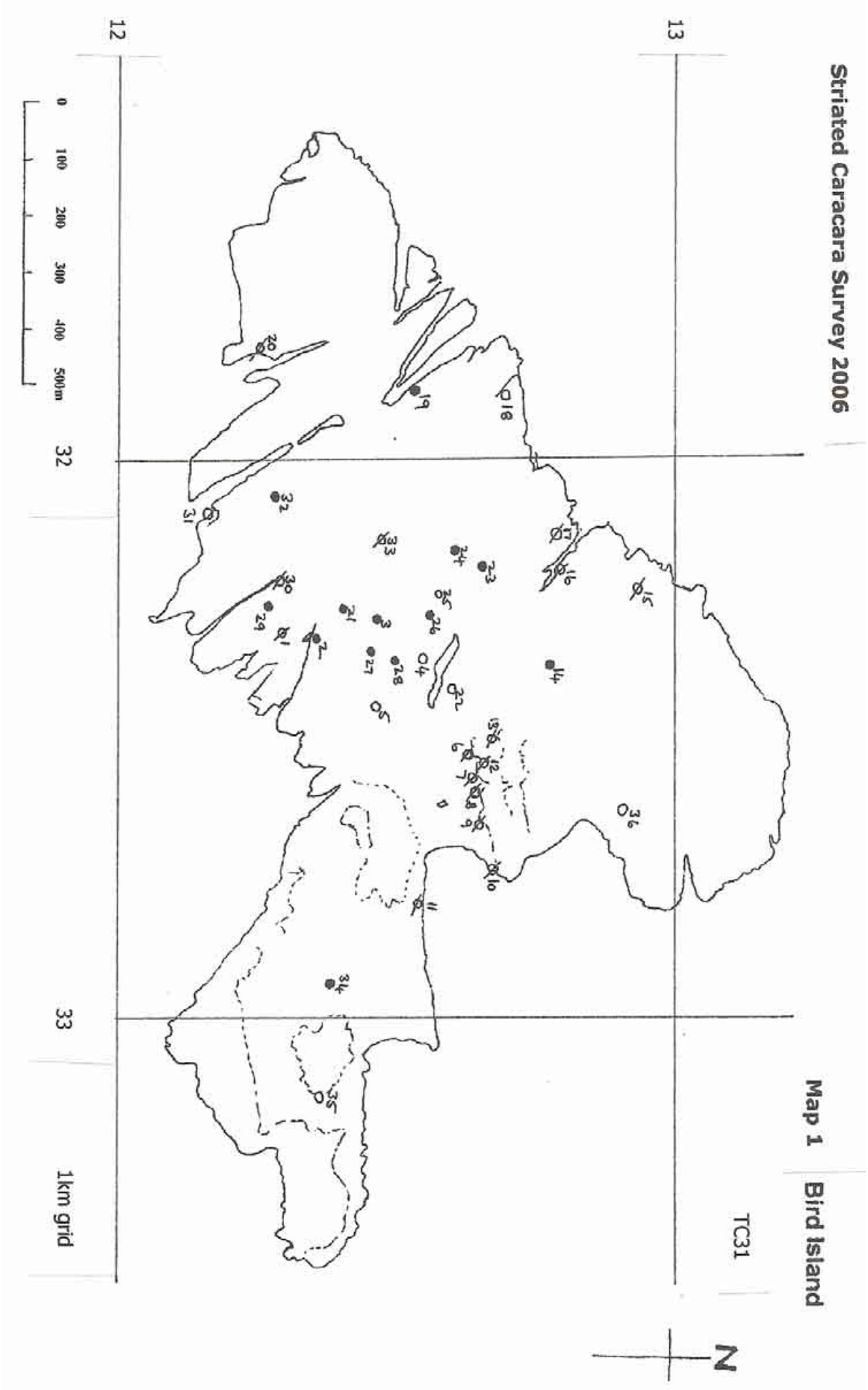
1. Bird Island
2. The Twins (South) and The Twins (North)
3. Elephant Jason
4. Grand Jason and Steeple Islet
5. Flat Jason
6. Sedge Island
7. Hummock Island
8. Steeple Jason
9. South Jason
10. West Point Island
11. North Fur Island
12. Carcass Island
13. Saddle Island

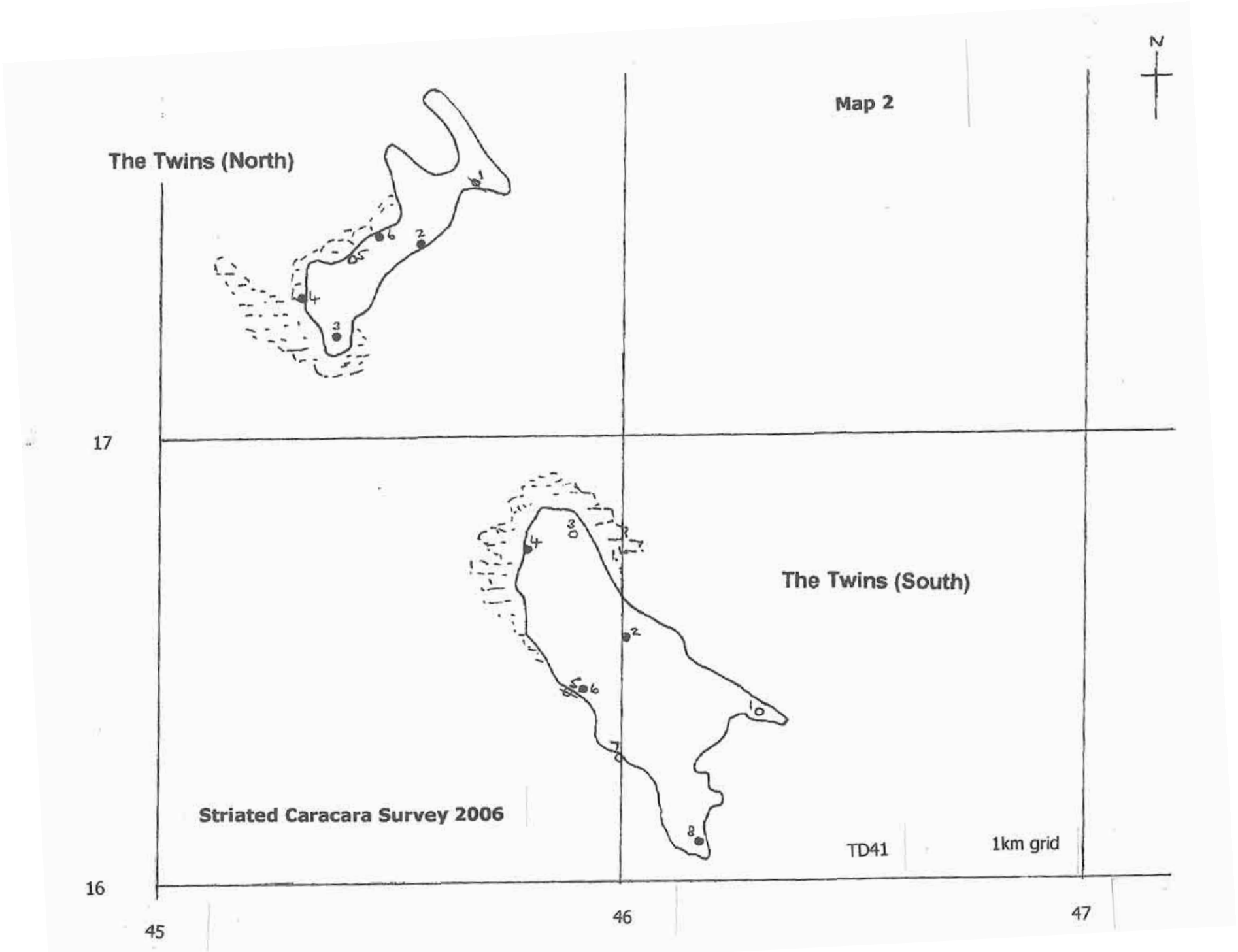
Key

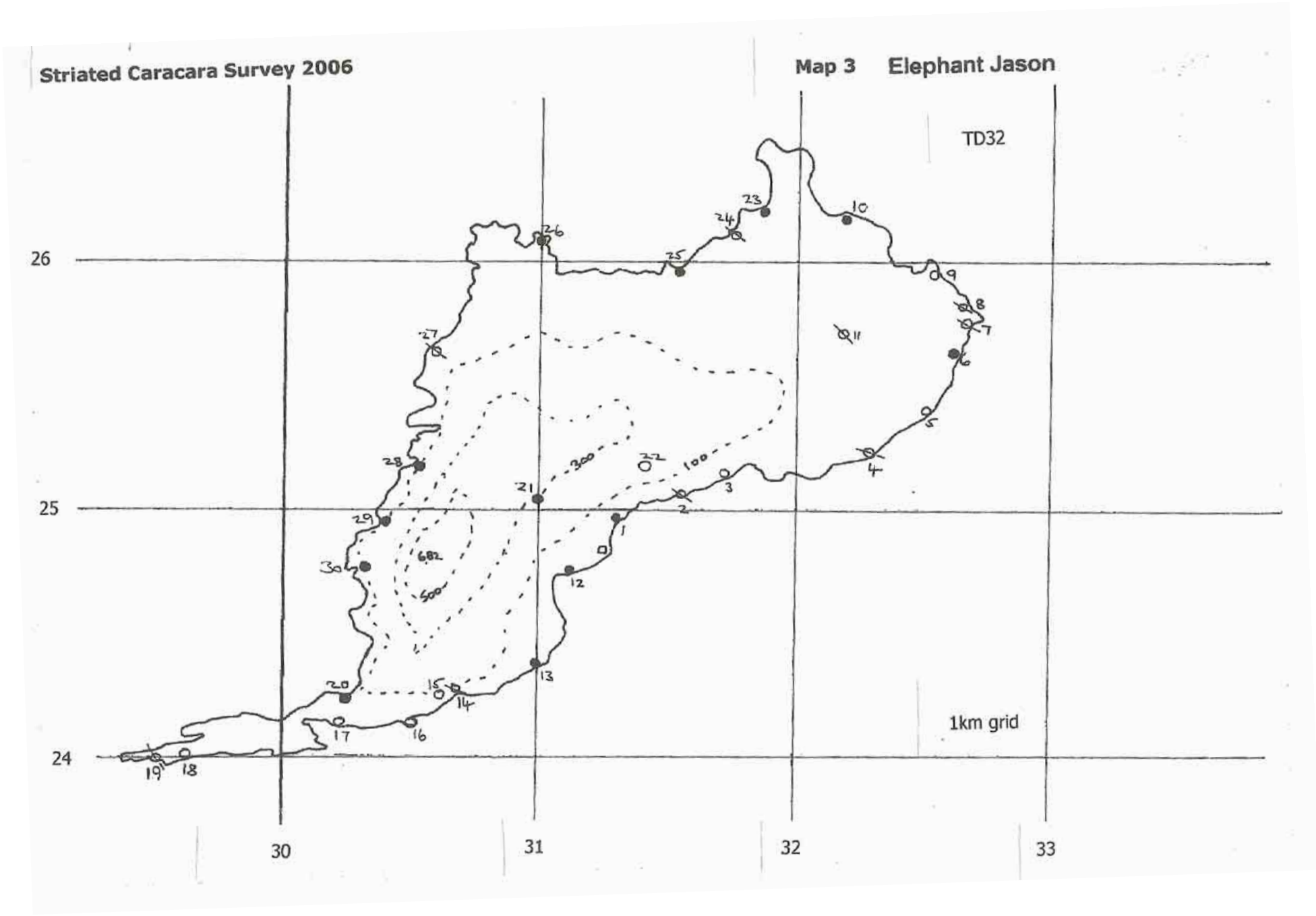
Occupied territories were recorded in three categories.

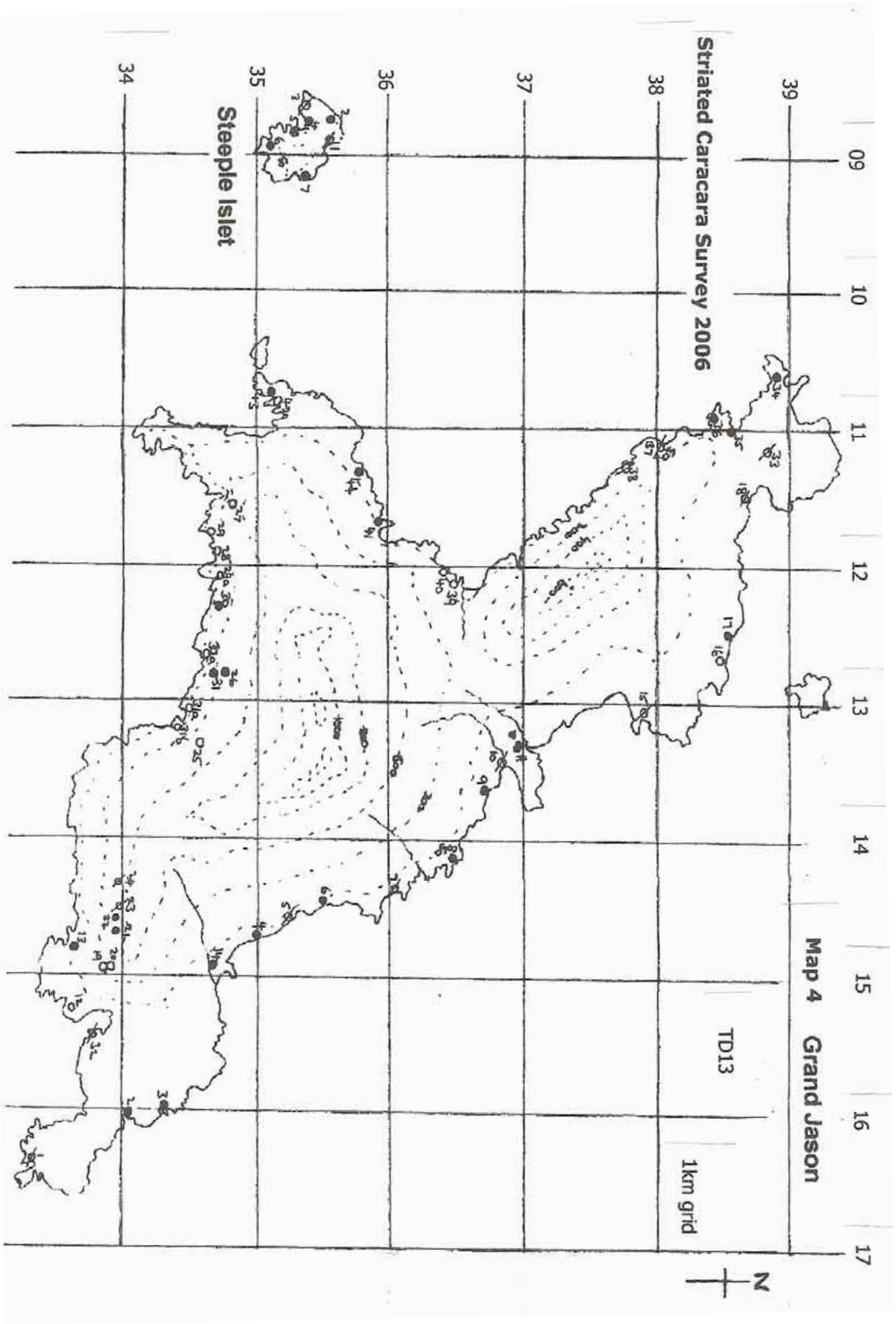
- A nest with contents (either eggs or young birds) was plotted with a **filled circle**.
- An empty nest obviously in use **or** with an adult present, often incubating and not walking off, was plotted as a **circle with a diagonal slash**.
- a site with adults acting territorially towards immatures or the surveyors but where the nest could not be found, was plotted as an **open circle**.

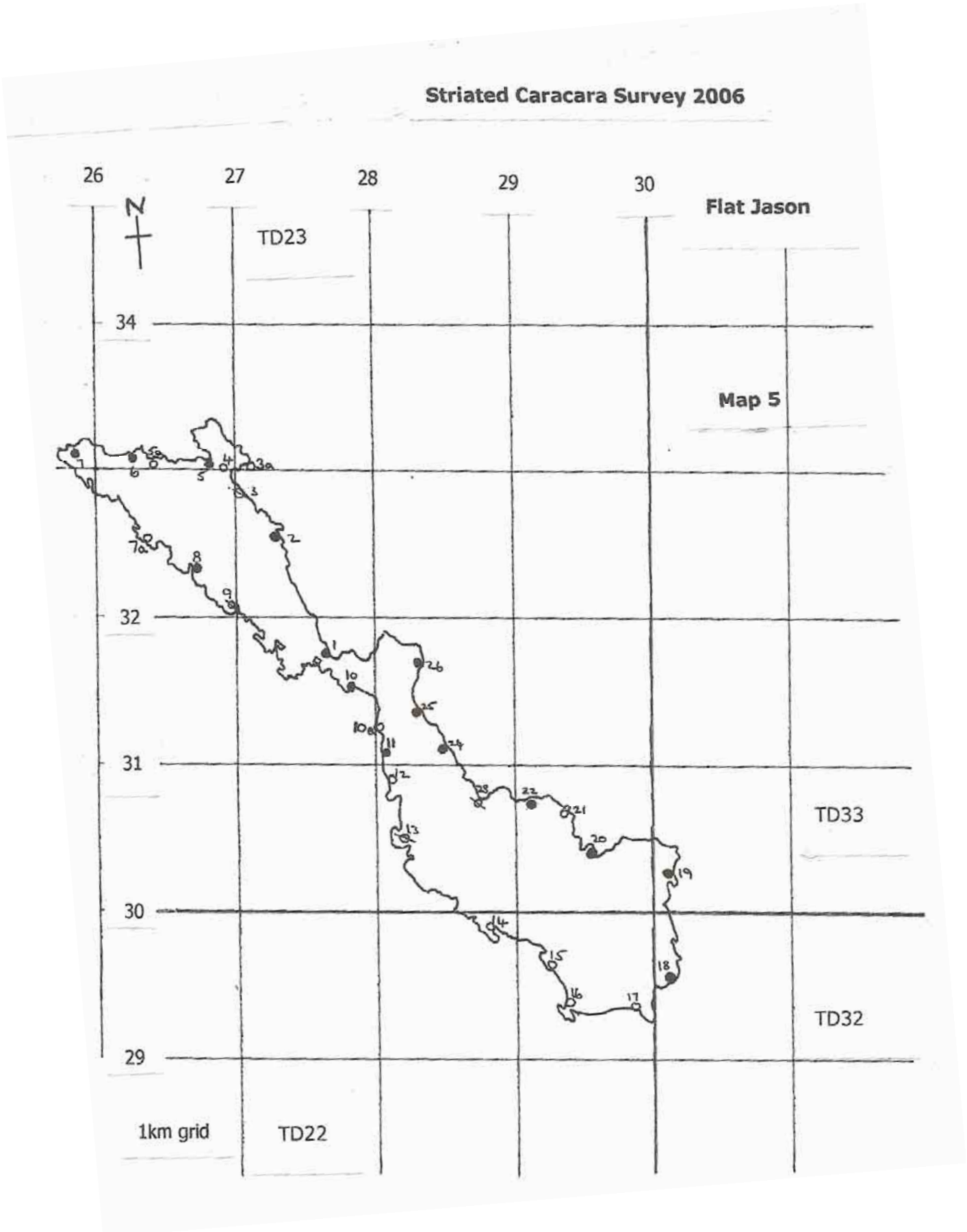
A few sites are marked with a circle, a number and a letter ‘a’ or’b’, indicating a solitary adult bird where there was insufficient evidence to record a territory.

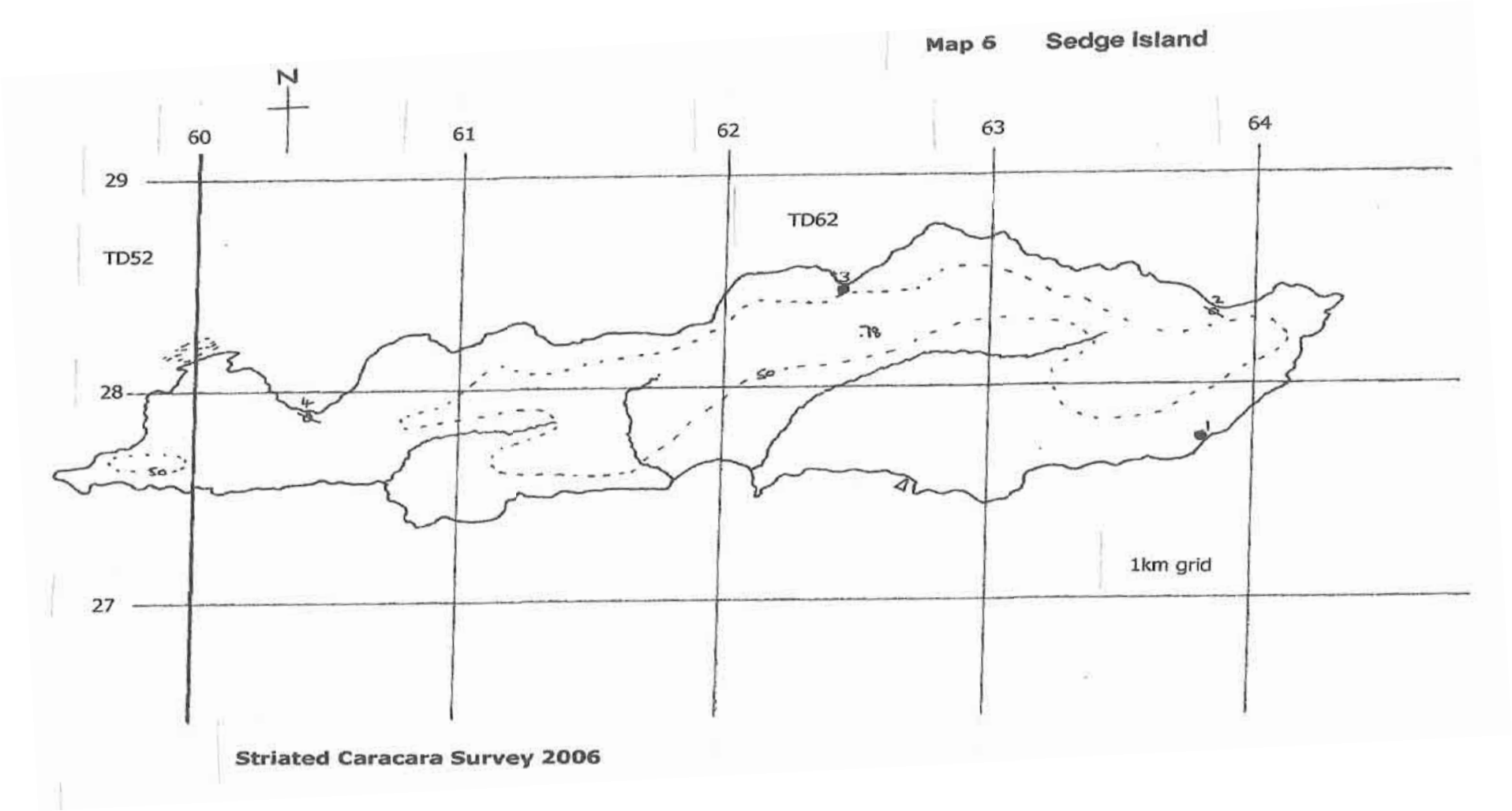

Striated Caracara Survey 2006
Map 1
Bird Island
TC31
N
12
13
32
33
0 100 200 300 400 500m
1km grid

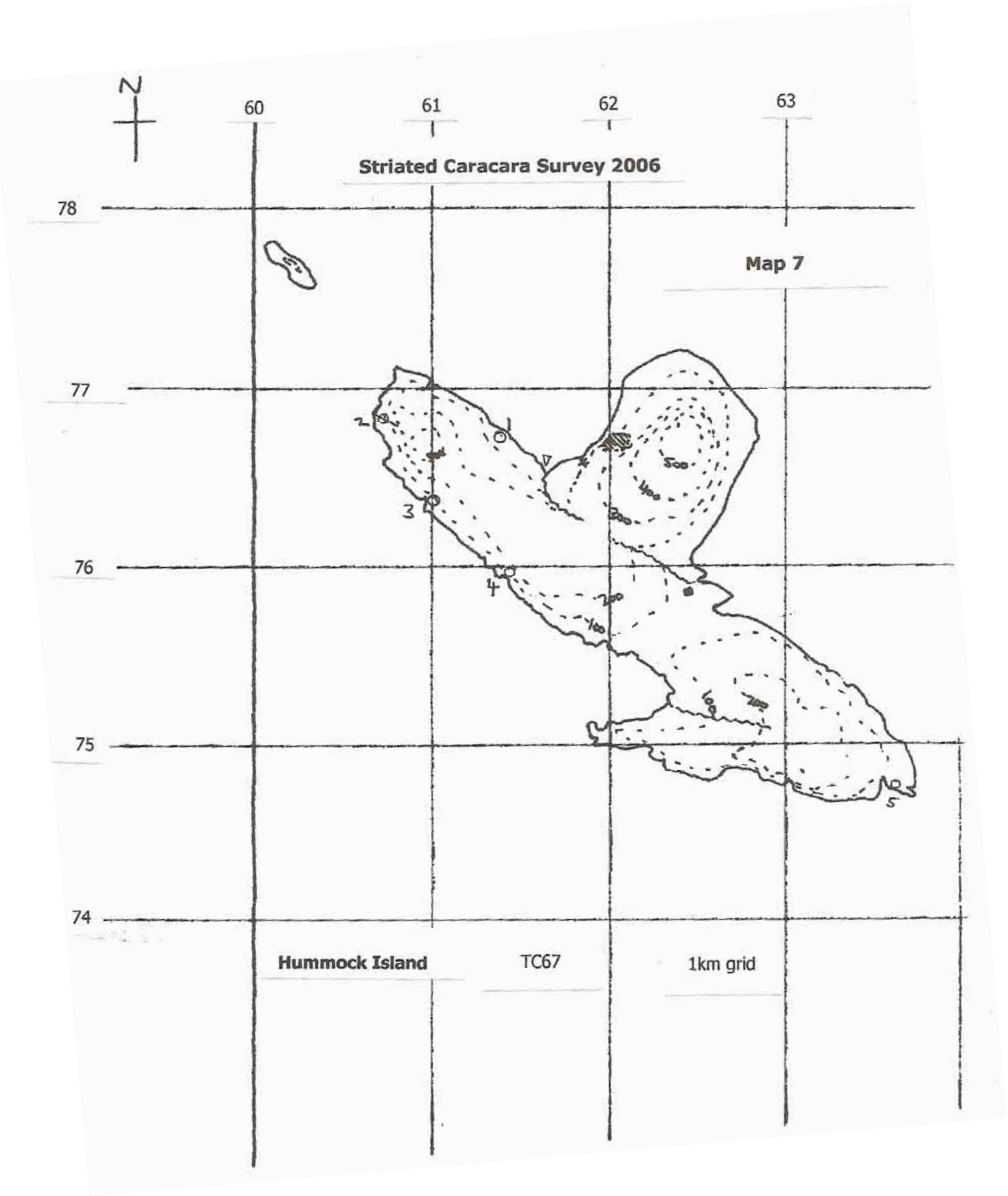

Map 2
N
The Twins (North)
The Twins (South)
Striated Caracara Survey 2006
TD41
1km grid
17
16
45
46
47

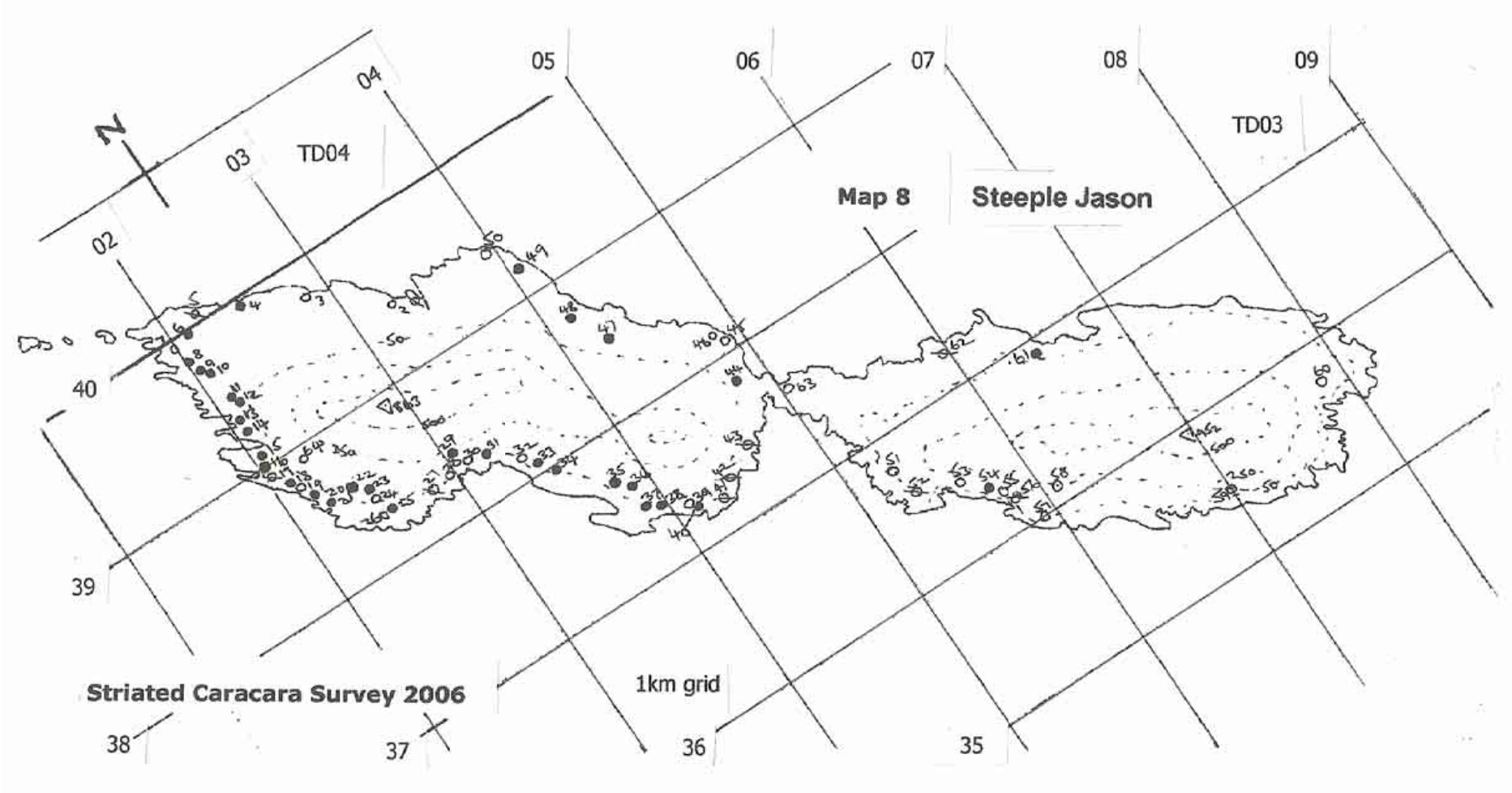

Striated Caracara Survey 2006
Map 3 Elephant Jason
TD32
1km grid
26
25
24
30
31
32
33
682
600
300
100
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

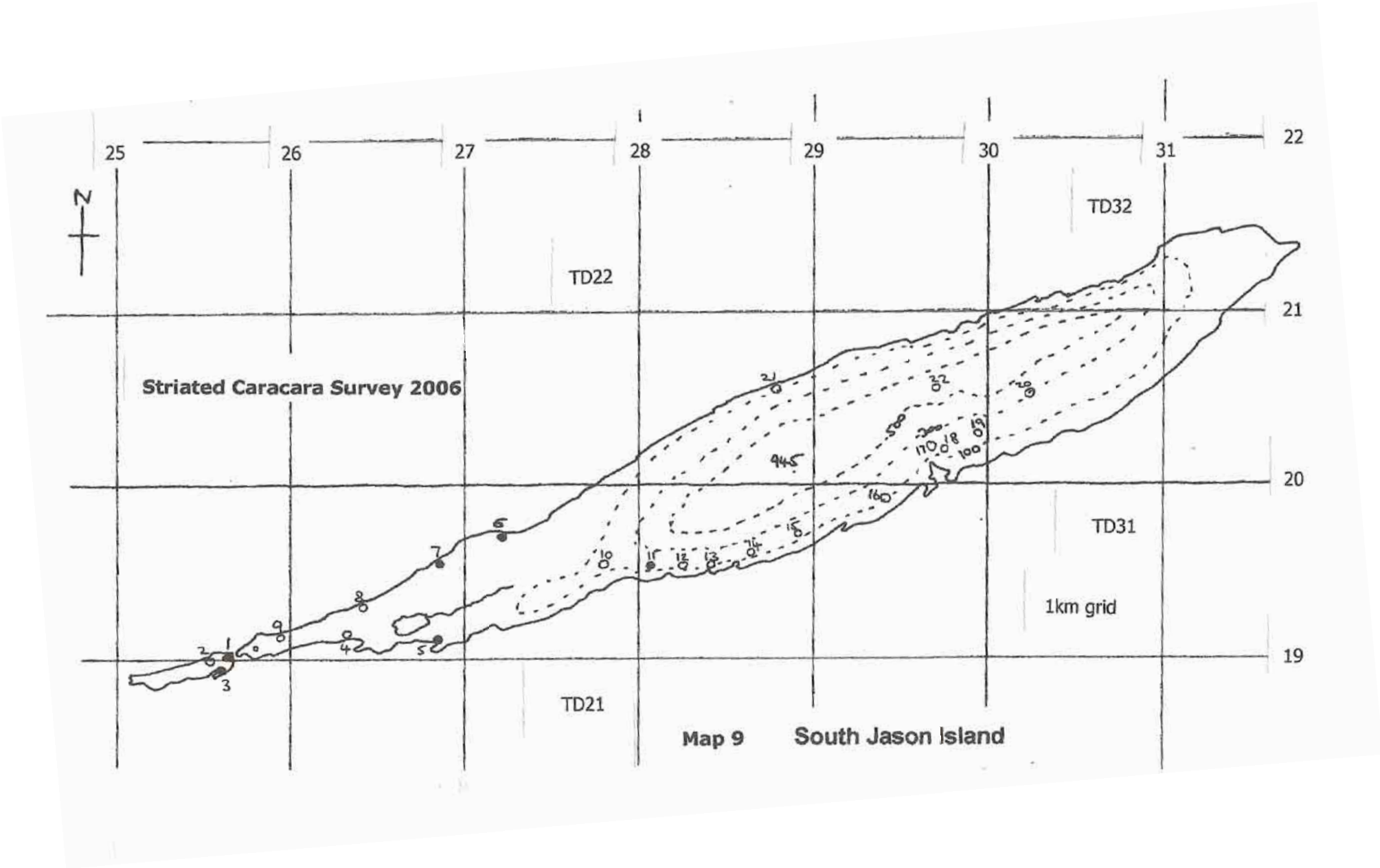

Striated Caracara Survey 2006
Steeple Islet
Map 4 Grand Jason
TD13
1km grid
N
09
10
11
12
13
14
15
16
17
34
35
36
37
38
39

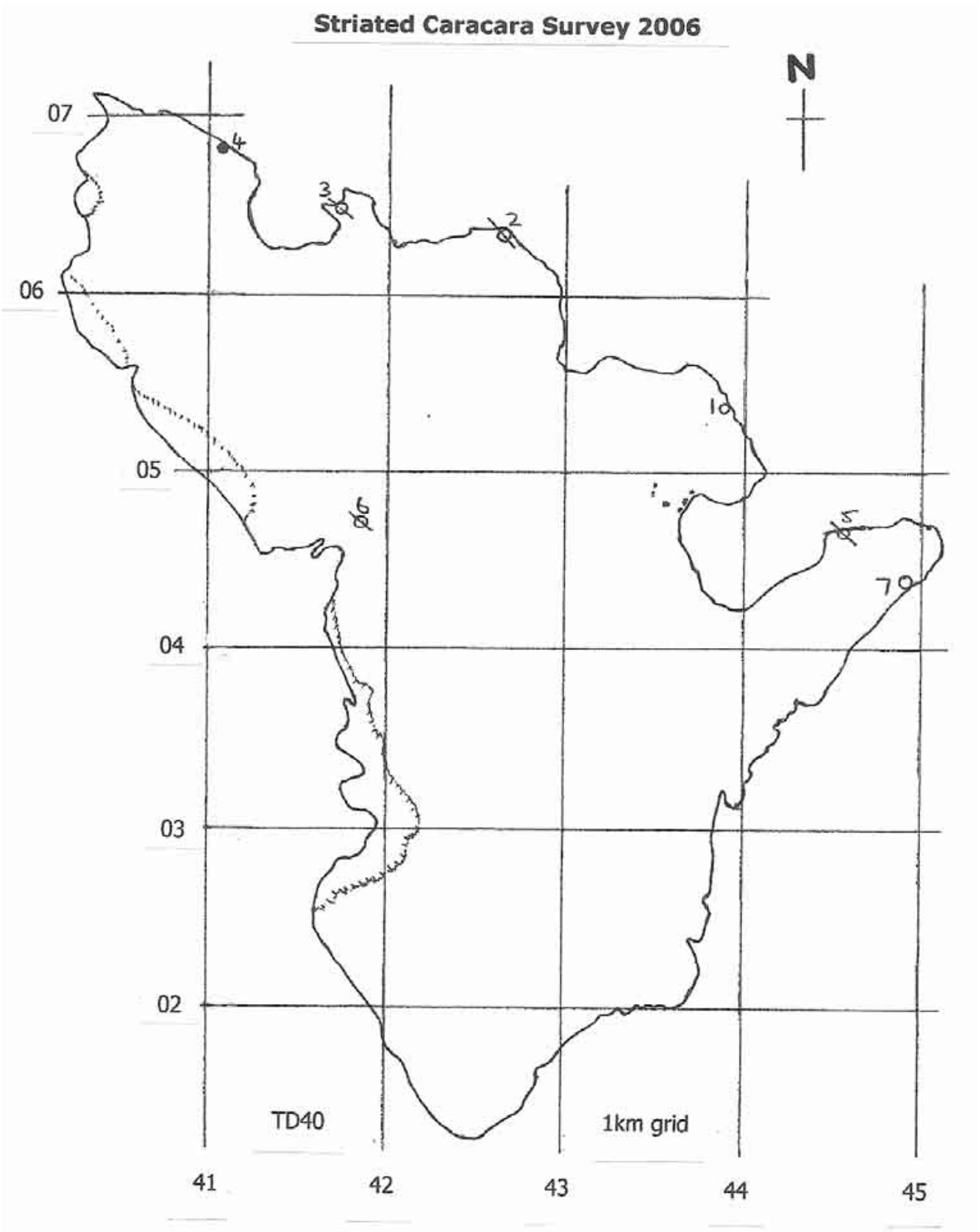

Striated Caracara Survey 2006
26
27
28
29
30
N
TD23
Flat Jason
34
Map 5
32
31
TD33
30
TD32
29
1km grid
TD22


Map 6 Sedge Island
N
60
61
62
63
64
29
28
27
TD52
TD62
1km grid
Striated Caracara Survey 2006

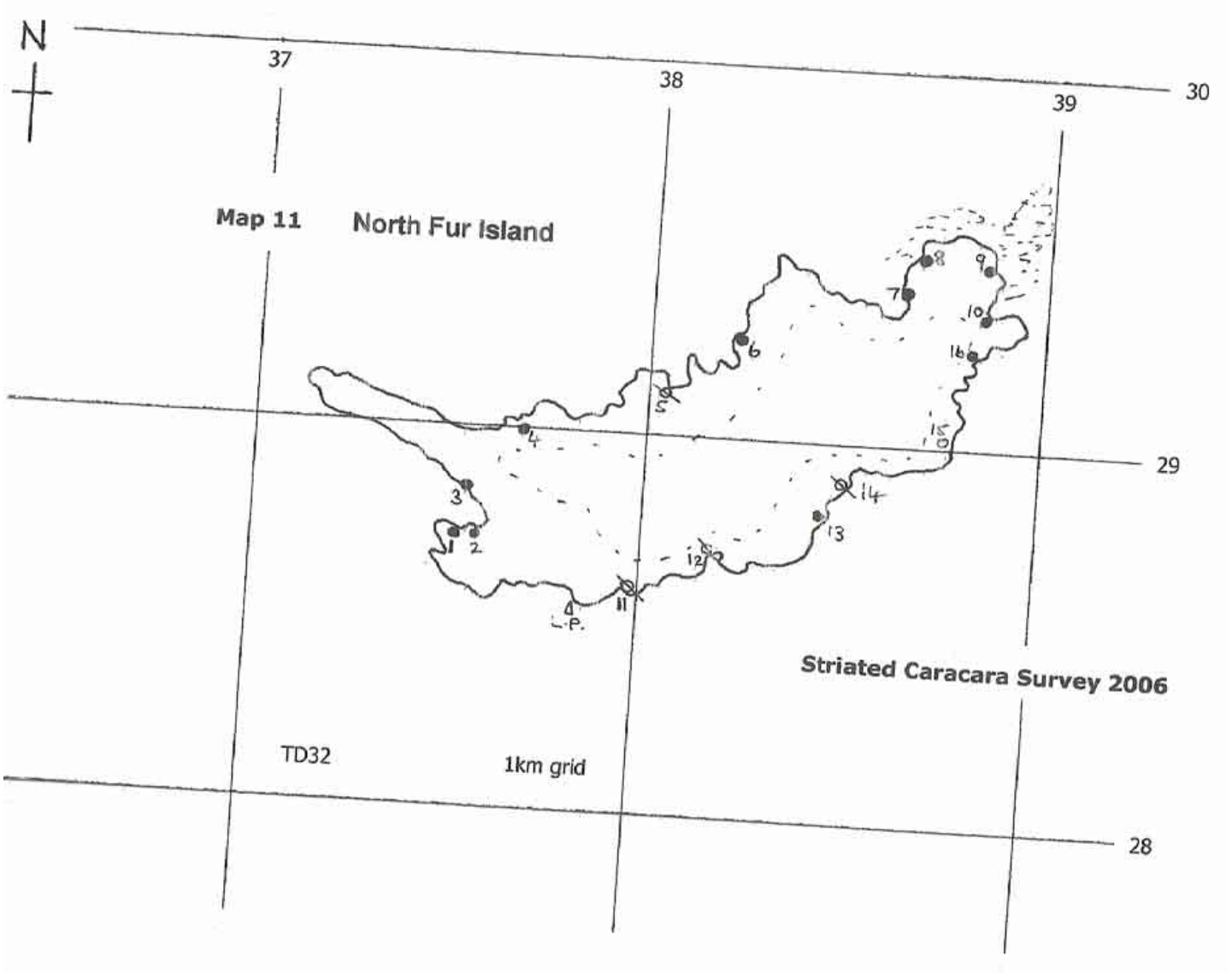

N
60
61
62
63
Striated Caracara Survey 2006
78
77
76
75
74
Map 7
1
2
3
4
5
500
400
300
200
100
Hummock Island
TC67
1km grid

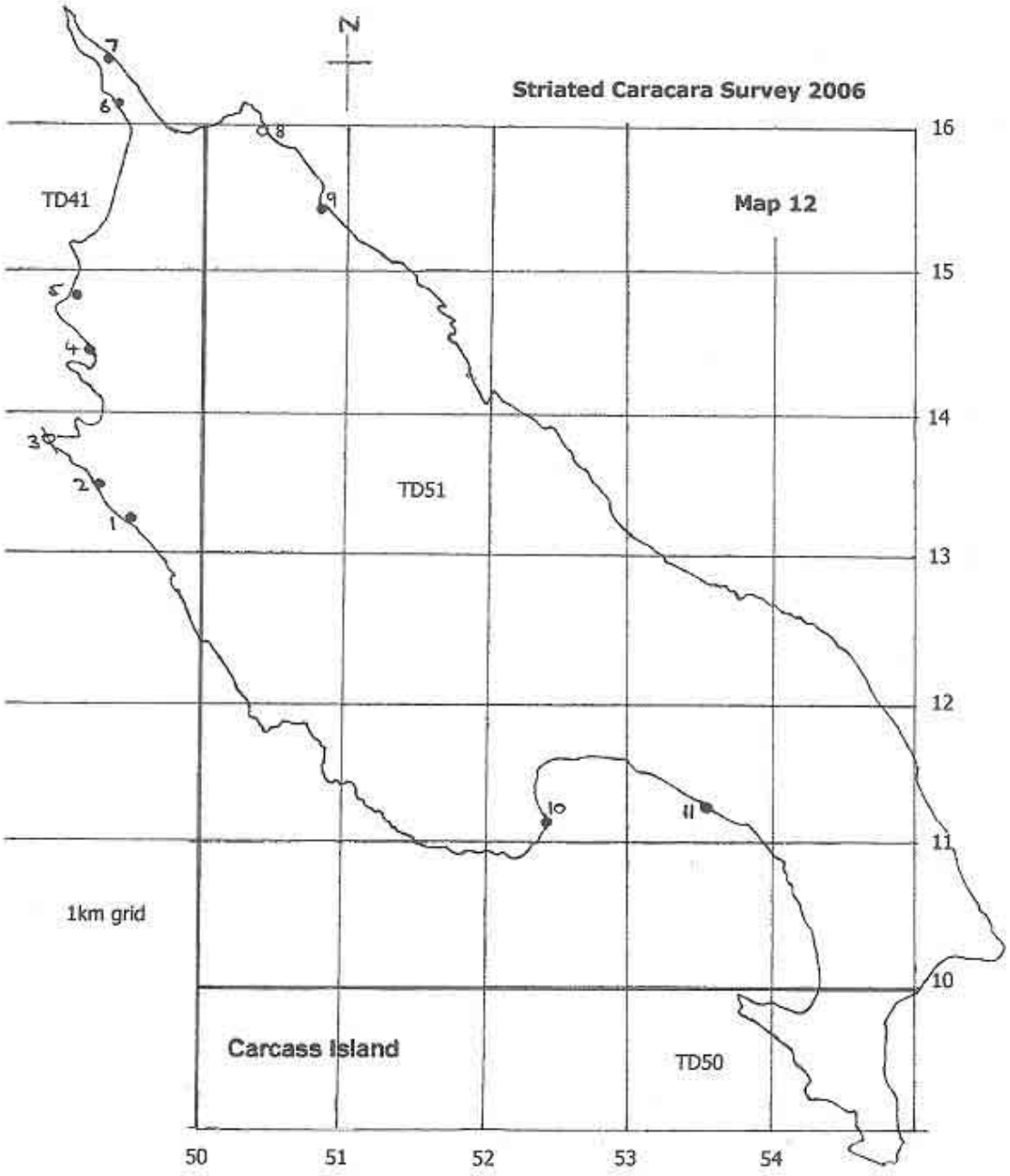

N
TD04
TD03
Map 8
Steeple Jason
Striated Caracara Survey 2006
1km grid
02
03
04
05
06
07
08
09
40
39
38
37
36
35

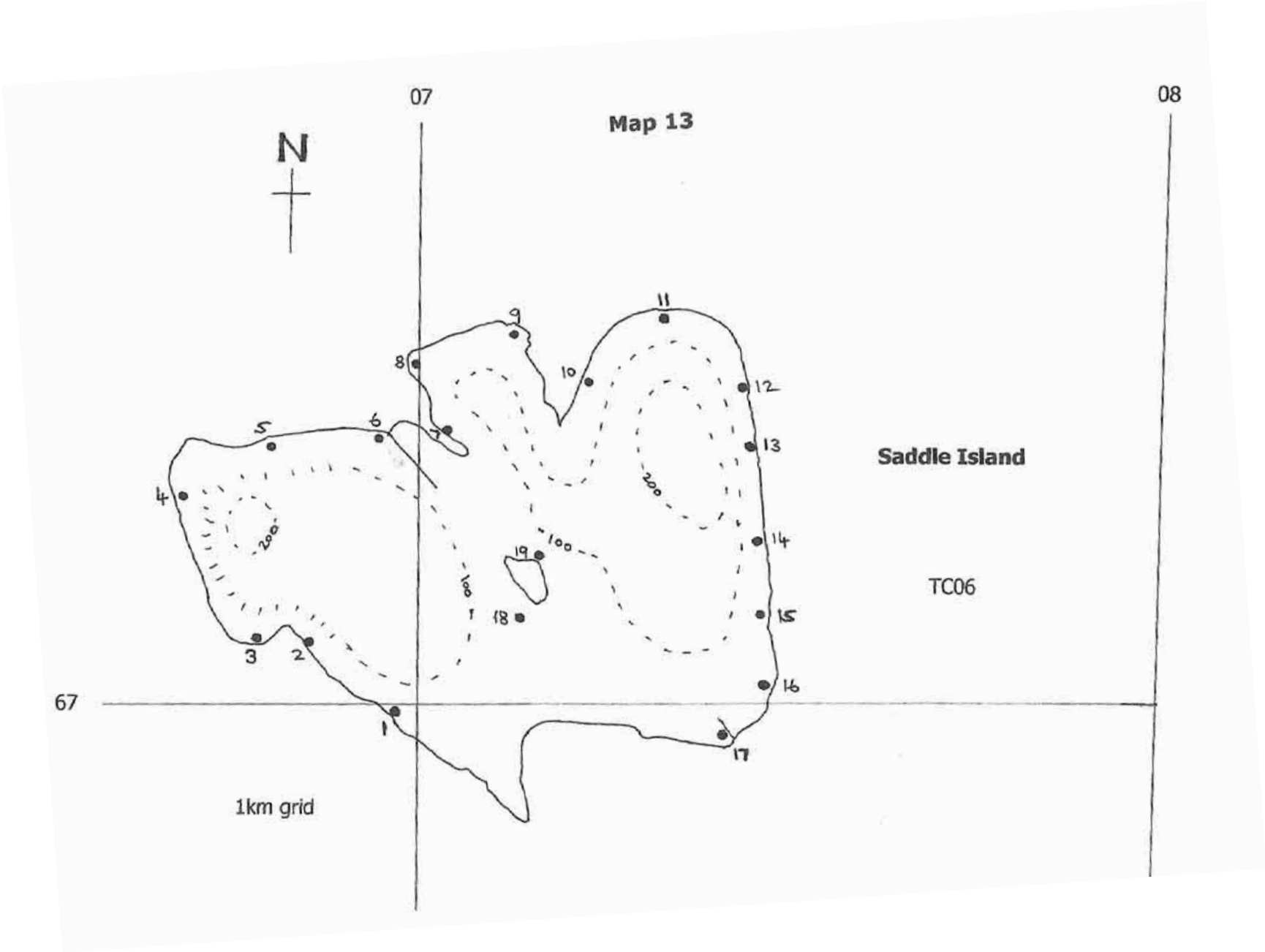

25
26
27
28
29
30
31
22
21
20
19
N
TD22
TD32
TD31
TD21
Striated Caracara Survey 2006
1km grid
Map 9 South Jason Island



Map 10 **West Point Island**


N
37
38
39
30
29
28
Map 11
North Fur Island
Striated Caracara Survey 2006
TD32
1km grid
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16


N
Striated Caracara Survey 2006
Map 12
TD41
TD51
TD50
Carcass Island
1km grid
1
2
3
4
5
6
7
8
9
10
11
16
15
14
13
12
11
10
50
51
52
53
54


Map 13
N
07
08
67
Saddle Island
TC06
1km grid
100
200
1
2
3
4
5
6
7
8
9
10
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12
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19

Appendix 2

Theoretical population survival and productivity

These calculations are based on several assumptions starting from the estimated total of 500 breeding pairs in 1997/98, with 5% average annual mortality over nine years. The projected survival rates detailed on each table for 1.5 juveniles or 1 juvenile fledged from each clutch of 3 eggs annually from 1997/98 to 2005/06, give estimated numbers surviving for each breeding season. Taking both the adult and juvenile survival figures into account, several potential population totals are calculated for the start of the 2006/07 season.

Table 5: Projected adult survival, 5% annual mortality over nine years of the estimated 500 breeding pairs in 1997/98

Table 6: Projected fledgling mortality, 75% to 5% over nine years with 1.5 juveniles per pair

Table 7: Projected fledgling mortality, 80% to 5% over nine years with 1.5 juveniles per pair

Table 8: Projected fledgling mortality, 80% to 5% over nine years with only 1 juvenile per pair

Table 9: Projected longevity of the 1997/98 cohort, at 1.5 juveniles per pair for 500 pairs, 80% to 5% mortality

Table 10: Projected population and productivity from juveniles at 1.5 per pair and at six mortality rates over nine years, 1997/98 to 2006/07

Table 11: Projected mature pairs over nine years, assuming breeding readiness is reached at age four years

Table 5: Projected adult survival of 500 pairs over 9 years

Theoretical adult mortality rate of 5% annually

Years	1		2		3		4		5		6		7		8		9		10
	97/98		98/99		99/00		00/01		01/02		02/03		03/04		04/05		05/06		06/07
Mortality rates		5%		5%		5%		5%		5%		5%		5%		5%		5%	
Survivors	1000		950		902		857		814		774		735		698		663		630

The above figures are used in calculations of productivity and survival of the whole population over nine years under each of the hypothetical mortality rates used for juveniles.

Table 6: Projected fledgling mortality, 75% to 5% with 1.5 juveniles per pair

Theoretical mortality rates from fledging 75%, 40%, 20%, 10% and 5% repeating

Years	1		2		3		4		5		6		7		8		9		10
	97/98		98/99		99/00		00/01		01/02		02/03		03/04		04/05		05/06		06/07
Mortality rates		75%		40%		20%		10%		5%		5%		5%		5%		5%	
	750		187		112		90		81		77		73		69		65		62
			750		187		112		90		81		77		73		69		65
					750		187		112		90		81		77		73		69
							750		187		112		90		81		77		73
									750		187		112		90		81		77
											750		187		112		90		81
													750		187		112		90
															750		187		112
																	750		187
																			750
Totals	750		937		1049		1139		1220		1297		1370		1439		1504		1566

Adult mortality rates suggested of 5% annually, starting from 500 pairs

Adult Survivors	1000		950		902		857		814		774		735		698		663		630
Total Population	1750		1887		1951		1996		2034		2071		2105		2137		2167		2196

Table 7: Projected fledgling mortality 80% to 5% over 9 years with 1.5 juveniles per pair

Theoretical mortality rates from fledging: 80%, 50%, 25%, 10% and 5% thereafter
assuming that each of 500 pairs raised only 1.5 nestlings per annum to fledging

Rate		80		50		25		10		5		5		5		5	
Years	1		2		3		4		5		6		7		8		9		10
	97/98		98/99		99/00		00/01		01/02		02/03		03/04		04/05		05/06		06/07
	750		150		75		56		51		48		46		43		41		39
			750		150		75		56		51		48		46		43		41
					750		150		75		56		51		48		46		43
							750		150		75		56		51		48		46
									750		150		75		56		51		48
											750		150		75		56		51
													750		150		75		56
															750		150		75
																	750		150
																			750
Totals	750		900		975		1031		1082		1130		1176		1219		1260		1299

Adult mortality rates suggested of 5% annually, starting from 500 pairs

Adult Survivors	1000		950		902		857		814		774		735		698		663		630
Total Population	1750		1850		1877		1888		1896		1904		1911		1917		1923		1929

Table 8: Projected fledgling mortality, 80% to 5% with 1 juvenile per pair

Theoretical mortality rates from fledging: 80%, 50%, 25%, 10% and 5% repeating
assuming that each pair raised only 1 nestling to fledging

Rate		80		50		25		10		5		5		5		5		5	
Years	1		2		3		4		5		6		7		8		9		10
	97/98		98/99		99/00		00/01		01/02		02/03		03/04		04/05		05/06		06/07
Survivors	500		100		50		34		32		30		29		27		26		24
			500		100		50		34		32		30		29		27		26
					500		100		50		34		32		30		29		27
							500		100		50		34		32		30		29
									500		100		50		34		32		30
											500		100		50		34		32
													500		100		50		34
															500		100		50
																	500		100
																			500
Totals	500		600		650		684		716		746		775		802		828		852

Adult mortality rates suggested of 5% annually, starting from 500 pairs

Adult Survivors	1000		950		902		857		814		774		735		698		663		630
Total Population	1500		1550		1552		1541		1530		1520		1510		1500		1491		1482

Table 9: Projected longevity of the 1997/98 cohort of juveniles

Theoretical Survival Table assuming annual mortality rates 80%, 50%, 25%, 10% and 5% repeating

%	80	50	25	10	5	5	5	5	5	5	5	5	5	5	5	5	5
Years	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14
Survivors	750	150	75	56	51	48	46	43	41	39	37	35	33	32	30	29	27
Years	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31
Survivors	26	25	23	22	21	20	19	18	17	16	15	15	14	13	13	12	11
Years	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	
	31/32	32/33	33/34	34/35	35/36	36/37	37/38	38/39	39/40	40/41	41/42	42/43	43/44	44/45	45/46	46/47	
Survivors	11	10	10	9	9	8	8	7	7	7	6	6	6	5	5	5	

The above figures and totals are based on the following assumptions: that each of 500 pairs of breeding adults manages to fledge on average 1.5 juveniles per annum (from the normal clutch of 3), which gives 750 fledged juveniles.

Table 10: Projected population at six possible initial mortality rates

Striated Caracara population: productivity projection over 9 years from 1997 to 2006
using theoretical mortality rates based on 500 pairs each fledging on average 1.5 juveniles annually
Abstracted from other productivity tables

Years	1		2		3		4		5		6		7		8		9		10	6-YEAR TOTAL	10-YEAR TOTAL
	97/98		98/99		99/00		00/01		01/02		02/03		03/04		04/05		05/06		06/07		
	Theoretical mortality rates from fledging: 80%, 50%, 25%, 10% and 5% repeating																				
Mortality rate		80%		50%		25%		10%		5%		5%		5%		5%		5%			
Survivors	750		150		75		56		51		48		46		43		41		39	268	1299
	Theoretical mortality rates from fledging: 75%, 40%, 20%, 10% and 5% repeating																				
Mortality rate		75%		40%		20%		10%		5%		5%		5%		5%		5%			
Survivors	750		187		112		90		81		77		73		69		65		62	427	1566
	Theoretical mortality rates from fledging: 70%, 40%, 20%, 10% and 5% repeating																				
Mortality rate		70%		40%		20%		10%		5%		5%		5%		5%		5%			
Survivors	750		225		135		108		97		92		88		83		79		75	514	1732
	Theoretical mortality rates from fledging: 65%, 40%, 20%, 10% and 5% repeating																				
Mortality rate		65%		40%		20%		10%		5%		5%		5%		5%		5%			
Survivors	750		262		157		126		113		108		102		97		92		87	599	1894
	Theoretical mortality rates from fledging: 60%, 40%, 20%, 10% and 5% repeating																				
Mortality rate		60%		40%		20%		20%		10%		5%		5%		5%		5%			
Survivors	750		300		180		144		130		123		117		111		106		101	688	2062
	Theoretical mortality rates from fledging: 50%, 20%, 10% and 5% repeating																				
Mortality rate		50%		20%		10%		5%		5%		5%		5%		5%		5%			
Survivors	750		375		300		270		255		242		230		220		210		200	1357	3052

Table 11: Projected mature pairs over 9 years				
Assuming breeding readiness at age 4 years for juvenile cohorts of 750 birds				
Theoretical Mortality rates of juveniles over 9 years	Matured survivors	Adult survivors from 1,000 in 1997/98	Total mature individuals in 2006/07	Potential pairs in 2006/07
80% to 5%	268	630	898	449
75% to 5%	**427**	**630**	**1057**	**529**
70% to 5%	514	630	1144	572
65% to 5%	599	630	1229	614
60% to 5%	688	630	1318	659
50% to 5%	1357	630	1987	993

In the year 10 columns of Tables 6, 7 and 8, the figures suggest that there could be between 852 (Table 8) and 1,566 (Table 6) additional birds over nine years. The suggested mortality rate for the 1,000 adults over the same period, implies that about 63% could still be alive, giving a potential total population of between 1,482 (Table 8) and 2,196 (Table 6). These totals include all immature birds from the previous four years, many of which will die before reaching maturity and it must be noted that only breeding birds were counted for the survey.

Table 10 shows the method of calculating the numbers of mature birds (at least 4 years old) in 2006/07. The 6-year totals vary with different estimated mortality rates and are the relevant figures when attempting to account for the size of the current breeding population. Table 11 gives the results of adding the projected 630 adult survivors to the figures in Table 10, producing totals of between 898 and 1,987 adult birds, potentially 449 to 993 breeding pairs.

The summary in Table 11 suggests that to explain the breeding population of 500-520 pairs estimated in 1997-98 and 2006, a fledging rate averaging 1.5 juveniles per pair with a mortality rate of 75% in the first year of life would be required.

Robin W Woods 18 April 2007