REPORT ON A SURVEY OF THE RECHERCHE CAPE BARREN GOOSE, APRIL 1993

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BACKGROUND

The Recherche Cape Barren Goose *Cereopsis novaehollandiae grisea* is restricted to Western Australia, breeding only on islands in and near the Archipelago of the Recherche off the State's south coast, near Esperance (Storr 1980, Blakers *et al.* 1984).

The subspecies is currently listed by the Australian and New Zealand Environment and Conservation Council (ANZECC) as 'Vulnerable' nationally (ANPWS 1991). Under the Western Australian Wildlife Conservation Act it has been declared as fauna 'which is likely to become extinct, or is rare'. The Action Plan for Australian Birds (Garnett 1992a) recommended listing as 'Endangered'. The book *Threatened and extinct birds of Australia* (Garnett 1992b), that accompanied the Action Plan, recommended listing as 'Critical' (a draft IUCN Red List category), based on a view that the population consisted of no more than 200 individuals; however, at the time of writing Garnett was not aware of survey data collected by the Western Australian Department of Conservation and Land Management (CALM) in February 1992.

Garnett (1992a) listed the goose as Endangered because he believed it met the proposed new IUCN criteria (Mace and Lande 1991) as follows: "N_e possibly <500, population possibly subject to catastrophes or declining" (p. 30). (N_e is the effective population size, ie, the number of breeding adults.) As evidence for a possibly declining population, he cited data that suggested maximum flock sizes are less now than they were in the past, and as evidence that the population was possibly subject to catastrophes he cited data from John Dell (Western Australian Museum) that, in 1991, 22 out of 55 birds sighted on 10 out of 13 islands visited were dead.

Although many counts have been made of the Recherche Cape Barren Goose on individual islands over the years, none of the surveys covered all islands. The most comprehensive survey was that of one of us (BH) in February 1992. Then, 232 live and 19 dead geese were counted on 38 out of 56 islands visited. This survey was conducted from a boat. The geese are often difficult to observe from a boat, especially on larger islands, and landing on most islands from a boat is very difficult because of steep, rocky shores and the heavy swell - the only method of landing available for most islands is swimming ashore.

Based on the above it was apparent that a comprehensive census of the Recherche Cape Barren Goose was needed in order to establish its conservation status and decide whether conservation action was warranted.

In 1992, CALM applied to the National Endangered Species Program for funds to conduct a helicopter-based census of the geese. This money was made available in 1993, and a contract between the two organisations was completed on 22 April 1993. The project

objective was "Assess the population status of *Cereopsis novaehollandiae grisea*, the western subspecies of the Cape Barren Goose", and the scope was defined as:

1. Conduct a helicopter survey of goose numbers on a representative sample of islands of the Recherche Archipelago. The coastline from Hopetoun to Israelite Bay to be surveyed by fixed-wing aircraft.
2. Estimate the current total population size for the subspecies and what actions, if any, are necessary to maintain or enhance the subspecies status.

The Archipelago of the Recherche consists of about 350 islands, islets and rocks along the south coast of Western Australia between Red Island (121°21'E) and the northernmost rock of Eastern Group (124°06'E), a distance of about 240 km. The islands extend out to sea for up to 64 km. Many of the smaller islands and rocks are un-named; these have been numbered by the Western Australian Department of Land Administration and are shown on Miscellaneous Plan 1633 (see Table 1). All features lie within the Recherche Archipelago Nature Reserve, a Class A reserve vested in the National Parks and Nature Conservation Authority and managed by CALM.

BIOLOGY AND ECOLOGY

As far as is known, Recherche Cape Barren Geese have a similar biology and ecology to the nominate subspecies, which occurs on islands in Bass Strait and off South Australia. The geese breed only on islands. Nesting takes place mainly between June and August and once the young can fly the adults moult, becoming flightless for up to six weeks. Moulting may occur quite late into the summer in some years, since Matthew Flinders reported that his men were able to kill geese with sticks and capture geese alive in January 1802 (Flinders 1814). During the summer, some birds fly to the mainland, where they can be found on farm dams, wetlands, beaches and pasture, especially green pasture. Some birds are usually present around the town of Esperance, including on the local golf course. However, the majority of birds appear to remain on the islands during the summer.

METHODS

The survey took place between 20 and 27 April 1993. April was chosen for two reasons. Firstly, and most importantly, it was thought that most geese that migrate to the mainland during the summer would have returned to the islands by this time, and secondly, the weather during April is usually fine and calm, making conditions ideal for flying and good visibility.

A Bell 206 Jet Ranger helicopter was chartered from West Coast Helicopters. Survey routes for each day were plotted onto a map and flying times calculated to ensure that they fell within the endurance of the aircraft. Then, with three observers, the flight got underway. The observer in the front, left-hand seat helped the pilot navigate (a Global Positioning System receiver was used to aid navigation to islands some distance offshore) and was responsible for counting and recording goose numbers, while the observer in the rear left-hand seat counted Australian Sea-lions *Neophoca cinerea* and New Zealand Fur-seals *Arctocephalus forsteri*. The third person, sitting in the right-hand rear seat, counted geese and seals on the right hand side and, when the right hand view was only of ocean, checked both geese and seals on the left of the helicopter. All geese and seal counts were dictated into hand-held tape recorders and were transcribed to note books that

evening. All observers also counted numbers of the Sooty Oystercatcher (*Haematopus fuliginosus*).

On arriving at an island, the pilot slowed the helicopter to about 40 to 50 knots (70 to 90 km/h) and descended to about 15 to 20 metres above the sea. He then flew around the island above the shoreline in a counter-clockwise direction, allowing maximum visibility on the left hand side. Then, with most smaller islands, he flew upwind over the centre of the island so geese on the top of the island could be sighted. For larger islands, extra circuits were made inland from the coast, so all the island could be viewed.

While planning the survey, one concern was that the geese would be frightened by a low-flying, noisy helicopter and would scatter. Not only might this prevent us seeing all the geese (we thought they may hide under shrubs), but it might also have unnecessarily stressed the birds. Once we started work we found that our fears were unfounded. Cape Barren Geese appeared to largely ignore the helicopter. Most simply stood there and watched us fly past, sometimes only 20 or 30 metres away, sometimes walking away from the direction of our approach. A few birds (estimated at less than 5%) took to the wing. In contrast, when we landed on an island and walked towards the birds, they usually flew away before we were within 50 metres of them.

It was clear that most geese had left the mainland for the islands, since when we examined, from the helicopter, some mainland areas around Esperance where geese are usually sighted during the summer, no geese were seen. Nevertheless, on 22 April we conducted a survey from a light aircraft of all mainland beaches and some inland areas. As well, we asked the public (via a media release and radio interviews) to report any geese sighted on the mainland during the week of our survey.

Most islands were counted on 21, 22 and 23 April. Red Island, at the western end of the Archipelago, was counted on the afternoon of 20 April, near the conclusion of the ferry flight from Perth. This allowed a test of the census design before embarking on the bulk of the counts. At the conclusion of the counts, the helicopter flew to Albany, to conduct other CALM business. This allowed some islands to the west of the Archipelago to be counted - Rocky Islands and West Island (near Hopetoun), Red Islet (Fitzgerald River National Park) and the Doubtful Islands (near Bremer Bay) on 26 April, and Bald Island on 27 April.

All features above high water mark in the Recherche were surveyed, except Twin Rocks (too far out to sea) and Slipper Island (inadvertently overlooked). Some rocks marked on maps as above high water had waves washing completely over them; these are not listed in Table 1. Other very small features have also not been included in this Table.

RESULTS

Goose counts on islands of the Archipelago of the Recherche are provided in Table 1, while Table 2 provides counts on islands to the west of the Archipelago and Table 3 lists data from the mainland. Altogether 631 birds were counted. No dead geese were seen. It is unlikely that many birds were missed during the surveys and we suggest the total population is probably no more than 650 birds. Areas of islands in the Recherche are from Department of Land Administration Miscellaneous Plan 1633; the areas of point features are given as 0.1 ha.

The islands with the highest counts were Cull Island (70), Daw Island (39), Round Island (31) and Wickham Island (31). Subjectively, all appeared to have a high proportion of grassy or herbaceous vegetation. Cull Island has extensive grass, which is correlated with a long period of grazing by sheep and goats, as well as frequent fire, before it was reserved for nature conservation. The goats are still present. There was no obvious relationship between numbers of geese and island area (Figure 1, Pearson correlation coefficient = 0.126, $P > 0.05$) although very small islands and rocks supported few birds.

DISCUSSION

The lack of previous complete surveys of geese in the Recherche has meant that population estimates have been largely based on guesswork. Frith (1982), probably based largely on the work of Dorward (1967), stated "most authors assume that the population of geese in the Archipelago is no more than 500." Storr (1987), in his monograph on birds of the Eucla Land Division, implied the Recherche population was approximately 1 000 but provided no supporting evidence and did not indicate why he had revised Frith's (1982) estimate. Storr's figure appears to have gained wide currency and was used by Marchant and Higgins (1990) in the *Handbook of Australian and New Zealand Birds*.

Our total population estimate of about 650 birds is lower than Storr's (1987) figure. However, there is no evidence that numbers during the 1993 survey differed from long-term mean values. A database with all observations available from the literature or from reports on CALM files was used to compare 1993 counts with those from earlier times. For the 20 islands where counting began in 1950 or earlier and at least three counts had been made, there was no significant difference between the average of the earlier counts and numbers in 1993 (Wilcoxon matched-pairs signed-ranks test, $T = 72$, $P > 0.05$). The average number of birds per island was 8.5 in 1993 compared with 6.5 in earlier surveys.

Given that numbers in 1993 appeared similar to those in earlier counts (mostly this century) and that there is no firm support for Storr's (1987) population estimate of 1 000, we suggest that the population is currently near its normal size and is not likely to suffer a rapid decline. We do not believe there is convincing evidence for the trend in declining numbers this century that Garnett (1992b) seems to imply. Furthermore, it is equivocal whether numbers really were higher when Matthew Flinders first visited the islands in January 1802. The only counts that we can reliably assign to particular islands are 25 birds on Goose Island and 27 on Miles Island. Geese have not been recorded on Goose Island during subsequent visits (1947, 1993) but the vegetation consists of low dense shrubs and does not appear to be suitable habitat. Possibly the island had been burnt shortly before the first visit - vegetation studies on the adjacent Middle Island reveal that it was burnt two or three years before Flinder's 1802 visit (Hopkins 1981). On Flinders' second visit to Miles Island, 12 birds were counted; recent counts of 2 and 9 do not appear significantly different. Over the last 15 years, counts have varied from 2 to 52 on Boxer Island, 6 to 50 on Daw Island and 0 to 28 on Sandy Hook Island. Even allowing for boat-based counts being incomplete on occasions, this shows that there is considerable variation in goose numbers between islands in different years.

Garnett (1992b) is correct in highlighting 1991 as a year of low abundance. Counts in 1991 on the 13 islands surveyed by John Dell were significantly lower than the average of counts in other years (Wilcoxon matched-pairs signed-ranks test, $T = 6.5$, $P < 0.01$). Garnett suggested that local drought and hot weather caused a shortage of food for the

geese in late summer or autumn of 1991. Forty per cent of the geese found by Dell were dead, apparently from starvation. Meteorological data from Esperance and Mount Howick show that January and February 1991 were very hot and dry (Table 4). Temperatures reached 44 °C on 31 January and 47 °C on 1 February, the latter being the hottest day recorded in Esperance. This heat wave caused widespread death of native vegetation on the south coast of Western Australia and seems also to have affected goose numbers. However, the population would appear to have recovered within two years.

MANAGEMENT ACTIONS

The population of Recherche Cape Barren Geese is small and localised, so it will always be vulnerable to habitat change or human predation. These factors are unlikely to affect the population significantly while the whole of the Archipelago of the Recherche is a Nature Reserve and while access remains difficult. Natural catastrophes are probably the greatest threat. There is evidence of widespread mortality and a significant reduction in population size in 1991, probably as a result of the exceptionally hot summer weather.

The taxon still appears to meet criteria for 'Endangered' under the Mace-Lande criteria (effective population $N_e < 500$ (corresponding to actual $N < 2\,500$) and population subject to catastrophic crashes of > 20% reduction per 5 to 10 years or 2 to 4 generations; although whether it fulfils the latter criterion is debatable). However, the Mace-Lande criteria have now been superseded and under the revised draft criteria (Mace *et al.* 1992), the subspecies would be listed as 'Vulnerable', meeting criterion A (population estimated to number less than 1 000 mature individuals).

At this stage, developing a Recovery Plan for the Recherche Cape Barren Goose seems unnecessary. The population appears to be stable and able to recover from natural disturbance. However, because of the small size of the population and uncertainty about population dynamics, we recommend that there should be at least one more helicopter survey of numbers, preferably in another two or three years.

ACKNOWLEDGMENTS

We thank helicopter pilot Andy Ross for his skilled flying and readiness to help with all aspects of the project. Alan Clarke of CALM's Science and Information Division helped with the logistics and helped count the birds. Carolyn Thompson and Caris Bailey of CALM's Corporate Relations Division assisted with media releases and public consultation. CALM's Esperance District Manager, Klaus Tiedemann, and his staff were most helpful.

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Table 1. Counts of Recherche Cape Barren Geese on islands of the Archipelago of the Recherche, 20 - 23 April 1993.

Island	Area (ha)	Count
2 (nr Hendy R)	0.5	0
6 (nr Bishop)	0.1	0
7 (nr Bishop R)	0.8	0
8 (nr Corbett)	8.0	0
11 (nr Corbett)	5.0	0
12 (E of Draper)	0.3	0
13 (nr Bishop R	4.0	0
28 (nr Charley)	0.8	0
45 (nr Finger)	6.0	0
46 (Finger South)	4.0	2
50 (S of Mondrain)	1.0	0
54 (Thistle Cove)	0.3	0
56 (Lucky Bay)	8.0	0
57 (Lucky Bay)	34.0	0
58 (nr Cloud)	2.0	0
62 (nr Ram)	0.1	0
63 (E of Frederick)	0.1	0
68 grp (nr Hastings)	1.3	0
73 (S Hastings)	1.0	0
75 (nr Mondrain)	0.7	0
76 (nr Mondrain)	0.9	0
77 (nr Mondrain)	0.9	0
78 (nr Mondrain)	4.0	0
79 (nr Howe)	6.0	0
80 (nr Howe)	9.0	4
81 (nr Lybkie)	5.0	0
82 (Lybkie)	6.0	4
84 (nr Lybkie)	2.0	0
85 (nr Lybkie)	17.0	5
86 (E MacKenzie)	0.4	0
89 (E MacKenzie)	0.9	0
91 (Rossiter Bay)	11.0	0
94 (Rossiter Bay)	17.0	4
95 (Kimberley)	12.0	4
97 (Mississippi Point)	9.0	2
99 (Rossiter Bay)	2.0	0
100 (Rossiter Bay)	3.0	0
102 (Rossiter Bay)	4.0	0
103 (Rossiter Bay)	2.5	0
108 (nr Lion)	0.7	1
115 (nr Gunton)	12.0	0
116 (nr Thistle)	0.3	0
117 (S North Twin Peak)	1.0	0
126 (W Inshore)	3.0	1
127 (Alexander Point)	5.0	0
132 (Pavement R)	6.0	0
133 (Lichen)	6.0	0
134 (E Tagon Point)	1.0	0

Island	Area (ha)	Count
139 group	0.5	4
142 (E North Twin Peak)	14.0	0
145 (nr Forrest)	3.0	0
149 (nr Forrest)	0.8	0
152 (Barely)	15.0	3
153 (nr Station)	4.0	0
154 (Cheyne Point)	2.0	0
158 (nr Creak)	3.0	0
160 (nr Thomas River)	1.0	0
161 (nr Ruby)	3.0	0
162 (nr Ruby)	1.0	0
163 (nr Ruby)	2.0	7
164 (Skink)	12.0	0
165 (Seal Creek)	2.0	0
166 (Seal Creek)	6.0	0
168 (W of Cape Arid)	4.0	0
169 (W of Cape Arid)	2.0	0
172 (nr Gulch)	14.0	0
173 (nr Miles)	2.0	0
173a (nr Mt Arid)	2.0	0
174 (nr Miles)	0.8	0
175 (nr Miles)	3.0	0
176 (nr Miles)	12.0	2
177 (nr Miles)	1.5	0
183 (nr Pasley)	3.0	0
184 (N Bellinger)	4.0	0
185 (N Bellinger)	4.0	0
186 (W Franklin)	1.5	0
187 (W Franklin)	8.0	0
194 (Six Mile group)	2.0	0
203 (nr Round)	6.0	0
206 (E Anvil)	3.0	0
207 (W Anvil)	6.0	0
210 (S Anvil)	6.0	0
212 (E Anvil)	16.0	0
214 (W New Year)	4.0	0
Anvil	41.0	14
Archdeacon (Helby)	23.0	0
Arid	16.0	0
Barrier	12.0	2
Beaumont	37.0	2
Bellinger	44.0	4
Ben	34.0	0
Bishop R	3.0	2
Black	71.0	0
Black R	0.1	0
Boxer	166.0	2
Brewis	1.5	0
Broughton	18.0	12
Burton Rocks	4.0	0
Button	4.0	2

Island	Area (ha)	Count
Canning	7.0	2
Cap	4.0	0
Capps	38.0	2
Cave	4.0	0
Charley	80.0	6
Cliff	16.0	6
Cloud	24.0	0
Cooper	62.0	19
Corbett	80.0	22
Cornwall	22.0	0
Creak	8.0	2
Cull (Gull)	46.0	70
Dailey	4.0	0
Davy	10.0	2
Daw (Christmas)	212.0	39
Devils R (= 27)	0.8	0
Dome	10.0	0
Douglas	30.0	8
Draper	20.0	3
Figure of Eight	248.0	16
Finger	10.0	2
Ford (= 211)	12.0	2
Forrest	20.0	2
Franklin R	0.1	0
Frederick	80.0	14
Free	16.0	2
Fur R	8.0	2
George	6.0	0
Giant R (a) & (b)	1.9	0
Giant R (c) & (d)	0.6	0
Gig R	0.1	0
Glennie	40.0	8
Godman	14.0	5
Goose	56.0	0
Gould	17.0	0
Gulch	84.0	13
Gunton	90.0	2
Hasler	10.0	0
Hastings	41.0	4
Hector R	4.0	0
Hendy	3.0	0
High	14.0	0
Hood	96.0	16
Hope	22.0	2
Howe	44.0	9
Hugo	3.0	0
Hull	34.0	2
Inshore	26.0	0
John	4.0	0
Kermadec (Wedge)	24.0	0
Limpet	4.5	0

Island	Area (ha)	Count
Lion	11.0	0
Little	6.0	0
Long	162.0	13
Lorraine	12.0	0
Low	5.0	0
MacKenzie	36.0	2
Magistrate Rocks	0.1	0
Manicom	4.0	0
Mart (a)	1.5	0
Mart (c)	3.0	0
Mart (d)	0.5	0
Mart (e)	34.0	0
Mart (f)	2.0	0
Mart (g)	26.0	0
Mart (j)	14.0	2
Mart (k)	30.0	0
Mart (m)	10.0	0
Middle	1036.0	0
Middle R	2.0	0
Miles	44.0	9
Mondrain	810.0	2
Murray R	0.8	0
Nares	6.0	0
New	24.0	0
New Year	18.0	19
North Twin Peak	272.0	0
Observatory	82.0	0
Owen	28.0	4
Pasco	44.0	0
Pasley	76.0	11
Pearson (a)	16.0	0
Pearson (b)	10.0	2
Pointer	33.0	11
Rabbit	12.0	11
Ram	116.0	5
Red	36.0	11
Remark	102.0	0
Rob	23.0	0
Round	32.0	31
Roy	7.0	0
Ruby	2.8	2
Rug R	3.0	0
Russell R	1.5	0
Sail R	0.1	0
Salisbury	368.0	0
Sandy Hook	238.0	0
Seal R	5.0	0
Six Mile	13.0	5
Slipper	4.0	-
Smith R	1.0	0
South Twin Peak	102.0	3

Island	Area (ha)	Count
Spindle (= 212)	16.0	3
Square R	.4	0
Station	46.0	2
Steep Rocks	0.1	0
Swell R	0.1	0
Table	3.0	0
Taylor	22.0	11
Taylor R	0.1	0
Termination	52.0	11
Thomas	52.0	4
Tizard	7.0	0
Tory (a)	35.0	2
Tory (b)	3.0	0
Tory (c)	8.0	0
Tory (d)	14.0	0
Tunney	30.0	2
Twin Rocks	3.5	-
Westall (Combe)	70.0	22
Whale R	0.8	0
Wharton	18.0	6
Wickham	43.0	31
Wilson	90.0	6
Woody	196.0	0
York (a)	6.0	0
York (b) & (c)	23.0	0
York (d)	12.0	4
York (e)	2.0	0
TOTAL		612

Table 2. Counts of Recherche Cape Barren Geese on islands to the west of the Archipelago of the Recherche, 26 - 27 April 1993.

Island	Area (ha)	Count
Red (Fitzgerald River NP)	12.0	4
Rocky Islands	41.0	0
West	28.0	0
Seal R (Doubtful Islands)		0
Doubtful (East)		0
Doubtful (Middle)		0
Doubtful (West)		0
Bald	800	0
TOTAL		4

Table 3. Counts of Recherche Cape Barren Geese on the mainland, 22 April 1993.

Location	Count
Beach near Cape Arid	7
Pink Lake Drive	8
Six Mile Hill	0
Esperance golf course	0
Esperance race course	0
TOTAL	15

Table 4. Rainfall and maximum temperatures recorded at Esperance and Mount Howick (80 km east of Esperance) during January and February 1991.

		Rainfall			Temperature
		Mean (mm)	Actual (mm)	Decile	Max. (°C)
Esperance	January	14	2.8	2	44
	February	27	2.0	2	47
Mt Howick	January	19	3.6	4	not available
	February	24	0	1	not available

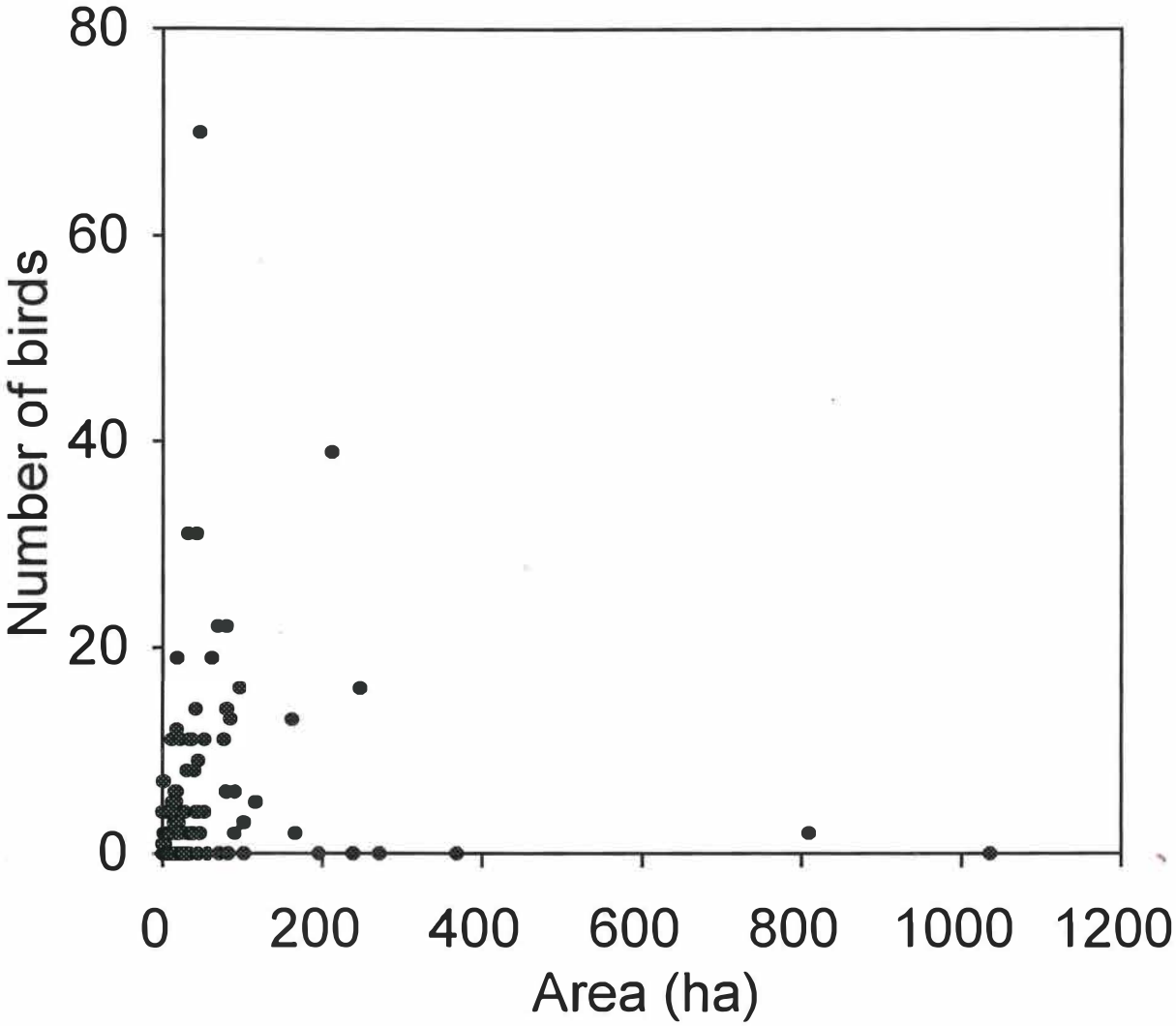
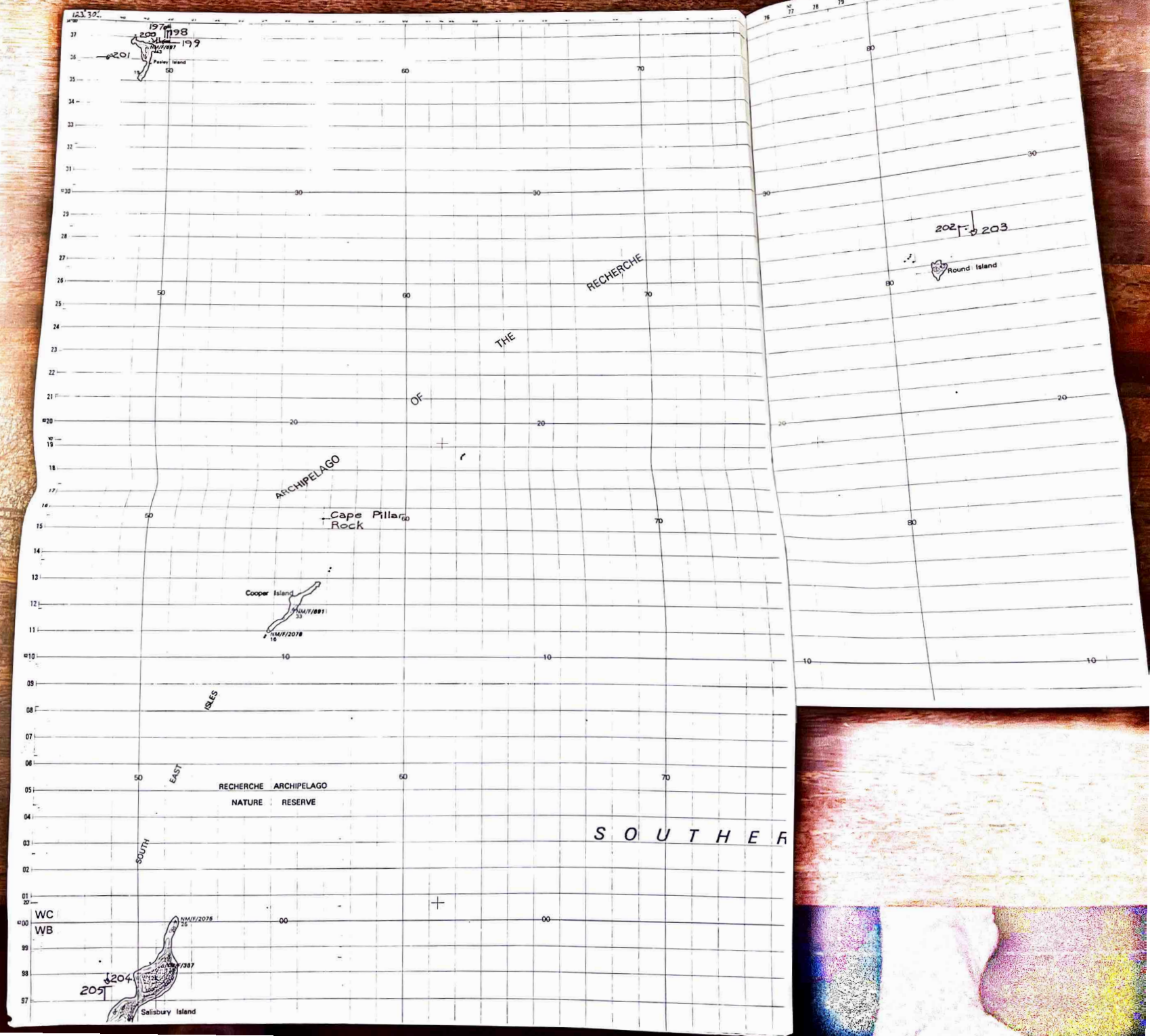


Figure 1. Relationship between island area and number of Recherche Cape Barren Geese counted.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197
198
199
200
201
NM/F/887
Pasley Island
RECHERCHE
THE
OF
ARCHIPELAGO
Cape Pillar
Rock
Cooper Island
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NM/F/2078
ISLES
EAST
SOUTH
RECHERCHE ARCHIPELAGO
NATURE RESERVE
SOUTHER
WC
WB
NM/F/2078
NM/F/387
204
205
Salisbury Island
202
203
Round Island


NUYTSLAND
PRIMITIVE
AREA
RESERVE
Gegelup
Point Loranzen
ISRAELITE
BAY
Jetty (Abandoned)
Old Telegraph Station
Point Dempster
LAKE
DARINGDELLA
NATURE
GREAT
AUSTRALIAN
BIGHT
Point Malcolm
RECHERCHE ARCHIPELAGO NATURE RESERVE (All islands)
Franklin Rock
Rodona Island
Cormorant Rock
Six Mile Island
Pointer Island
Anvil Island
EASTERN GROUP
DAW ISLAND
New Year Island
580 000
590 000
600 000
6280 000
6270 000
6260 000
33° 40'
33° 50'
186
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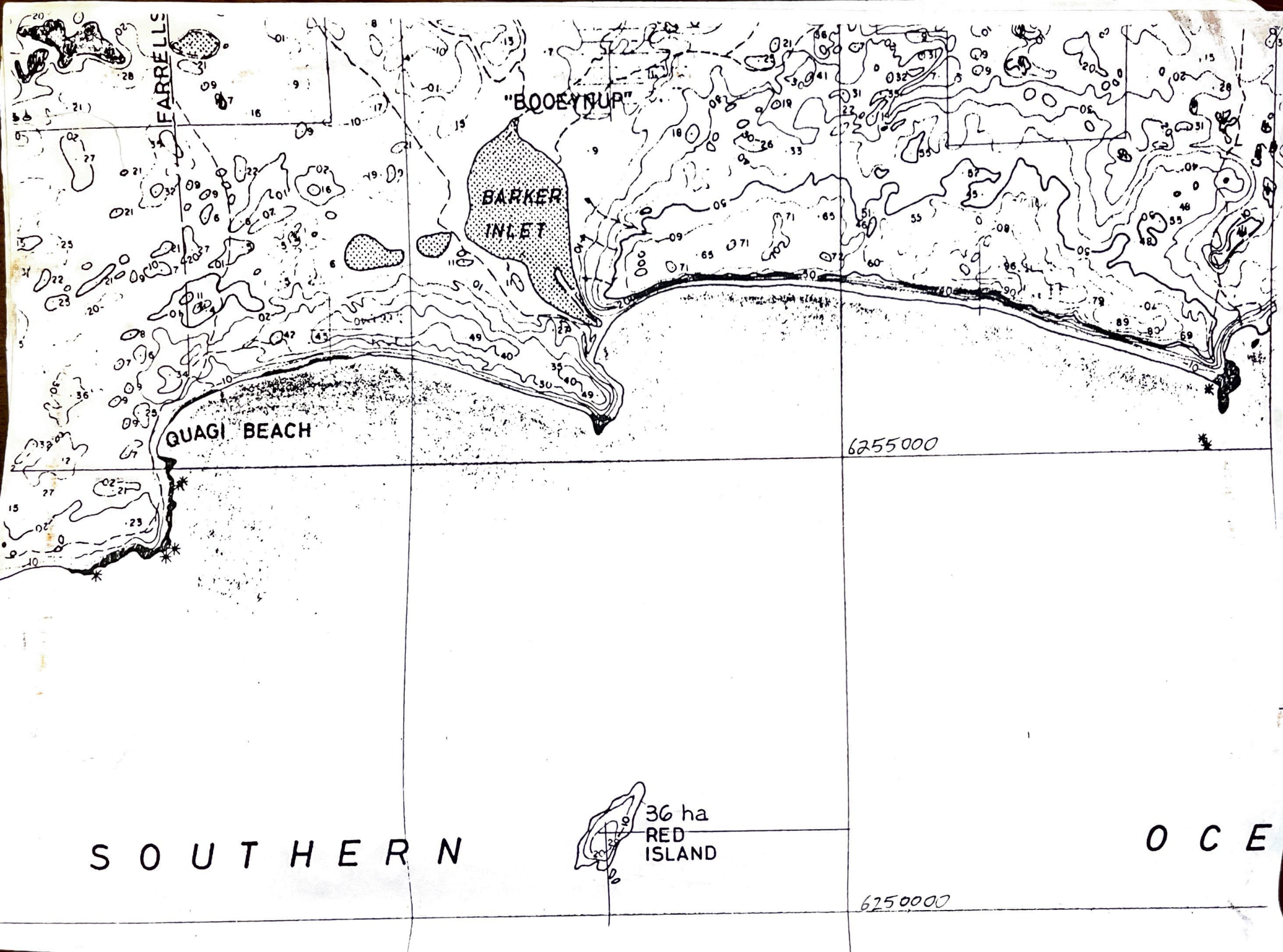
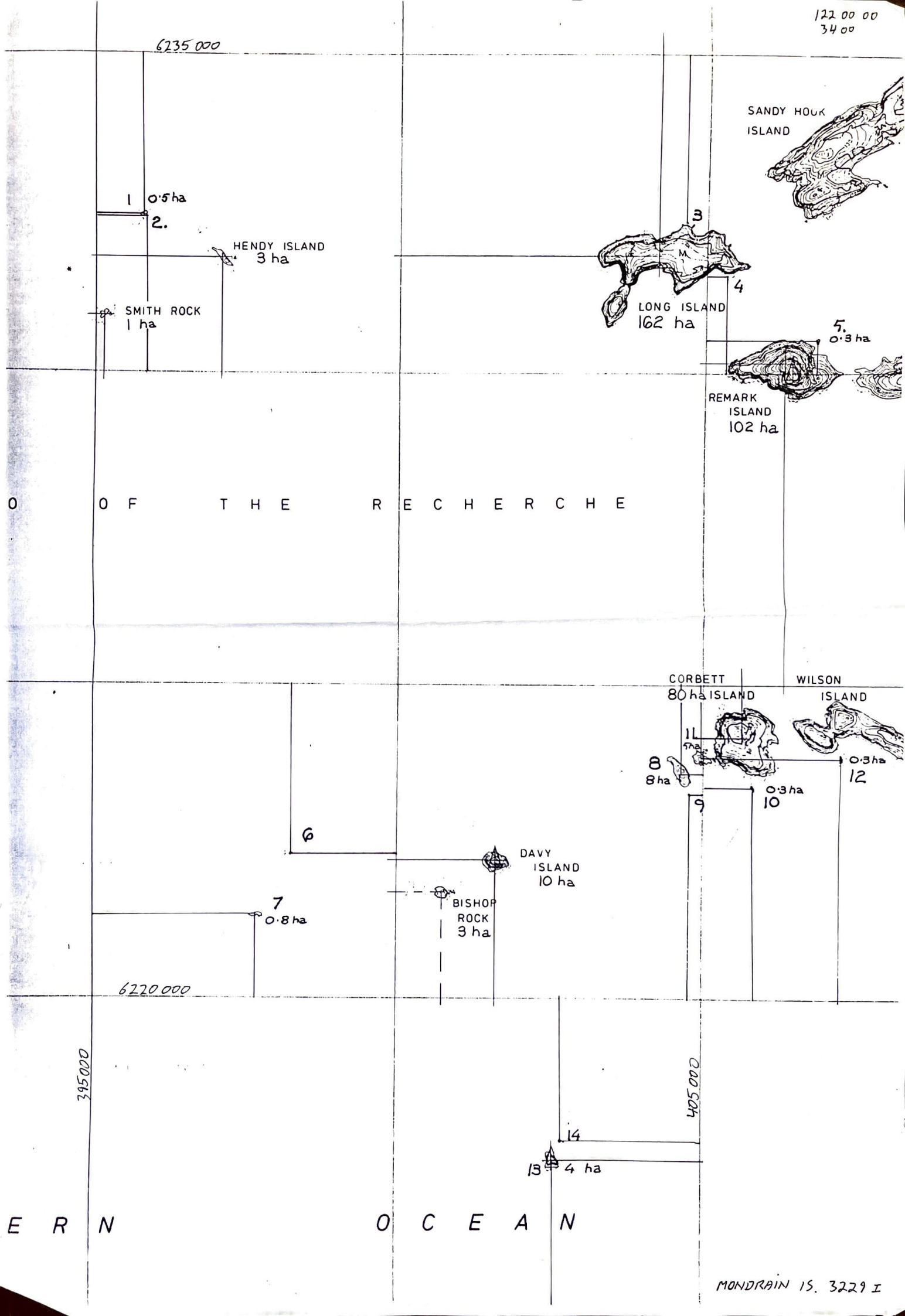
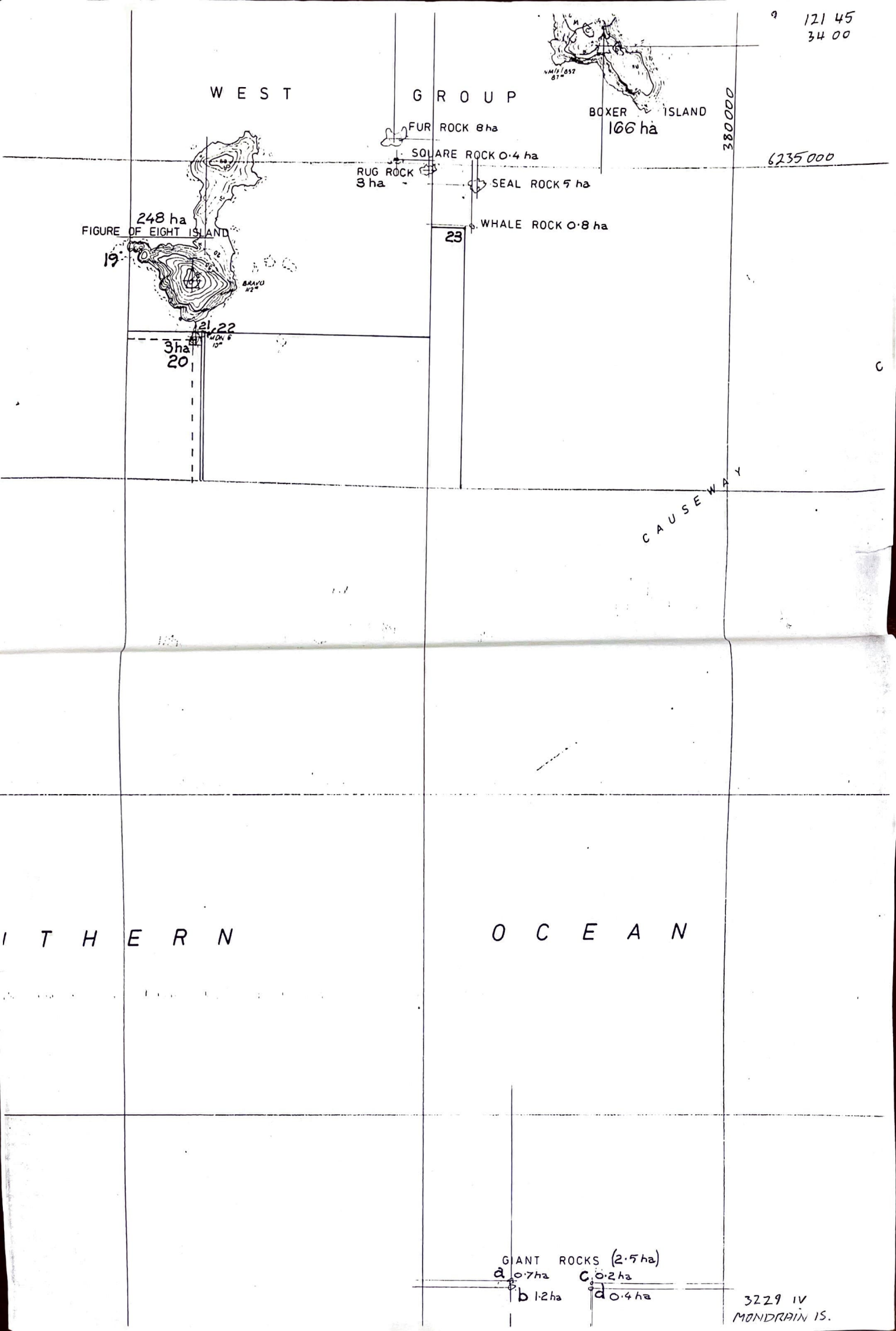
WINDABOUT LAKE
WOODY LAKE
LAKE WARDEN
FISHERIES
ALLARINGA
Dalyup Spring
PINK LAKE
TARRIGAN
COLLIER ROAD
ROAD
"CASTLETOWN"
CHADWICK
ESPERANCE BAY
24 LOW ROCK 5 ha
ELEVEN MILE
ESPERANCE
LIMPET ROCK 4·5 ha
DEMPSTER HEAD
WIRELESS HILL
Cook Rock
BLUE HAVEN
SECOND BEACH
HUGHES STEP
WEST BEACH
SURFERS BEACH
TWILIGHT BAY
TWILIGHT BEACH
FOURTH BEACH
NINE MILE BEACH
PICNIC COVE
4 ha BUTTON ISLAND
OBSERVATORY POINT
BURTON ROCKS 4 ha
12 ha RABBIT ISLAND
7 ha CANNING ISLAND
0·7 ha 25
TAYLOR ROCK
28 0·8 ha
BLACK ISLAND 71 ha
OBSERVATORY ISLAND 82 ha
SWELL ROCKS
80 ha CHARLEY ISLAND
26
CULL ISLAND 46 ha
GIG ROCKS
MAGISTRATE ROCKS
STEEP ROCKS
6240000 mN
0·8 ha 27
405000 mE
ARCHIPELAGO OF THE RECHERCHE
31
32
33
29
30
52 ha
35
THOMAS ISLAND
0·7 ha 37
38
34
90 ha
GUNTON ISLAND

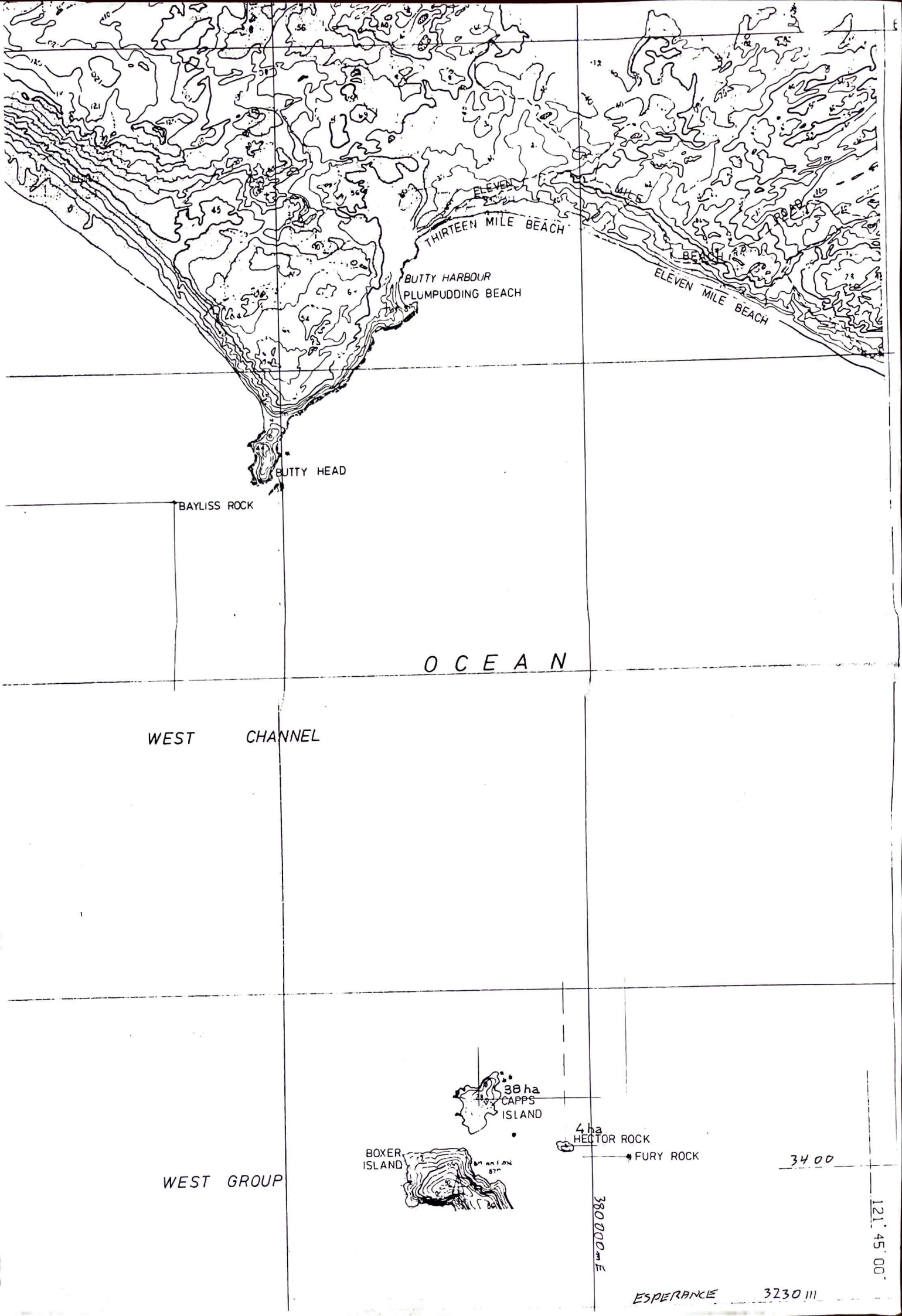

FARRELLS
"BOOEYNUP"
BARKER INLET
QUAGI BEACH
6255000
36 ha
RED
ISLAND
SOUTHERN
OCE
6250000

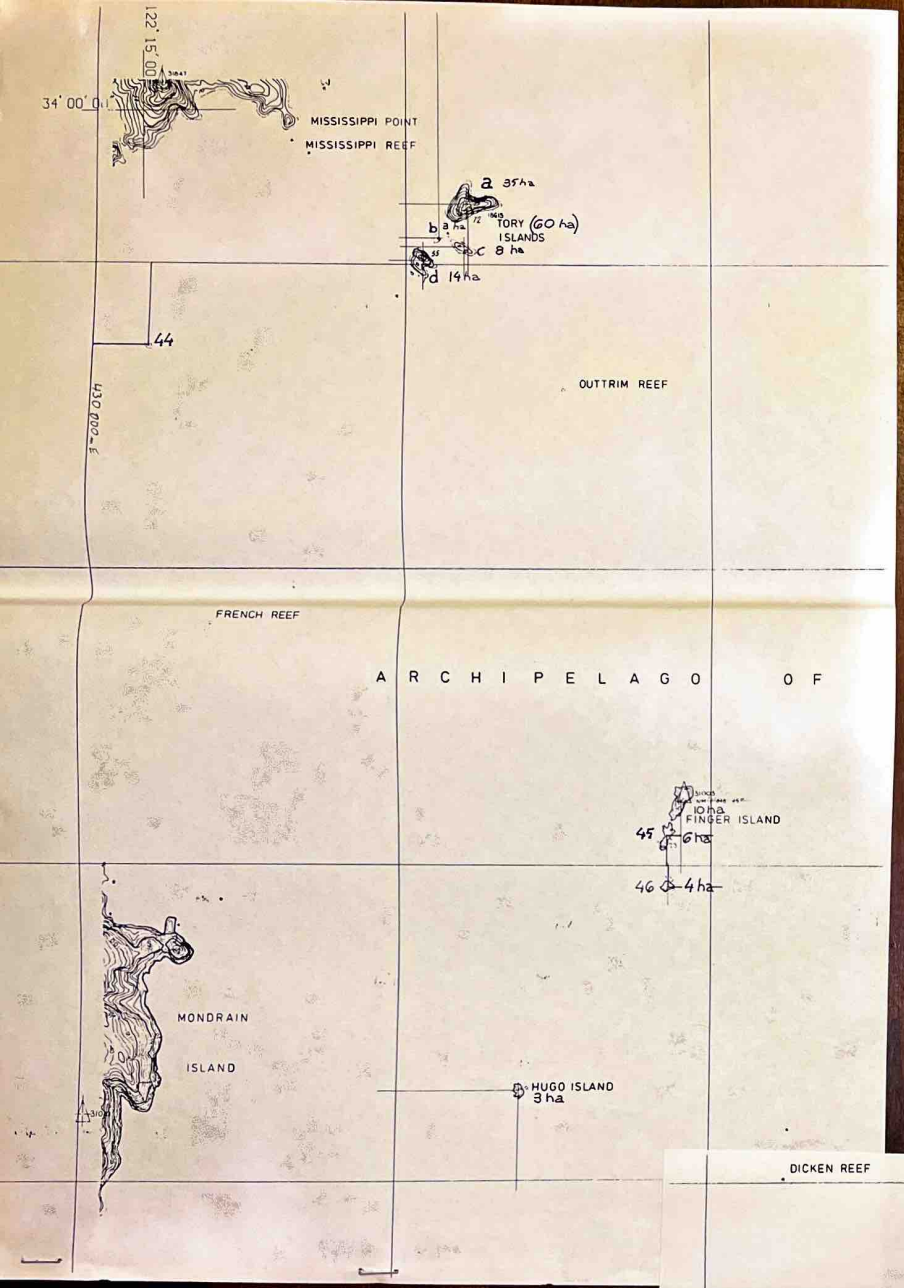

122 00 00
34 00
6235 000
SANDY HOOK ISLAND
1 0·5 ha
2.
HENDY ISLAND
3 ha
SMITH ROCK
1 ha
3
M
4
LONG ISLAND
162 ha
5.
0·3 ha
REMARK ISLAND
102 ha
O F T H E R E C H E R C H E
CORBETT
80 ha ISLAND
WILSON ISLAND
11
7 ha
8
8 ha
0·3 ha
12
0·3 ha
9
10
6
DAVY ISLAND
10 ha
BISHOP ROCK
3 ha
7
0·8 ha
6220 000
395000
405000
14
13
4 ha
E R N O C E A N
MONDRAIN IS. 3229 I

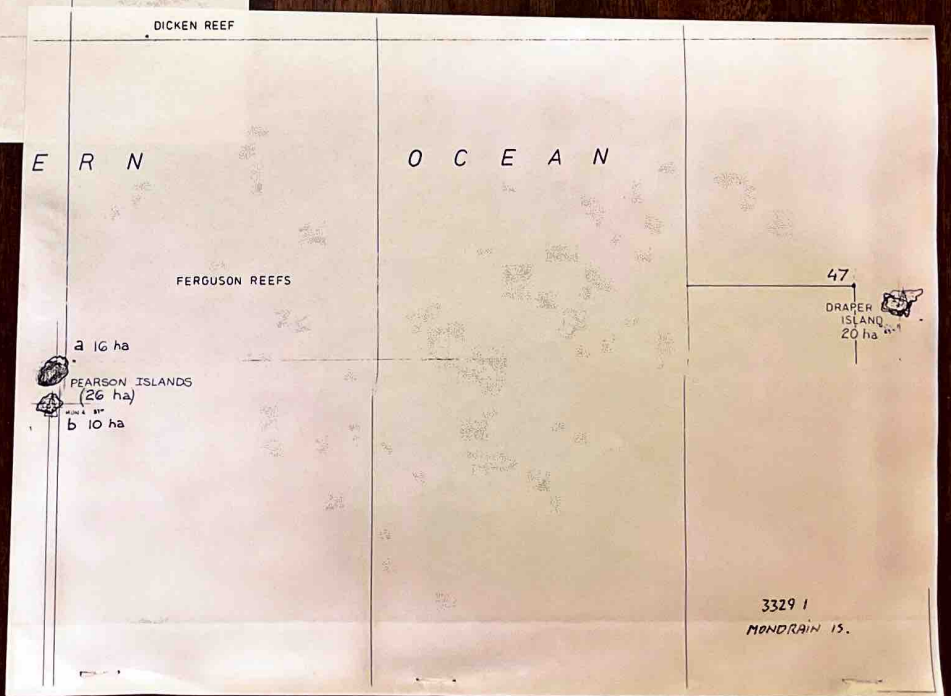
9 121 45
34 00

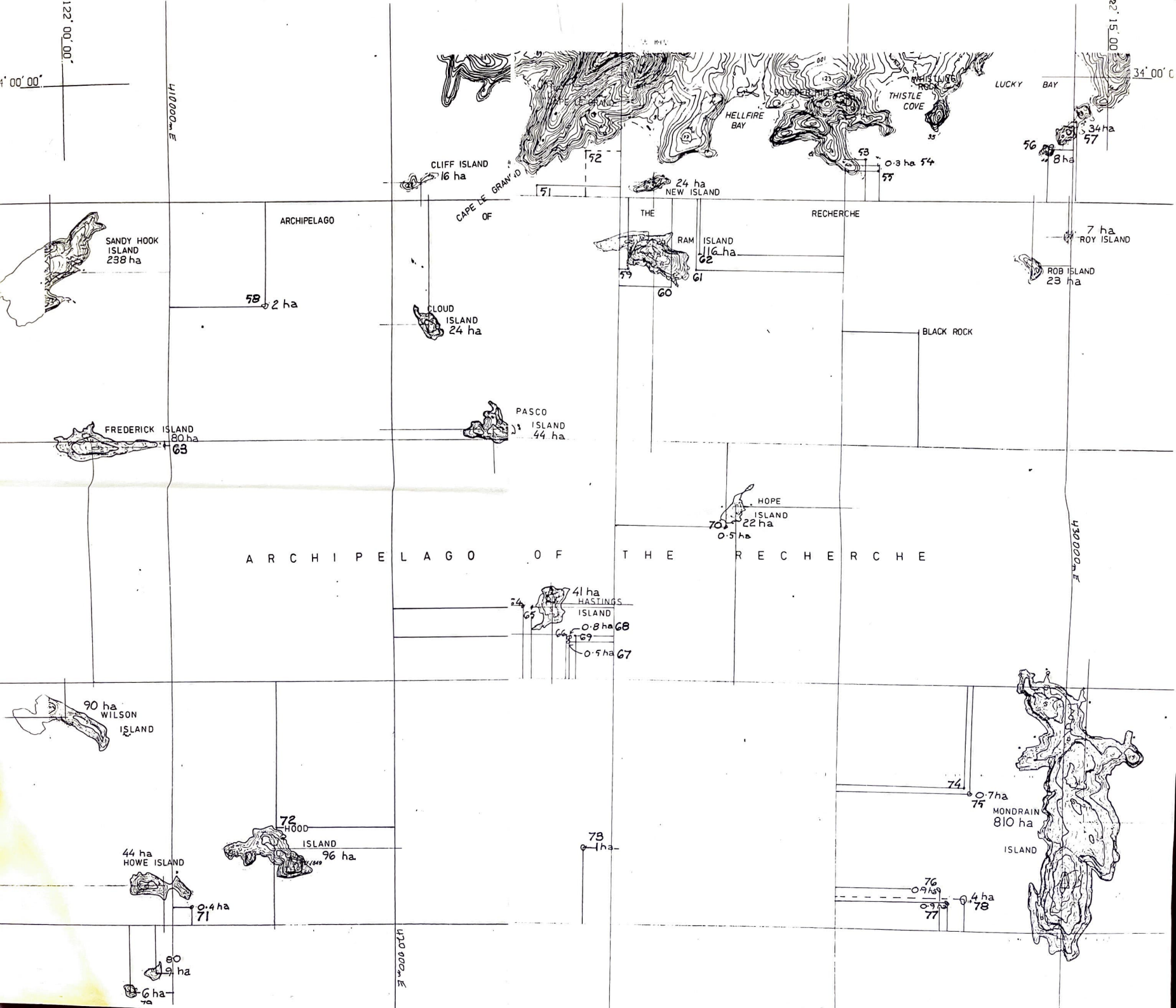


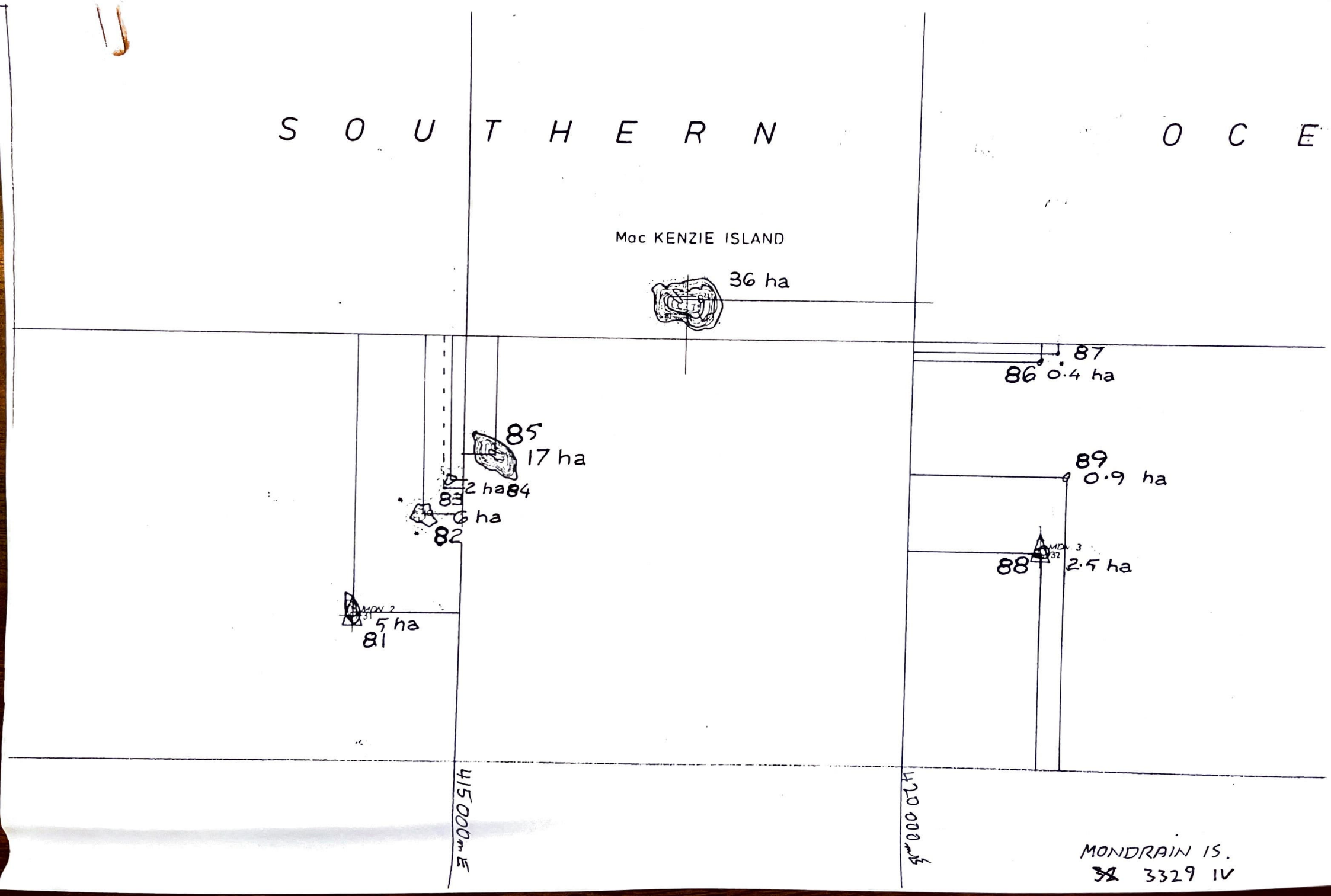
3229 IV
MONDRAIN IS.

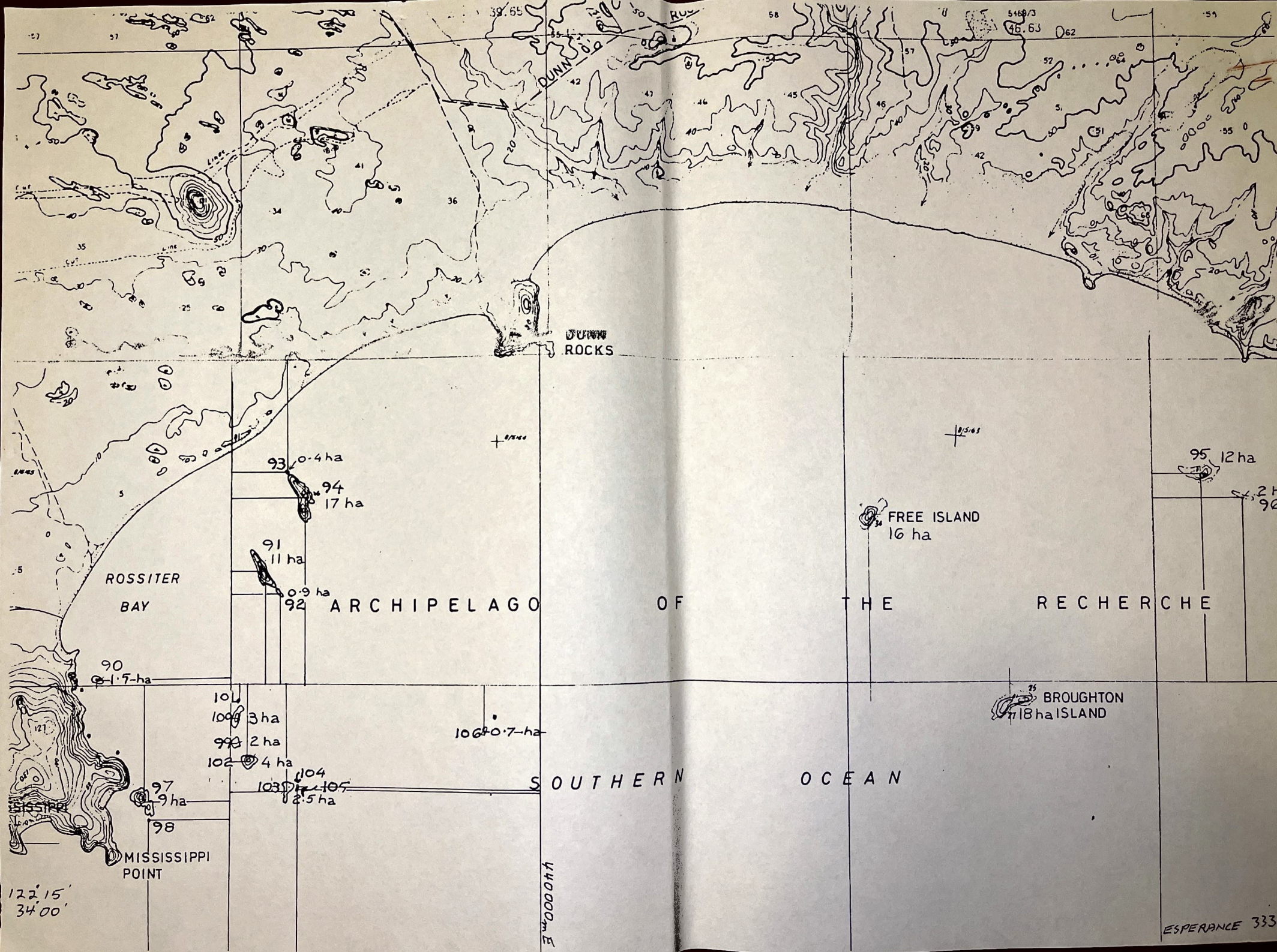

THIRTEEN MILE BEACH
ELEVEN MILE BEACH
BUTTY HARBOUR
PLUMPUDDING BEACH
BUTTY HEAD
BAYLISS ROCK
OCEAN
WEST CHANNEL
38 ha
CAPPS ISLAND
4 ha
HECTOR ROCK
FURY ROCK
BOXER ISLAND
WEST GROUP
3400
380000mE
121° 45' 00"
ESPERANCE 3230 III

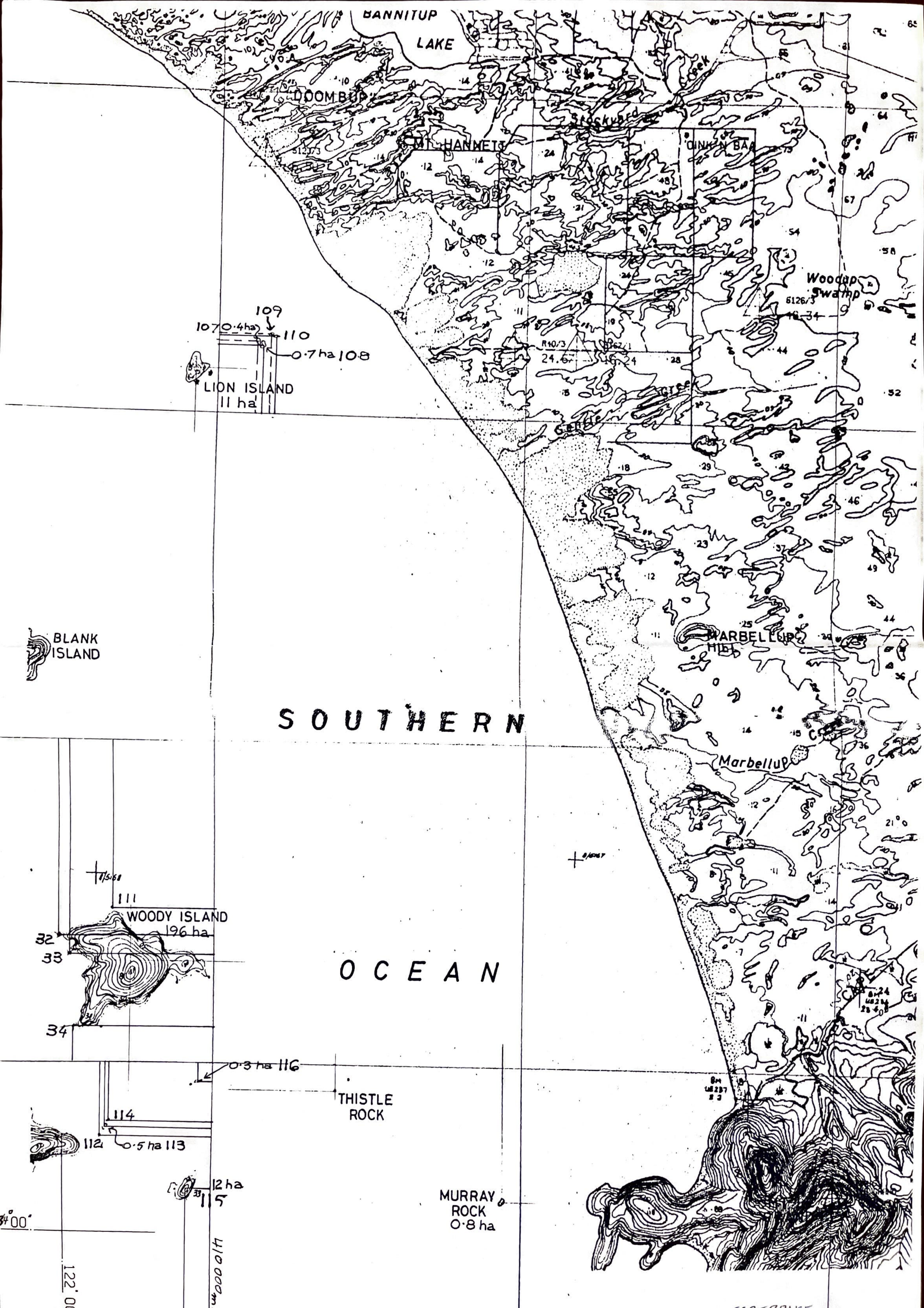

122° 15' 00"
34° 00' 00"
MISSISSIPPI POINT
MISSISSIPPI REEF
a 35ha
TORY (60 ha)
ISLANDS
b a ha
c 8 ha
d 14ha
44
OUTTRIM REEF
FRENCH REEF
A R C H I P E L A G O O F
10 ha
FINGER ISLAND
45
6ha
46
4ha
MONDRAIN
ISLAND
HUGO ISLAND
3 ha


DICKEN REEF
E R N
O C E A N
FERGUSON REEFS
47
DRAPER
ISLAND
20 ha
a 16 ha
PEARSON ISLANDS
(26 ha)
b 10 ha
3329 1
MONDRAIN IS.


122° 00' 00"
34° 00' 00"
410000mE
430000mE
CAPE LE GRAND
HELLFIRE BAY
BOULDER HILL
THISTLE COVE
WHISTLING ROCK
LUCKY BAY
CLIFF ISLAND
16 ha
52
53
0·3 ha 54
55
56
8 ha
34 ha
57
24 ha
NEW ISLAND
51
THE
RECHERCHE
ARCHIPELAGO
OF
SANDY HOOK ISLAND
238 ha
58
2 ha
CLOUD ISLAND
24 ha
RAM ISLAND
116 ha
59
60
61
62
7 ha
ROY ISLAND
ROB ISLAND
23 ha
BLACK ROCK
PASCO ISLAND
44 ha
FREDERICK ISLAND
80 ha
63
HOPE ISLAND
22 ha
70
0·5 ha
ARCHIPELAGO OF THE RECHERCHE
41 ha
HASTINGS ISLAND
64
65
0·8 ha 68
66
69
0·5 ha 67
90 ha
WILSON ISLAND
72
HOOD ISLAND
96 ha
44 ha
HOWE ISLAND
0·4 ha
71
73
78
1 ha
74
0·7 ha
75
MONDRAIN ISLAND
810 ha
76
0·9 ha
77
0·4 ha
78
80
9 ha
6 ha
79
410000mE


S O U T H E R N
O C E
Mac KENZIE ISLAND
36 ha
87
86 0·4 ha
85
17 ha
89
0·9 ha
2 ha 84
83
6 ha
82
88
2·5 ha
5 ha
81
E 150 000 mE
E 170 000 mE
MONDRAIN IS.
3329 IV


DUNN ROCKS
93 0·4 ha
94 17 ha
91 11 ha
0·9 ha
92
ROSSITER BAY
ARCHIPELAGO OF THE RECHERCHE
FREE ISLAND 16 ha
95 12 ha
90 1·7 ha
101
100 3 ha
99 2 ha
102 4 ha
103
104
105 2·5 ha
106 0·7 ha
97 9 ha
98
MISSISSIPPI POINT
BROUGHTON ISLAND 18 ha
SOUTHERN OCEAN
122°15'
34°00'
ESPERANCE 333



BANNITUP
LAKE
DOOMBUP
MT. HANNETT
Stockyard
Creek
DINKIN BAA
Woodup Swamp
LION ISLAND
11 ha
107 0·4 ha
109
110
0·7 ha 108
Marbellup
MARBELLUP HILL
BLANK ISLAND
SOUTHERN
OCEAN
111
WOODY ISLAND
196 ha
32
33
34
0·3 ha 116
THISTLE ROCK
114
112
0·5 ha 113
12 ha
115
MURRAY ROCK
0·8 ha
34°00'
122°00'
410000 m

480000

485000

900000

5000

122° 45′ 00″

34°00′

NORTH TWIN PEAK ISLAND

SOUTH TWIN PEAK ISLAND
102 ha

117
1 ha

4 ha
SLIPPER ISLAND

SAIL ROCK

A R C H I P E L A G O O F T H E R E C H E R C H E

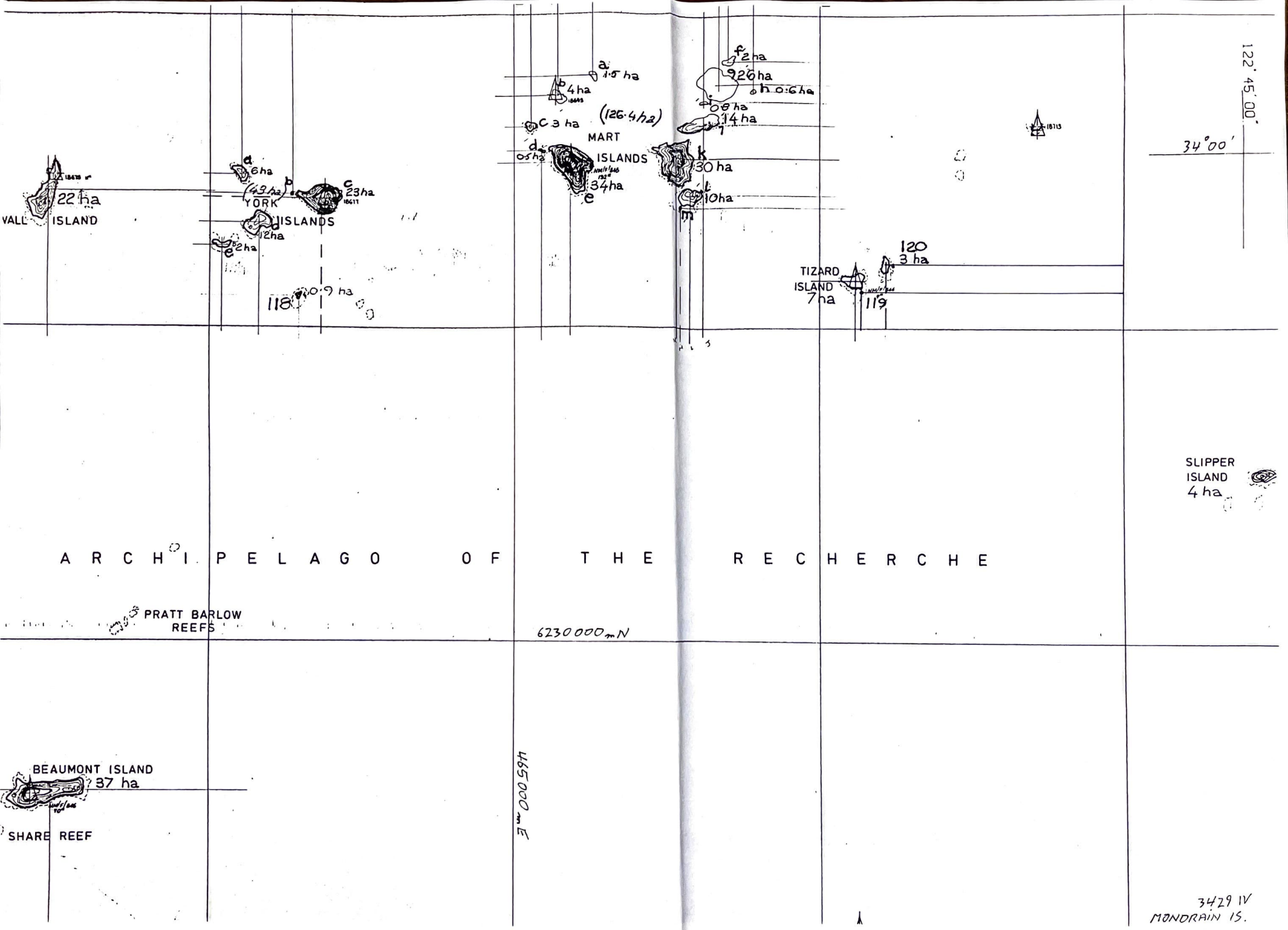
E 020 084

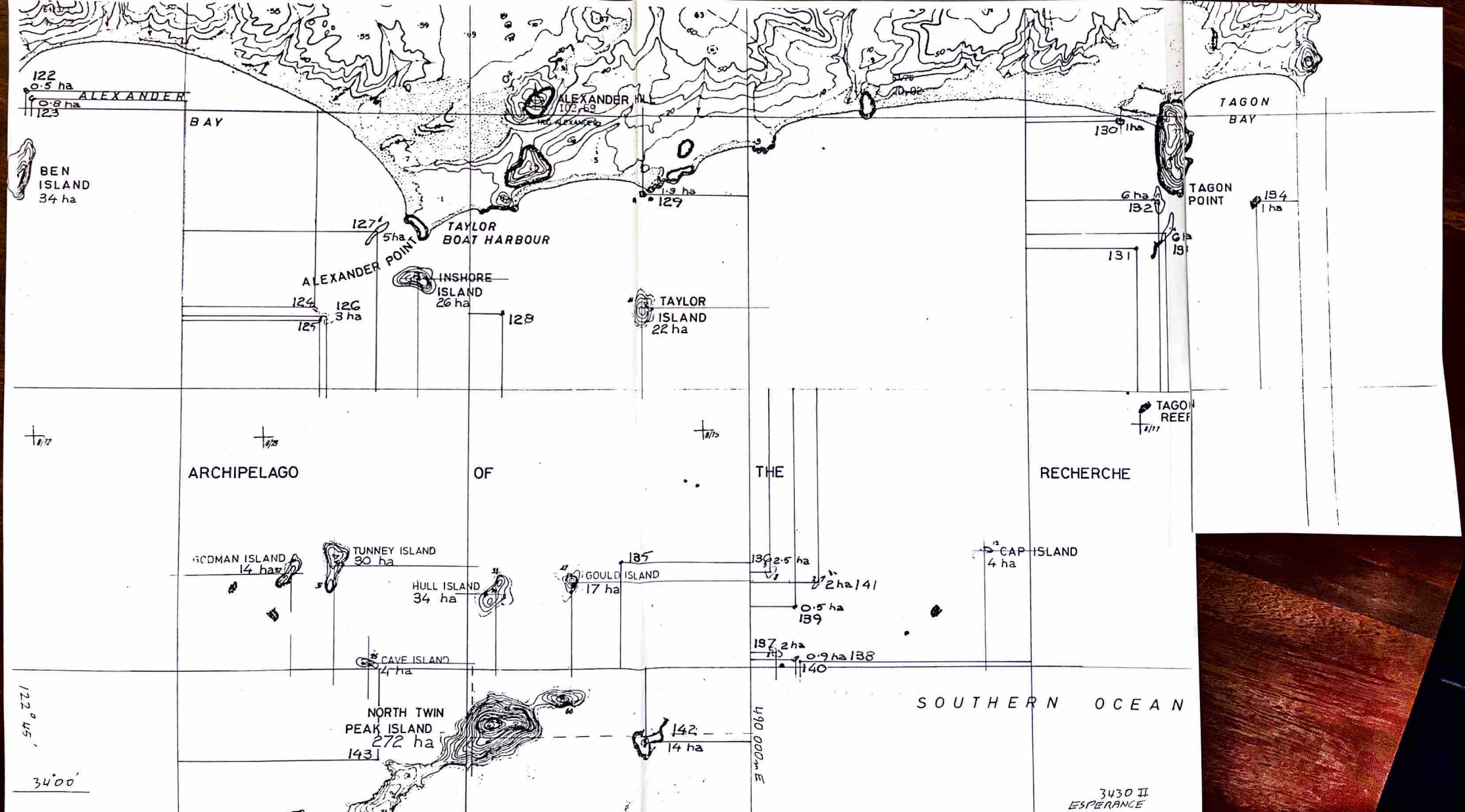
KERMADEC ISLAND
24 ha

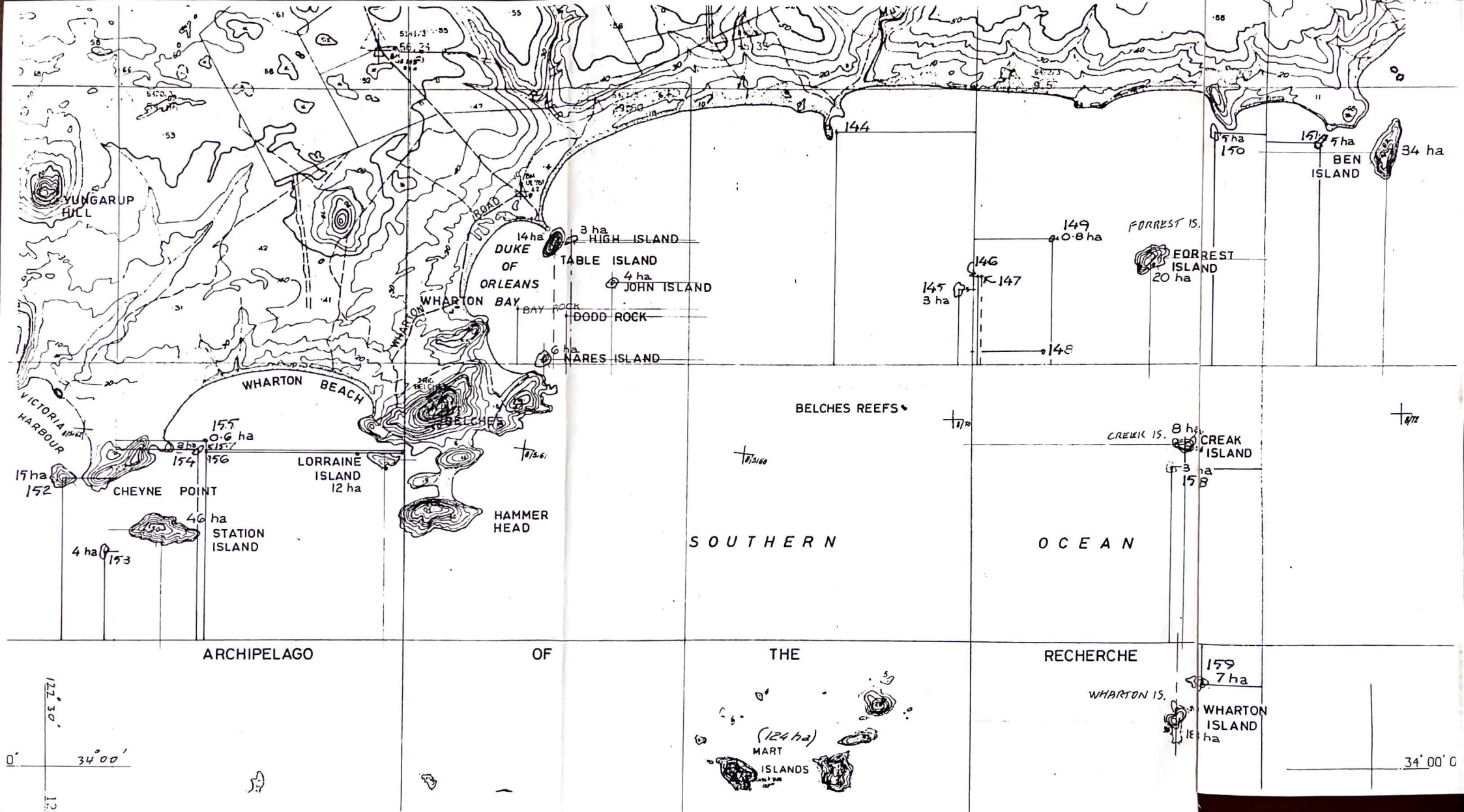
KERMADEC ROCKS

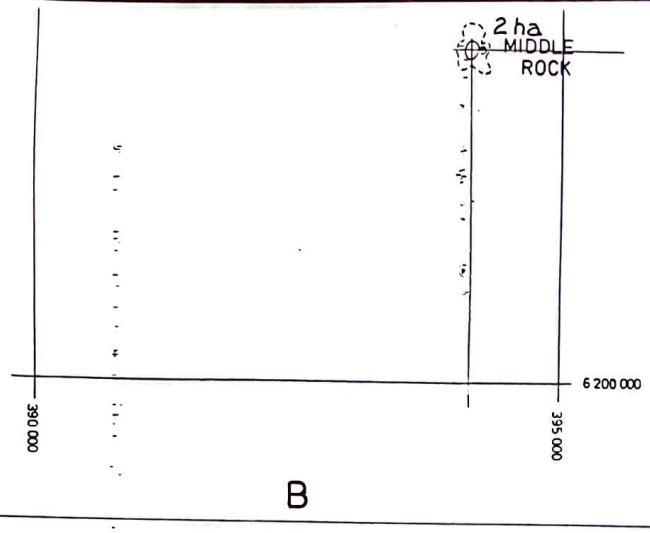
RAWSON REEF

34291
MONDRAIN IS.

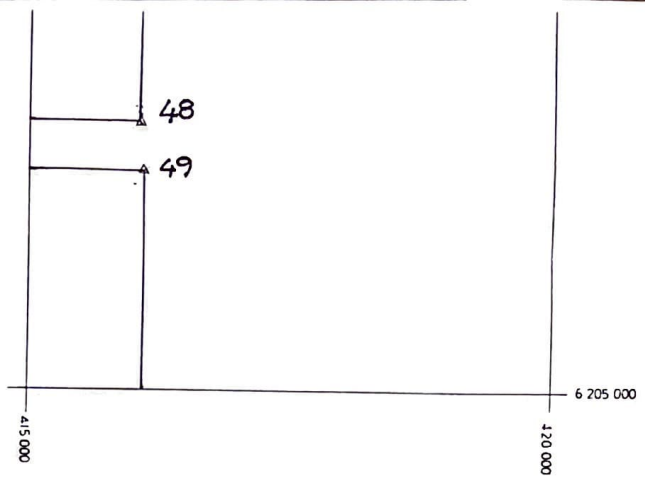

22 ha
VALL ISLAND
d 6 ha
(49 ha)
b
c 23 ha
YORK
ISLANDS
12 ha
e 2 ha
118
0·9 ha
a 1·5 ha
b 4 ha
c 3 ha
(126·4 ha)
MART
d 0·5 ha
ISLANDS
34 ha
e
f 2 ha
92·6 ha
h 0·6 ha
g 0·8 ha
14 ha
k 30 ha
l 10 ha
m
120
3 ha
TIZARD
ISLAND
7 ha
119
122° 45' 00"
34° 00'
SLIPPER
ISLAND
4 ha
A R C H I P E L A G O O F T H E R E C H E R C H E
PRATT BARLOW
REEFS
6230000 mN
465000 mE
BEAUMONT ISLAND
37 ha
SHARE REEF
3429 IV
MONDRAIN IS.


122
0·5 ha
ALEXANDER
0·8 ha
123
BAY
ALEXANDER HILL
102
BEN
ISLAND
34 ha
1·9 ha
129
127
5 ha
TAYLOR
BOAT HARBOUR
ALEXANDER POINT
INSHORE
ISLAND
26 ha
124
126
3 ha
125
128
TAYLOR
ISLAND
22 ha
TAGON
BAY
130
1 ha
TAGON
POINT
6 ha
132
134
1 ha
131
TAGON
REEF
ARCHIPELAGO
OF
THE
RECHERCHE
GODMAN ISLAND
14 ha
TUNNEY ISLAND
30 ha
HULL ISLAND
34 ha
185
GOULD ISLAND
17 ha
136
2·5 ha
2 ha
141
0·5 ha
139
CAP ISLAND
4 ha
187
2 ha
0·9 ha
138
140
CAVE ISLAND
4 ha
NORTH TWIN
PEAK ISLAND
272 ha
143
142
14 ha
SOUTHERN OCEAN
122° 45'
34°00'
490 000m E
3430 II
ESPERANCE

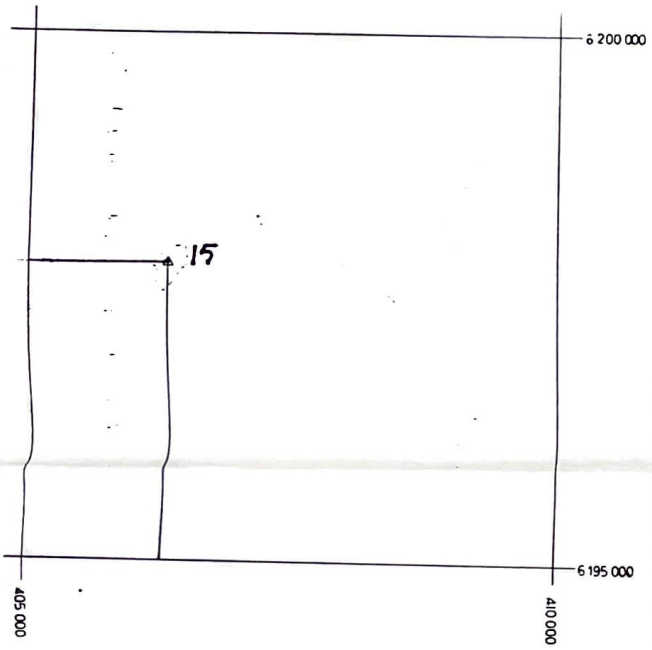

YUNGARUP HILL
ROAD
DUKE OF ORLEANS BAY
WHARTON BAY
WHARTON
14 ha
3 ha
HIGH ISLAND
TABLE ISLAND
4 ha
JOHN ISLAND
BAY ROCK
DODD ROCK
6 ha
NARES ISLAND
WHARTON BEACH
VICTORIA HARBOUR
155
0·6 ha
154
156
LORRAINE ISLAND
12 ha
15 ha
152
CHEYNE POINT
46 ha
STATION ISLAND
4 ha
153
HAMMER HEAD
BELCHES REEFS
SOUTHERN
OCEAN
144
149
0·8 ha
FORREST IS.
FORREST ISLAND
20 ha
146
147
145
3 ha
148
5 ha
150
151
5 ha
BEN ISLAND
34 ha
CREEK IS.
8 ha
CREAK ISLAND
3 ha
158
159
7 ha
WHARTON IS.
WHARTON ISLAND
18 ha
(124 ha)
MART ISLANDS
ARCHIPELAGO
OF
THE
RECHERCHE
122° 30'
34° 00'
34° 00' 0



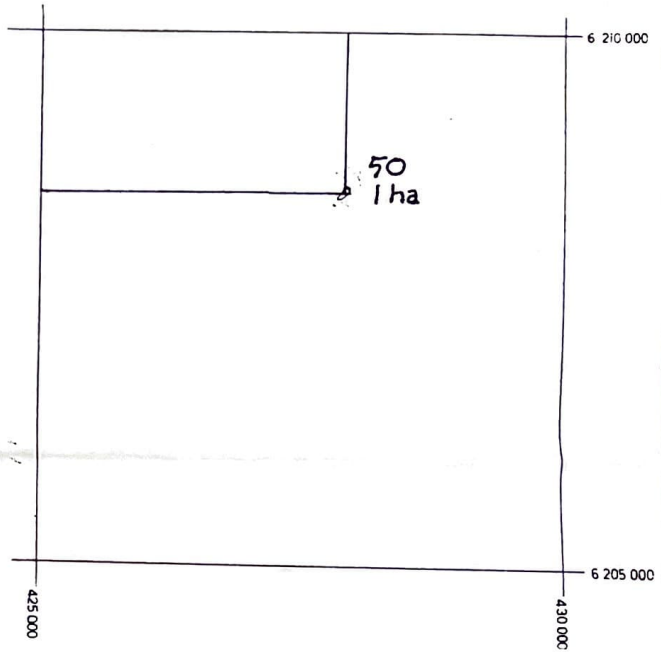
B



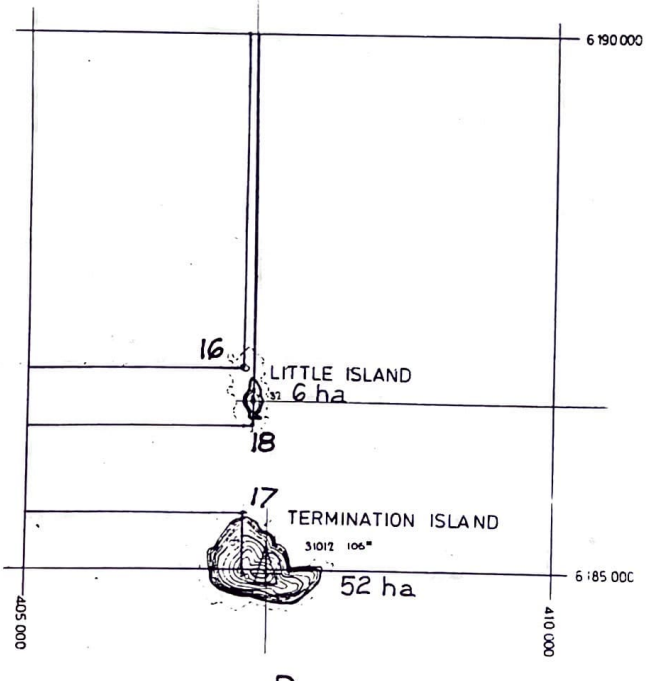
E



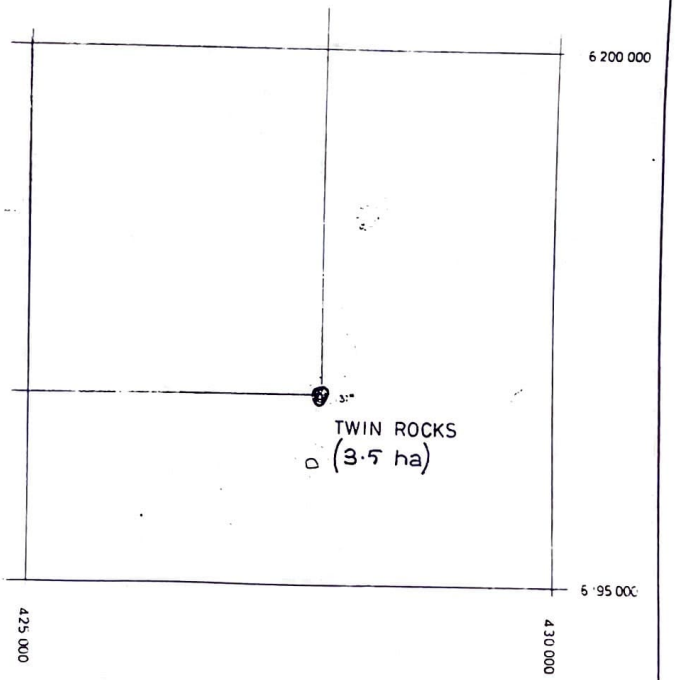
C



F



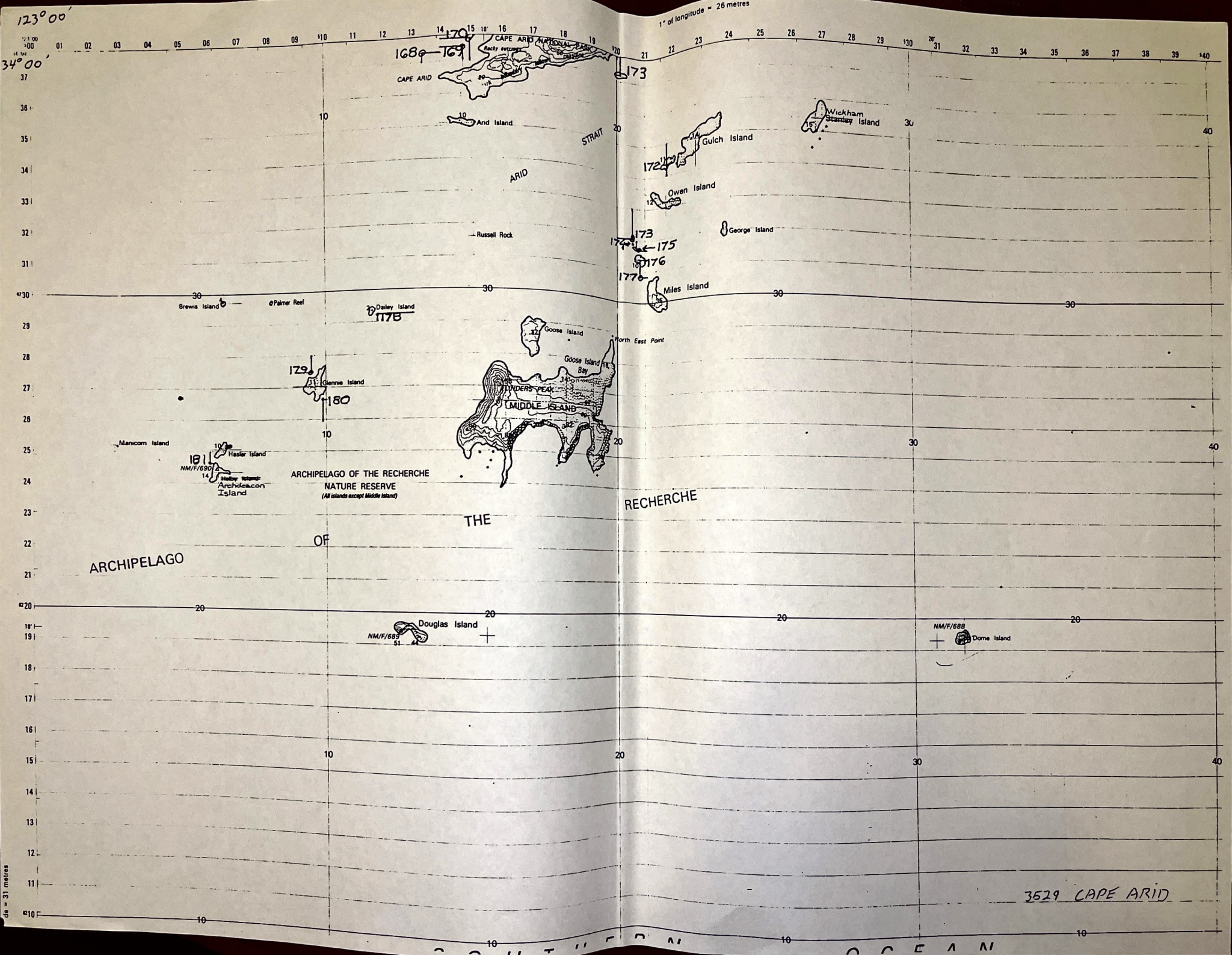
D

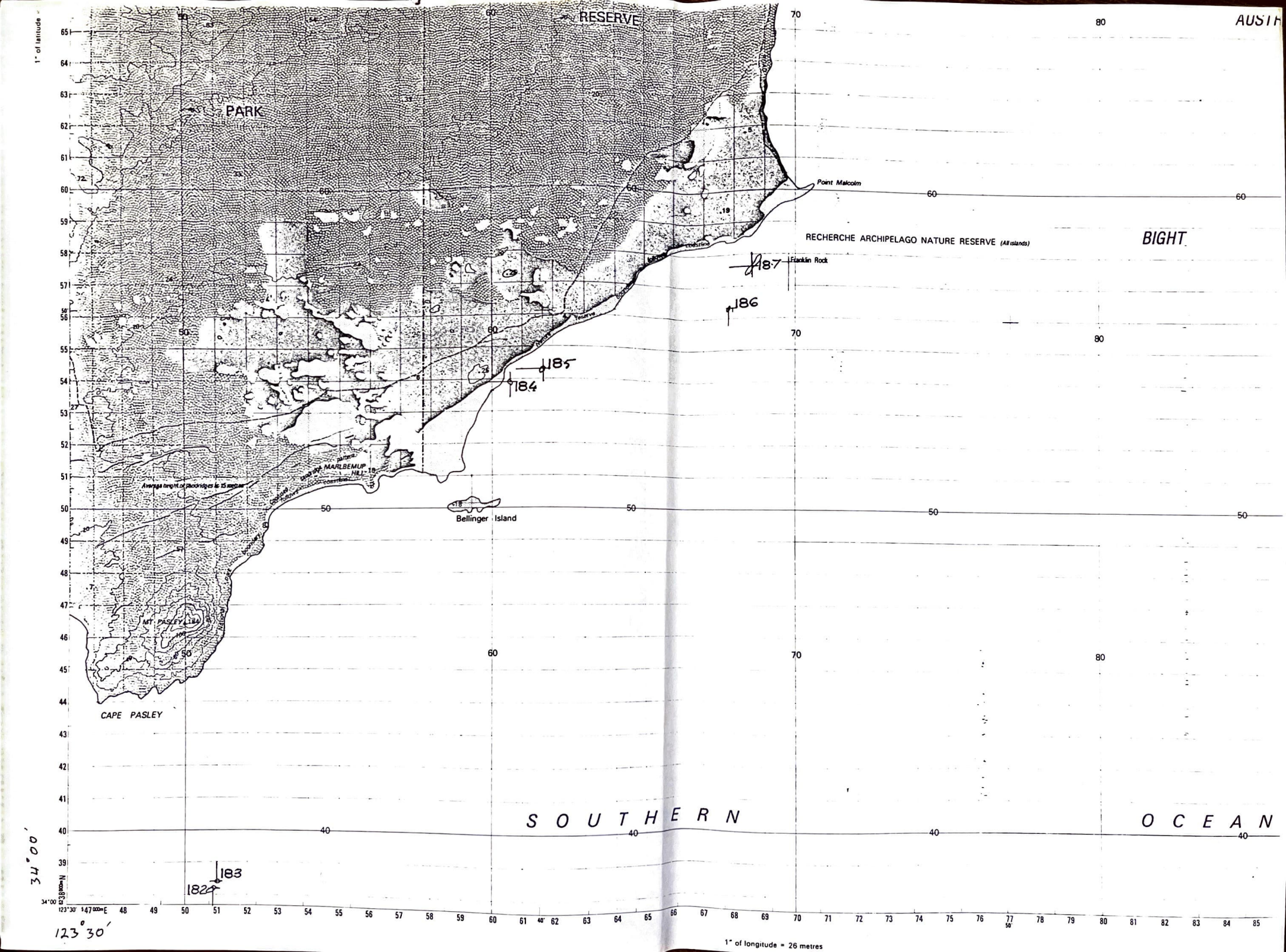


G

MONDRAIN IS.

SANDY BIGHT 3530


123°00'
34°00'
1° of longitude = 26 metres
CAPE ARID NATIONAL PARK
CAPE ARID
Arid Island
STRAIT
ARID
Russell Rock
Gulch Island
Wickham
Stanley Island
Owen Island
George Island
Miles Island
Brewis Island
Palmer Reef
Dailey Island
Goose Island
North East Point
Goose Island Bay
Glennie Island
FLINDERS PEAK
MIDDLE ISLAND
Manicom Island
Hasler Island
NM/F/690
Archdeacon Island
ARCHIPELAGO OF THE RECHERCHE
NATURE RESERVE
(All islands except Middle Island)
THE
RECHERCHE
OF
ARCHIPELAGO
Douglas Island
NM/F/689
NM/F/688
Dome Island
3529 CAPE ARID


RESERVE
PARK
Point Malcolm
RECHERCHE ARCHIPELAGO NATURE RESERVE (All islands)
BIGHT
Franklin Rock
187
186
185
184
183
182
MARLBEMUP HILL
Bellinger Island
CAPE PASLEY
MT PASLEY
SOUTHERN
OCEAN
34°00'
123°30'
1° of latitude = 38 000m N
1° of longitude = 26 metres