Tasmanian Aquaculture
& Fisheries Institute
University of Tasmania

Head Office:
Marine Research Laboratories,
Nubeena Crescent, Taroona,
Tasmania 7053
Telephone: (03) 6227 7277
Facsimile: (03) 6227 8035

Chris Simpson
Marine Conservation Branch,
CALM,
Freemantle,
W.A.

14/1/2000

Dear Chris,
please find enclosed a copy of the data report from our Jurien Bay survey last year. Hopefully it will provide you with all the details you require for your records. Please contact myself or Graham if you have any queries regarding any of the details,

Yours,

Neville Barrett.

Jurien Bay MPA survey data report.

From the period 26th of October 1999 to the 4th of November 1999 a baseline biological survey was conducted in the proposed Jurien Bay Marine Park. The survey team consisted of four people, Dr Graeme Edgar, Dr Neville Barrett and Alastair Morton from the Tasmanian Aquaculture and Fisheries Institute, and Mike Lapwood, Marine Operations Officer at the Department of Conservation and Land Management in Western Australia.

The methodology was similar to that used in Tasmanian and other interstate surveys on marine reserves. The aim of the survey was to obtain baseline biological data from sites within the sanctuary zones, scientific reference areas and general use zones that posses similar habitat types. With this method the effectiveness of various levels of protection can be distinguished from more general long term trends in coastal waters when changes in protected areas are found to be significantly larger or smaller than changes outside them.

The study concentrated on species associated with reefs because this habitat type is the most heavily targeted by inshore fisheries, and because many reef-associated species are site attached and so should recover relatively rapidly in "no-take" areas. By contrast, most open water and soft-bottom fishes are unlikely to remain in small "no-take" areas for sufficient time to receive adequate protection.

Site selection.

A total of 25 sites were surveyed using the latest draft of the proposed zoning map. Sites were carefully selected to give a good spread of the different zones, they also had to have at least 200 m of shallow reef and be of similar habitat type. Of these sites, a total of 8 were in the zone designated for General Use, 9 sites were in the Special Purpose (Scientific Reference) area and 8 sites were in the proposed Sanctuary zones (See maps attached). This was the maximum number of sites able to be surveyed given the windy conditions experienced at the time of sampling and the availability of suitable reef.

Census methodology.

Visual census techniques were used in the study because sampling needed to be non-destructive within proposed "no-take" areas and a large amount of data is required on a range of species within the short seasonal survey periods. A large number of species were surveyed because, although target species are suspected to show the most significant recovery initially, there may be significant secondary effects of fishing that will go undetected unless greater species numbers are censused. Three different census methods were used to obtain adequate descriptive information on reef communities at different spatial scales.

At each reef site, the abundance and size structure of large fishes, the abundance of cryptic fishes and benthic invertebrates, and the percent cover of macroalgae were each censused separately. The densities of large fishes were estimated by laying four 50 m transect lines along a fixed depth contour (generally the 5 m depth contour, although when this was not possible the 3 m contour was used) and recording on waterproof paper the number and estimated size-class of fish within 5 m of each side of the line, as observed by a diver swimming up one side of the line and then back along the other. Size-classes used in the study were 25, 50, 75, 100, 125, 150, 200, 250, 300, 350, 375, 400, 500, 625, 750, 875 and 1000+ mm. A total of four 5 m x 100 m transects was thus censused for large fish at each site.

Smaller fishes and megafaunal invertebrates (large molluscs, echinoderms, crustaceans) were next counted along the transect lines used for the fish survey by recording animals within 1 m of one side of the line (a total of four 1 m x 50 m transects). The distance of 1 m was assessed using a stick carried by the diver. The maximum length of abalone and the carapace length of rock lobsters were measured underwater using vernier callipers whenever possible.

The area covered by different macroalgal species was then quantified by placing a 0.25 m^2 quadrat at 10 m intervals along the transect line and determining the percent cover of the various plant species. Cover was assessed by counting the number of times each species occurred directly under the 50 positions on the quadrat at which perpendicularly placed wires crossed each other (a total of 1.25 m^2 for each of the 50 m sections of transect line).

After the diving survey the position of each site was recorded using a hand held GPS (Scoutmaster), using Aus 84 Datum System to give Southings and Eastings in decimal minutes. Site positions and site details are shown in Table 1. Site sketches provided by Mike Lapwood are also provided with this report. Additional site details, including depth are contained in the main datafile. The datafile is in Excel format, entitled "Jurien data". Within this file each species is assigned an individual code which has been standardised between similar studies in Tasmania, Victoria and New South Wales. The species codes and species names can be found in sheet 2 of the datafile. Each site has been allocated a site code which corresponds to codes shown in Table 1. The datafile breaks up each site into the four individual transects conducted for fishes and invertebrates, and for macroalgae as a matrix with no of points out of 50 of each species in each quadrat presented as a column of data. This data is multiplied by 2 to give percentage cover. For fish, counts are broken up into numbers in each size category (N in inches at top of spreadsheet), for invertebrates there are simply counts in the N column for most species.

To examine the degree of similarity between communities present at sites sampled, and sites between treatments, the percentage cover of macroalgal species were compared using the Bray-Curtis similarity index on untransformed percentage covers. The resulting relationships are shown

as a similarity cluster diagram (Fig. 1) and as a two-dimensional MDS output with stress of 0.13 indicating that this figure is a good spatial representation of relationships. Both these figures show that the degree of dispersal of sites is similar between treatments (sanctuary, reference and general use) and while sites are not identical in their community types, the variance is mostly due to site differences rather than differences between treatments. With this similarity of variance between treatments, the balanced design, and number of replicates between treatments, we should be well placed to detect biologically significant changes in the abundance of most common species if or when they occur following protection.

For any information regarding the database, or site details please contact Neville Barrett (03)62277221, neville.barrett@utas.edu.au, or Graham Edgar (03)62267632, graham.edgar@utas.edu.au.

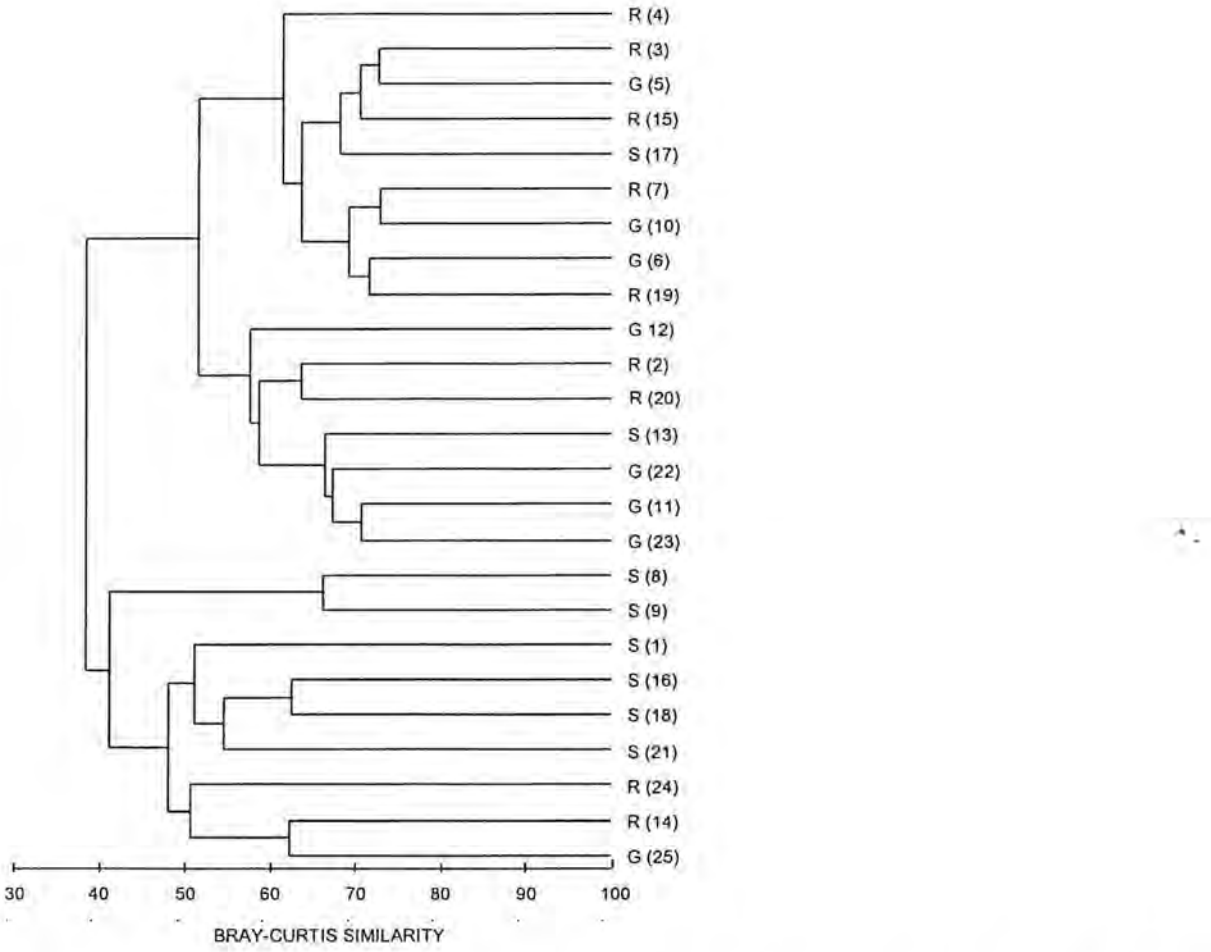


Figure 1. Cluster dendogram of the relationship between macroalgal communities at sites surveyed within the proposed Jurien Bay MPA. Cluster based on the results of a Bray-Curtis similarity comparison of percentage cover data.

Table 1. Sites sampled and their zoning designation.

Date	Dive Number	Site code	Location	Zone	GPS position
26/10/99	1	35/1	North Head 1	Sanctuary	30°13.902' 114°59.872'
26/10/99	2	35/2	Sandland Island	Scientific Reference	30°12.961' 114°59.496'
27/10/99	3	35/3	Outer Rocks	Scientific Reference	30°25.252' 115°00.096'
27/10/99	4	35/4	Outer Rocks (North) 2	Scientific Reference	30°26.001' 114°59.974'
27/10/99	5	35/5	Escape Island	General Use	30°19.'745' 114°59.263'
28/10/99	6	35/6	Inside Seaward Ledge	General Use	30°17.404' 114°58.349'
29/10/99	7	35/7	Juddy Reef	Scientific Reference	30°10.272' 114°57.334'
29/10/99	8	35/8	Fishermans Is. 1	Sanctuary	30°08.035' 114°56.928'
29/10/99	9	35/9	Fishermans Is. 2	Sanctuary	30°08.035' 114°56.928'
30/10/99	10	35/10	North Tail	General Use	30°15.832' 114°58.488'
30/10/99	11	35/11	Australia Lump	General Use	30°11.770' 114°59.328'
30/10/99	12	35/12	Sandy Cape	General Use	30°10.883' 114°59.592'
31/10/99	13	35/13	North Head Island	Sanctuary	30°13.635' 114°59.631'
31/10/99	14	35/14	North Lumps	Scientific Reference	30°09.446' 114°59.'732'
31/10/99	15	35/15	Middle Lumps	Scientific Reference	30°09.430' 114°58.001'
1/11/99	16	35/16	Longman Reef	Sanctuary	30°40.131' 115°07.316'
1/11/99	17	35/17	Flat Rock	Sanctuary	30°45.382' 115°09.885'
1/11/99	18	35/18	Flat Rock Reef	Sanctuary	30°45.234' 115°10.167'
2/11/99	19	35/19	Gazely Reef	Scientific Reference	30°42.557' 115°07.084'
2/11/99	20	35/20	Kearn Reef	Scientific Reference	30°43.324' 115°09.095'
2/11/99	21	35/21	Cavenagh Reef	Sanctuary	30°37.246' 115°06.143'
2/11/99	22	35/22	Inner Seven Ft Rocks	General Use	30°35.381' 115°03.888'
3/11/99	23	35/23	Sams Reef	General Use	30°29.108' 115°01.'799'
3/11/99	24	35/24	No Name Reef	Scientific Reference	30°26.119' 115°02.119'
4/11/99	25	35/25	Fisherman Island	General Use	30°07.230' 114°57.195'

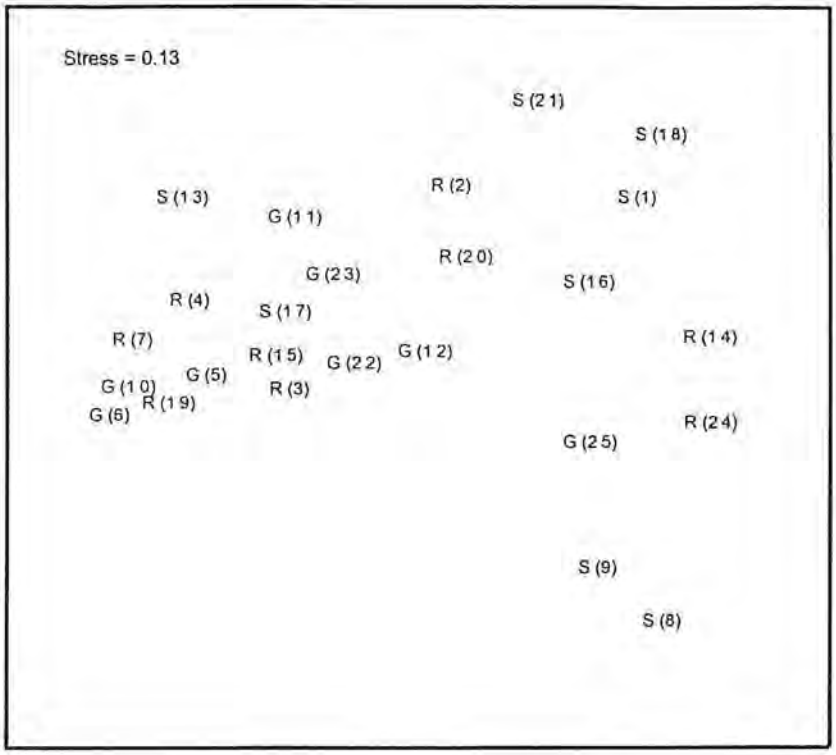
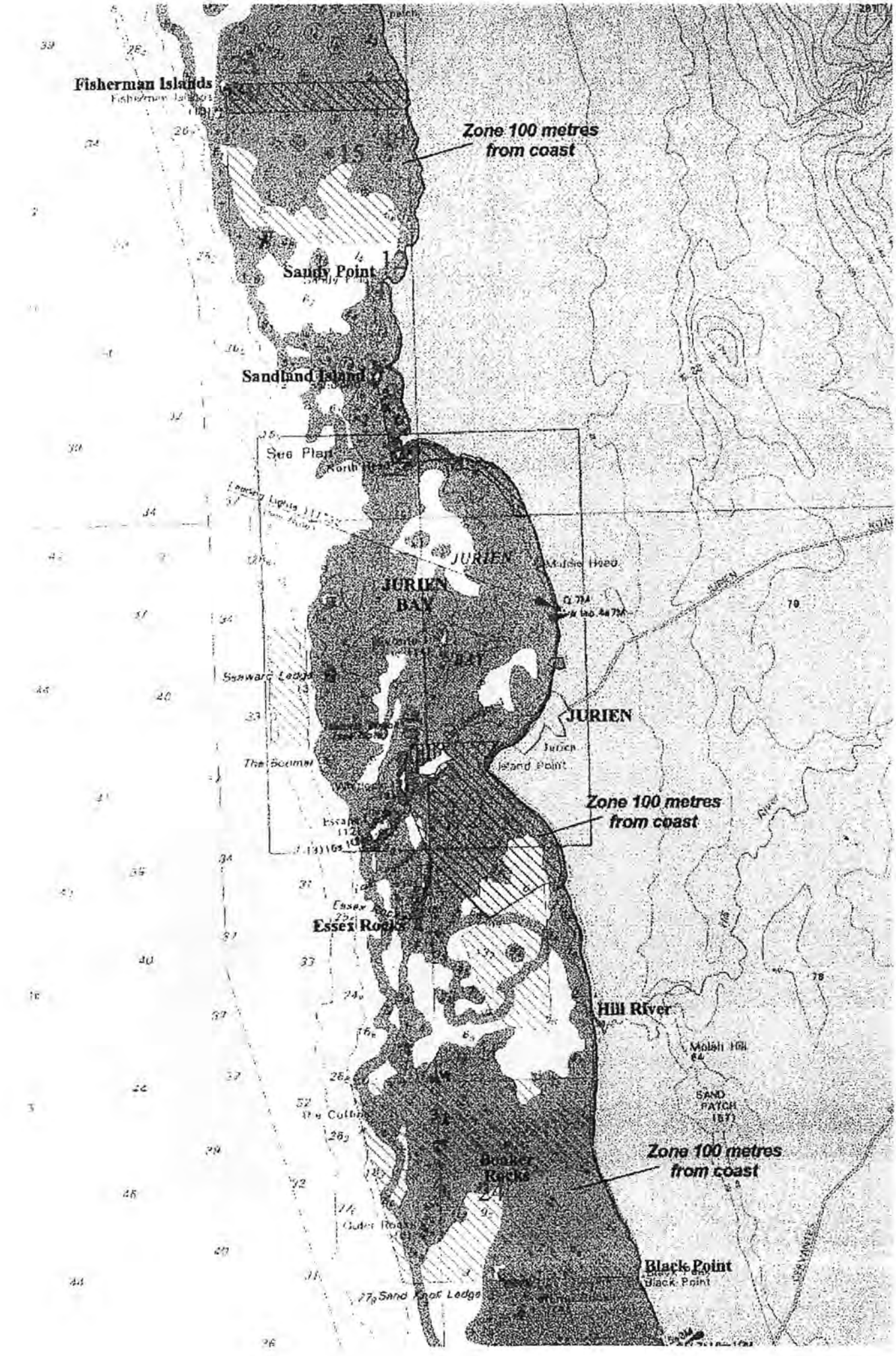
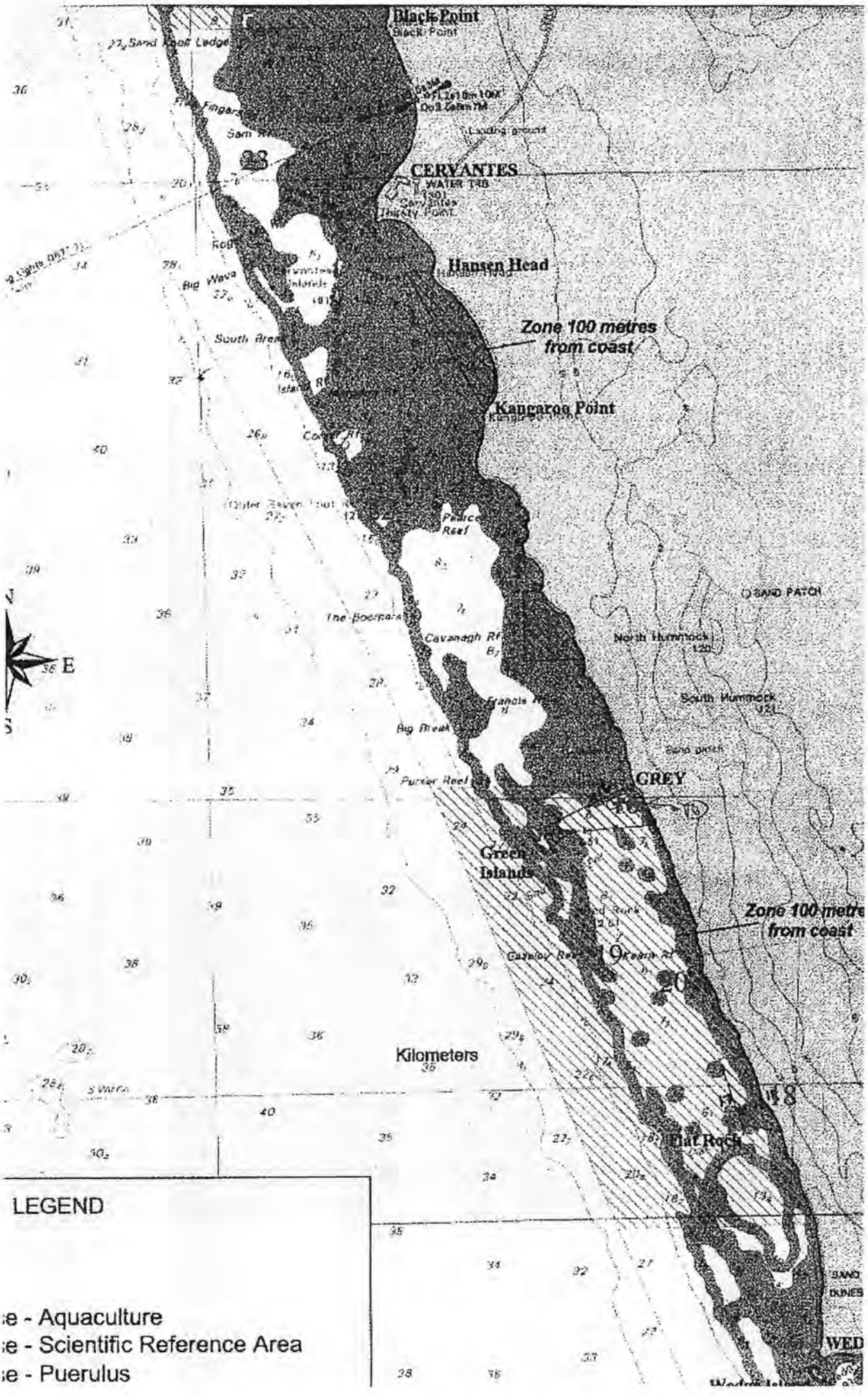


Figure 2. Two dimensional Multi-Dimensional Scaling plot of the Bray-Curtis similarity relationship between macroalgal communities at sites surveyed within the proposed Jurien Bay MPA.


Fisherman Islands
Zone 100 metres from coast
Sandy Point
Sandland Island
Sue Plan
JURIEN
JURIEN BAY
JURIEN
Zone 100 metres from coast
Essex Rocks
Hill River
Zone 100 metres from coast
Boulder Rocks
Black Point


Black Point
CERVANTES
Hansen Head
Zone 100 metres from coast
Kangaroo Point
GREY
Green Islands
Zone 100 metres from coast
Kilometers
Flat Rock
LEGEND
e - Aquaculture
e - Scientific Reference Area
e - Puerulus

JURIEN

DS BOAT 31° 46·027
115° 45·980

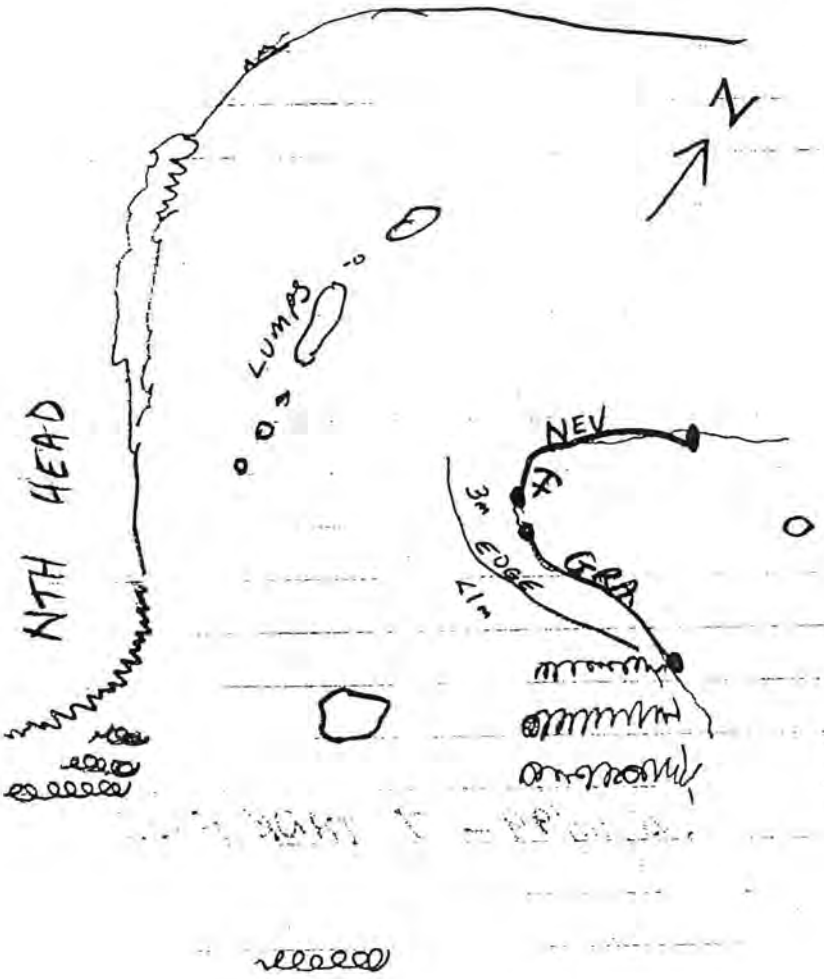
DS SCOUTMASTER 31° 46·078
115° 45·855

CALIBRATION AT 1610, 24/10/99

---

00 26/10 INSIDE NORTH HD. BOAT: 30° 13·923 (NH 1)
114° 59·943

S/M 30° 13·~~950~~ 902
114° 59·~~775~~ 872



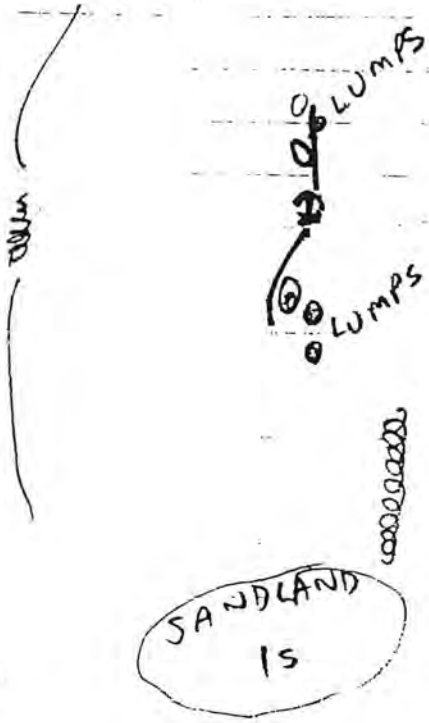
(2)

26·10·99 ~~H00~~ 1130 HRS NORTH HD 2 (SANDLAND Is.)

N. Hd

BOAT 30° 12·975
114° 59·~~522~~

S/M 30° 12·961
114° 59·496



26/10/99 – 7 TANK FILLS

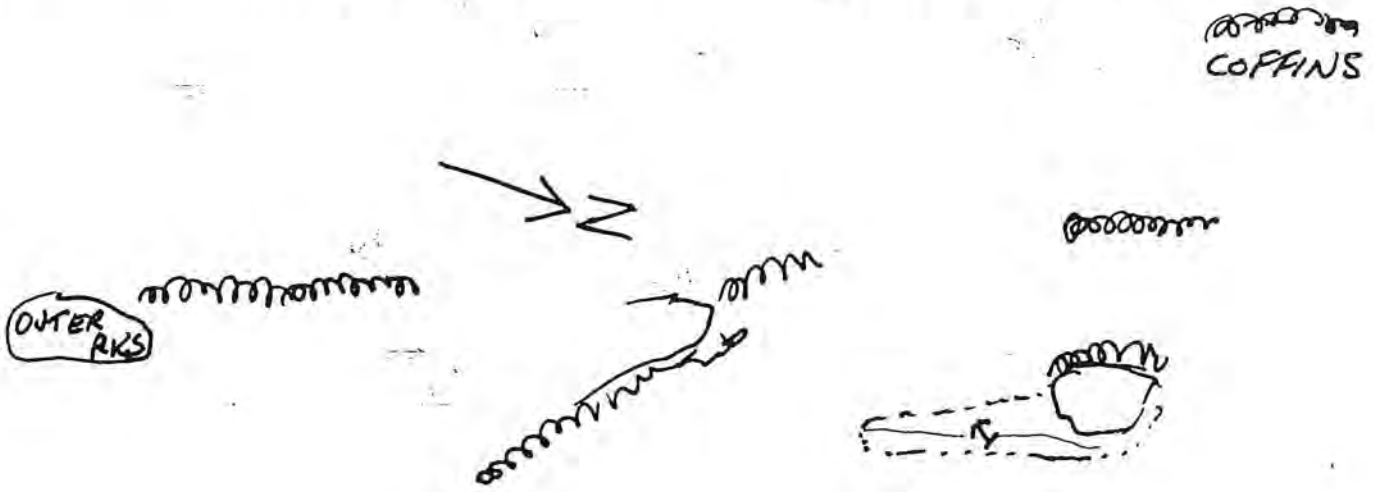
27-10-99 0900 2 WENT TO BOOKER ROCKS. SITE UNSUITABLE FOR TRANSECT (NOT ENOUGH REEF). APPROX 12 SEALIONS ON BOOKER - ALL FEMALES.

NICK GALE 93340290
0417 952 118.

2 NM NORTH OF OUTER ROCKS

BOAT 30° 25.304' 115° 00.089'

S/M 30° 25.252' 115° 00.096'



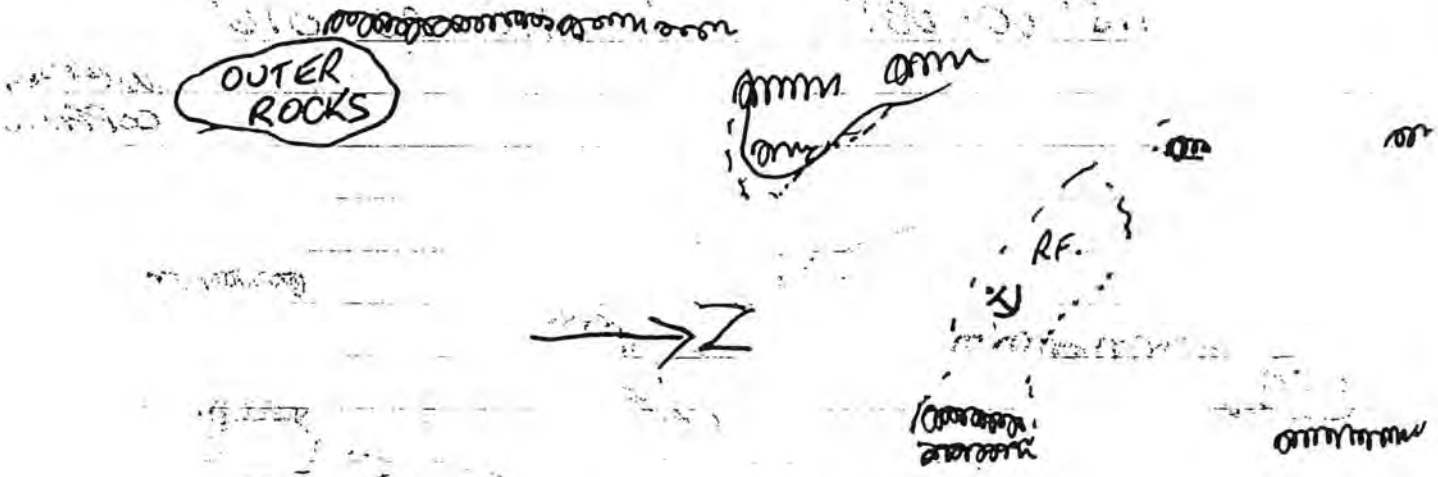
BOOKER RKS.

(4)

27-10-99 1130 HRS
½ N.M. NORTH OF OUTER ROCKS

BOAT 30° 26·011'
114° 59·976'

S/M 30° 26·001'
114° 59 974'



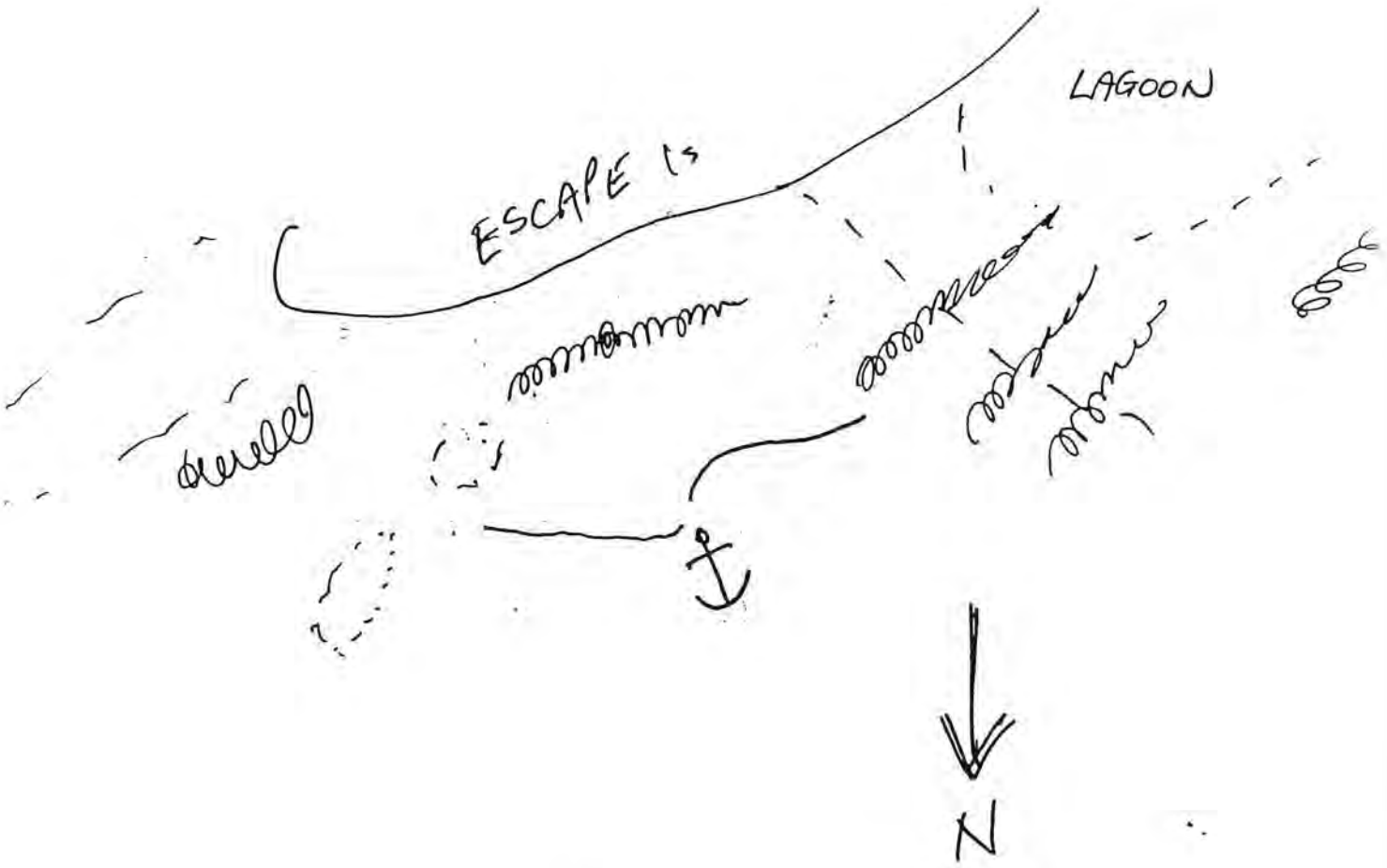
VENT OVER BIG LUMP/SHALLOW GROUND AT
(BOAT) 30° 24·169'
115° 00·551'

MIGHT GET TO DO A SITE ON IT LATER

27.10.99 1440HRS
LEE OF ESCAPE I/S.

BOAT 30° 19·738'
114° 59·255'

S/M 30° 19·745'
114° 59·263'

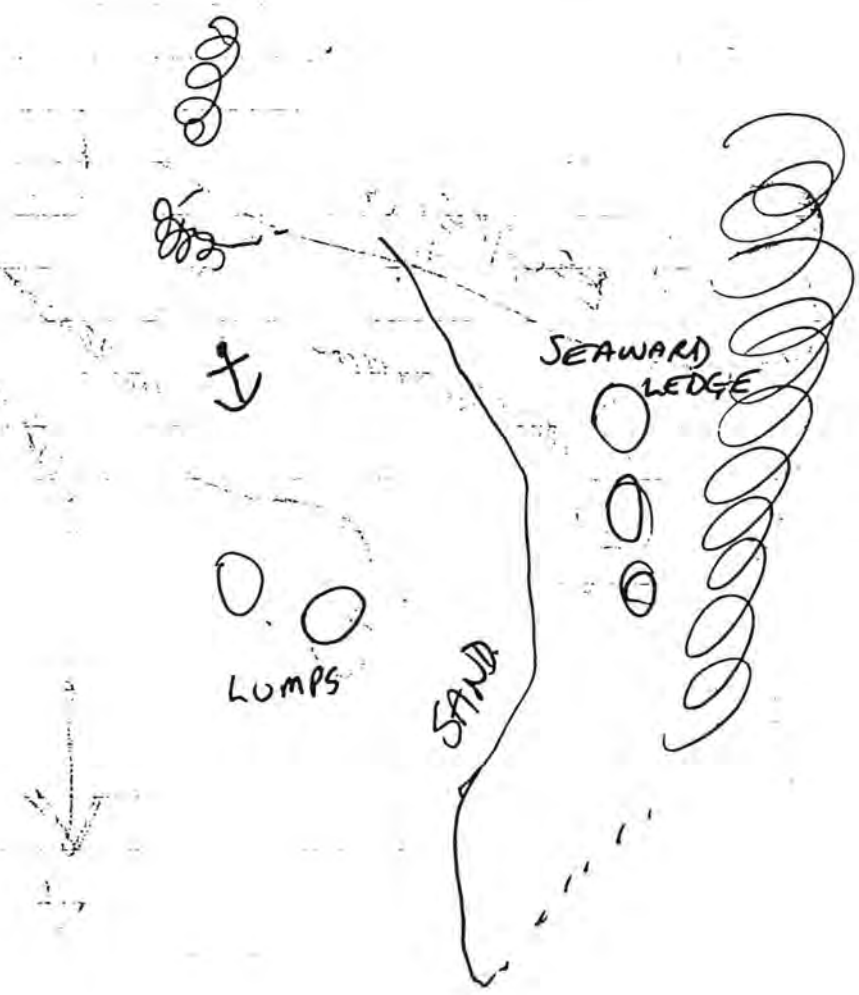


27/10/99 9 TANK FILLS (16)

(b)

28-10-99. INSIDE SEAWARD LEDGE 074

BOAT 30° 17.409 S/m 30° 17.404
114° 58.347 114° 58.349.

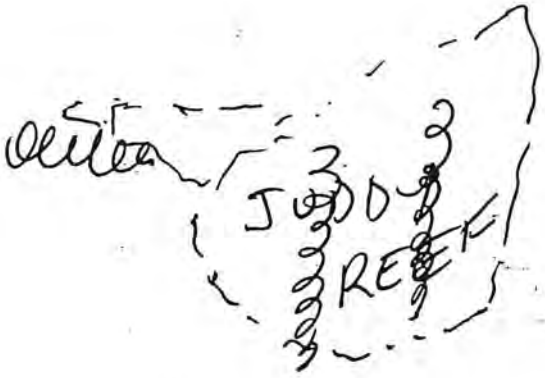


28-10-99 3 TANK FILLS (19)

9-10-99 JUDDY REEF. 0745

30° 10·282'
114° 57 332'

S/M 30° 10·272'
114° 57·334'



OUTER REEF.

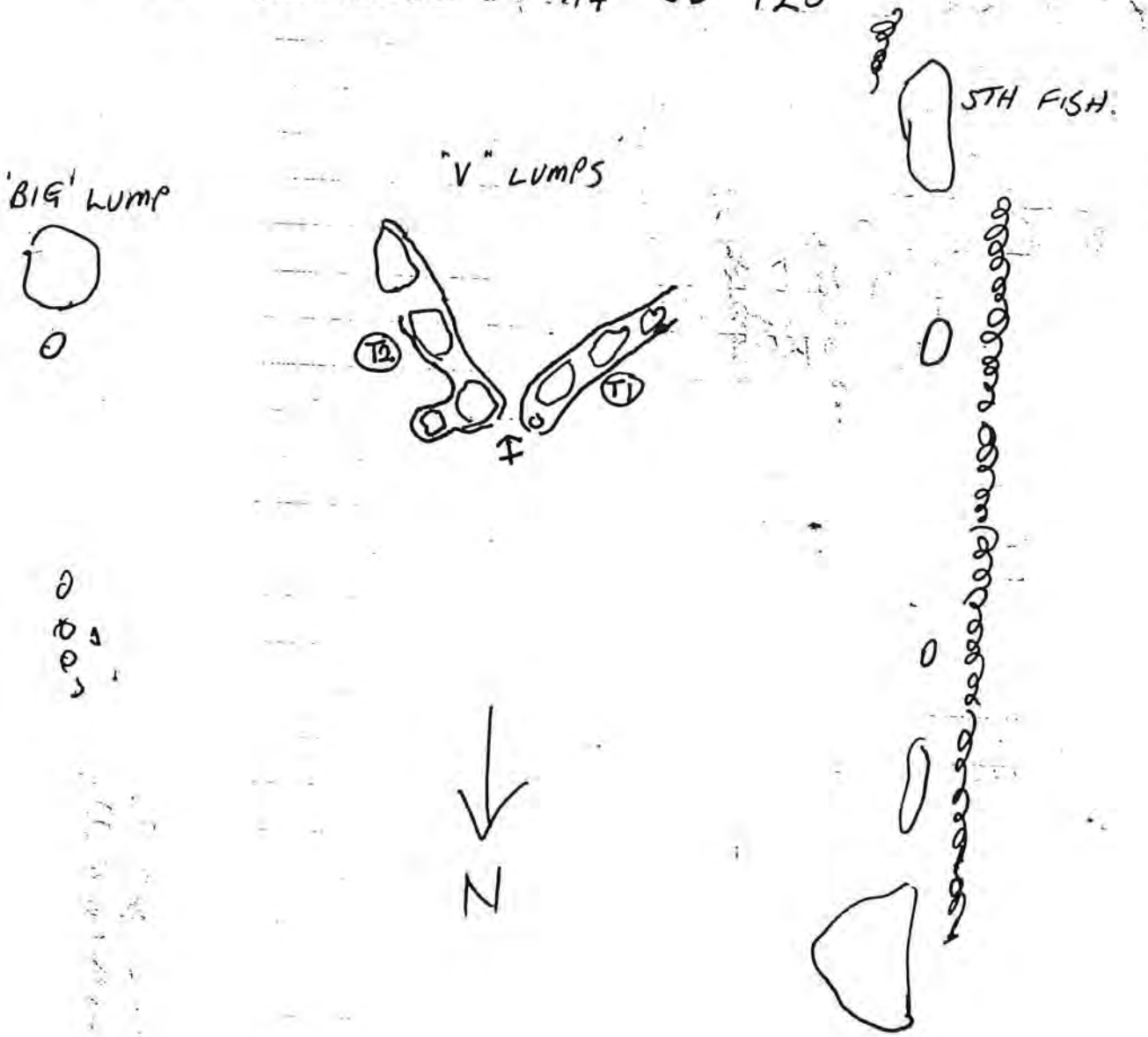
(8) & (9)

1ST DIVE: WEST
2ND DIVE: EAST

2 SITES

29-10-99 LUMPS INSIDE FISHERMEN Is. 10 & 12

BOAT 30° 08·026 S/M 30° 08·035
114° 56·966 114° 56·928



29-10-99 9 TANK FILLS (28

(10)

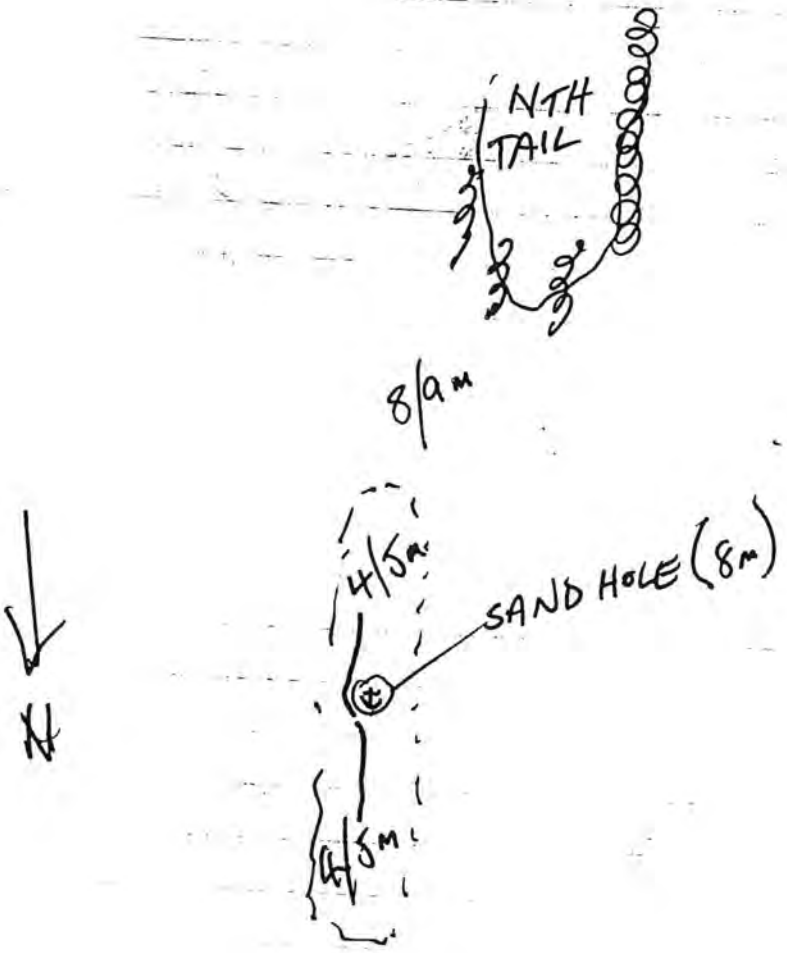
30.10.99

NORTH TAIL (NTH RIDGE)

0740

BOAT 30° 15.848
114° 58.475

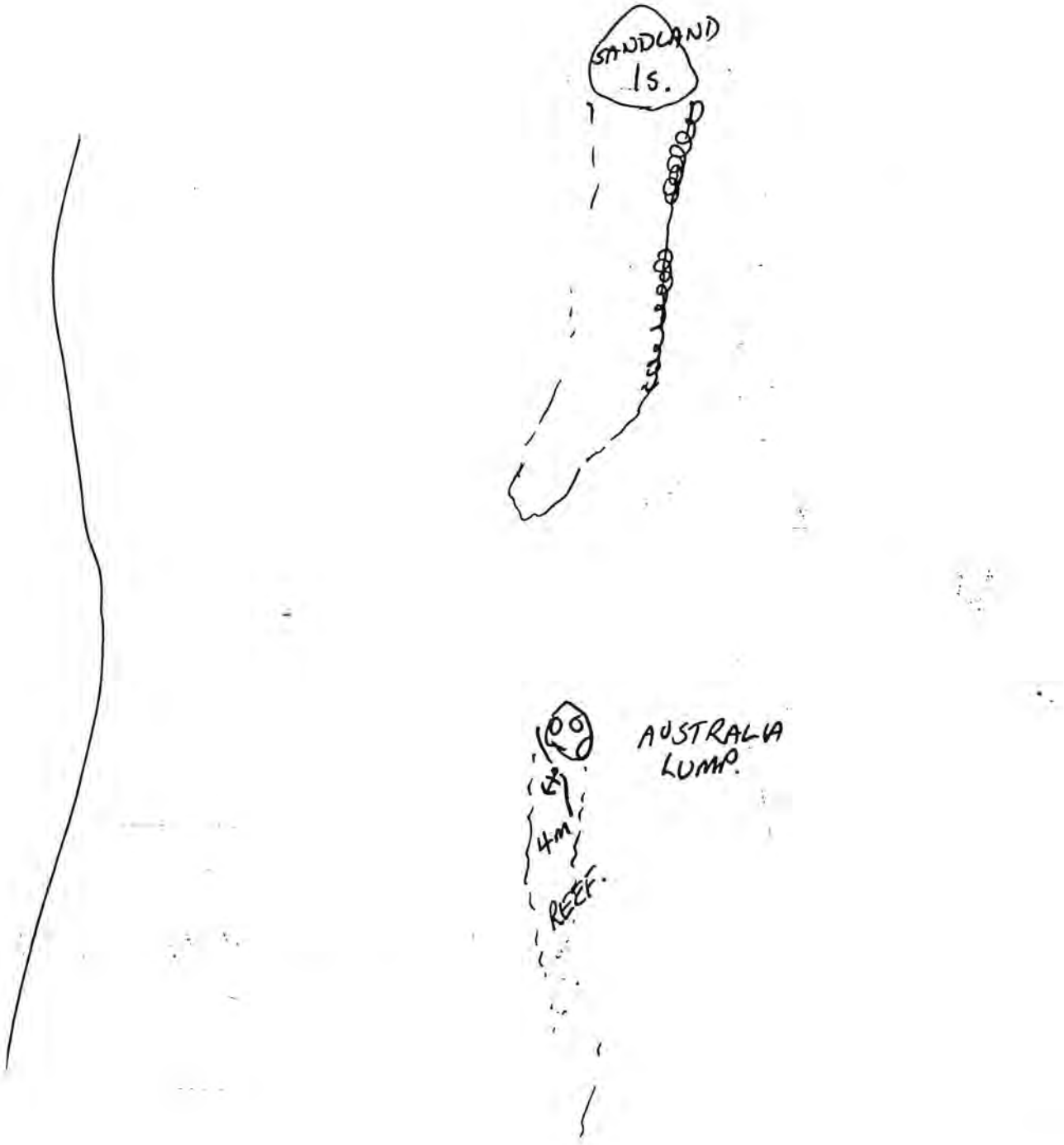
S/M 30 15.832
114 58.488



30·10·99 'AUSTRALIA LUMP' 0950

BOAT 30° 11·783
114° 59·297

S/M 30° 11·770
114° 59·328

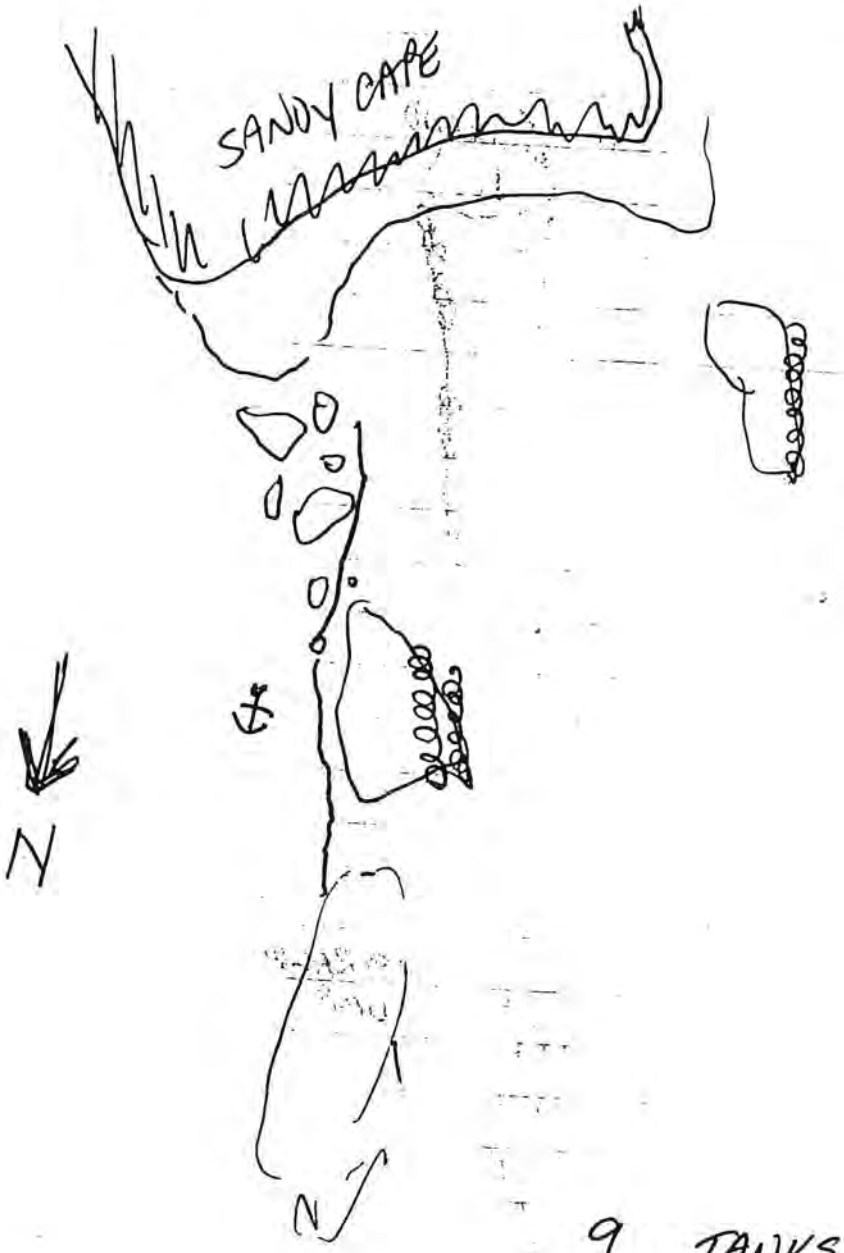


(17)

30.10.99 SANDY CAPE

BOAT 30° 10.886
114 59.575

S/M 30° 10.883
114 59.592

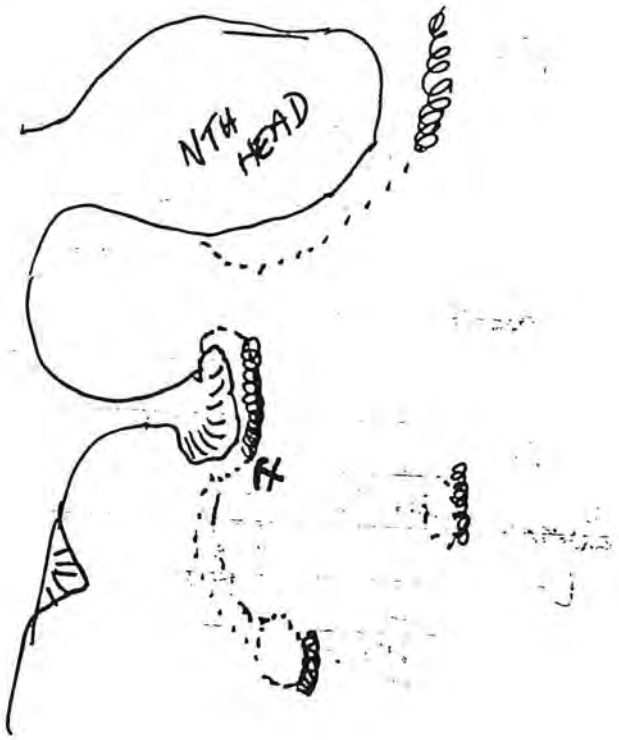


9 TANKS FILLED (37)

31·10·99 NORTH HEAD ISLAND 0745

BOAT 30° 13.625
114° 59.618

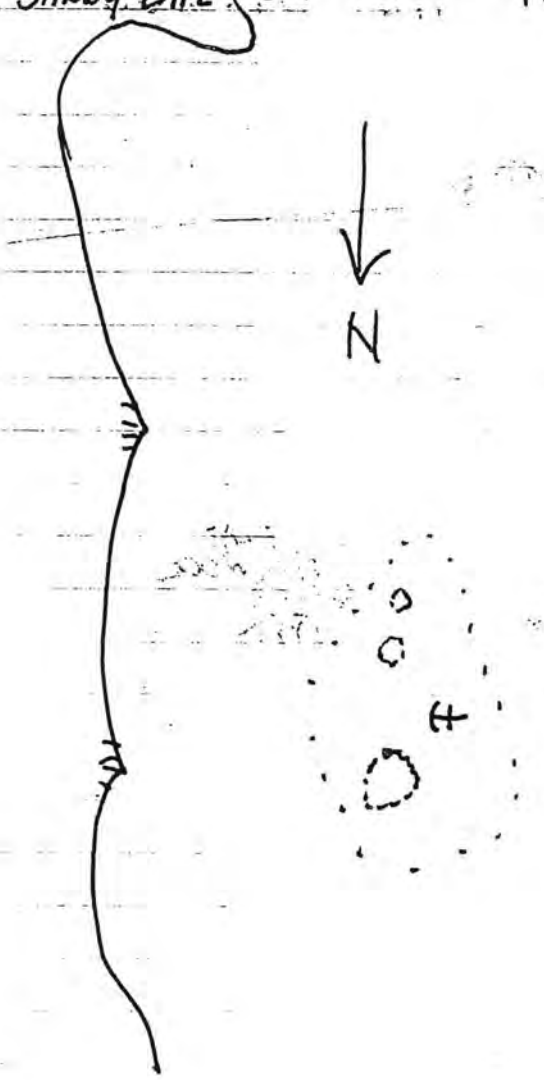
S/M 30° 13.635
114° 59.631



(14)

31-10-99 "NORTH LUMPS" 0950

BOAT 30° 09·439 S/M 30° 09·446
114° 59·754 114° 59·732



10.99 "MIDDLE LUMPS" 1215 (13)

30° 09.431 S/M 30° 09.430
114° 58.000 114° 58.001

NTH LUMPS

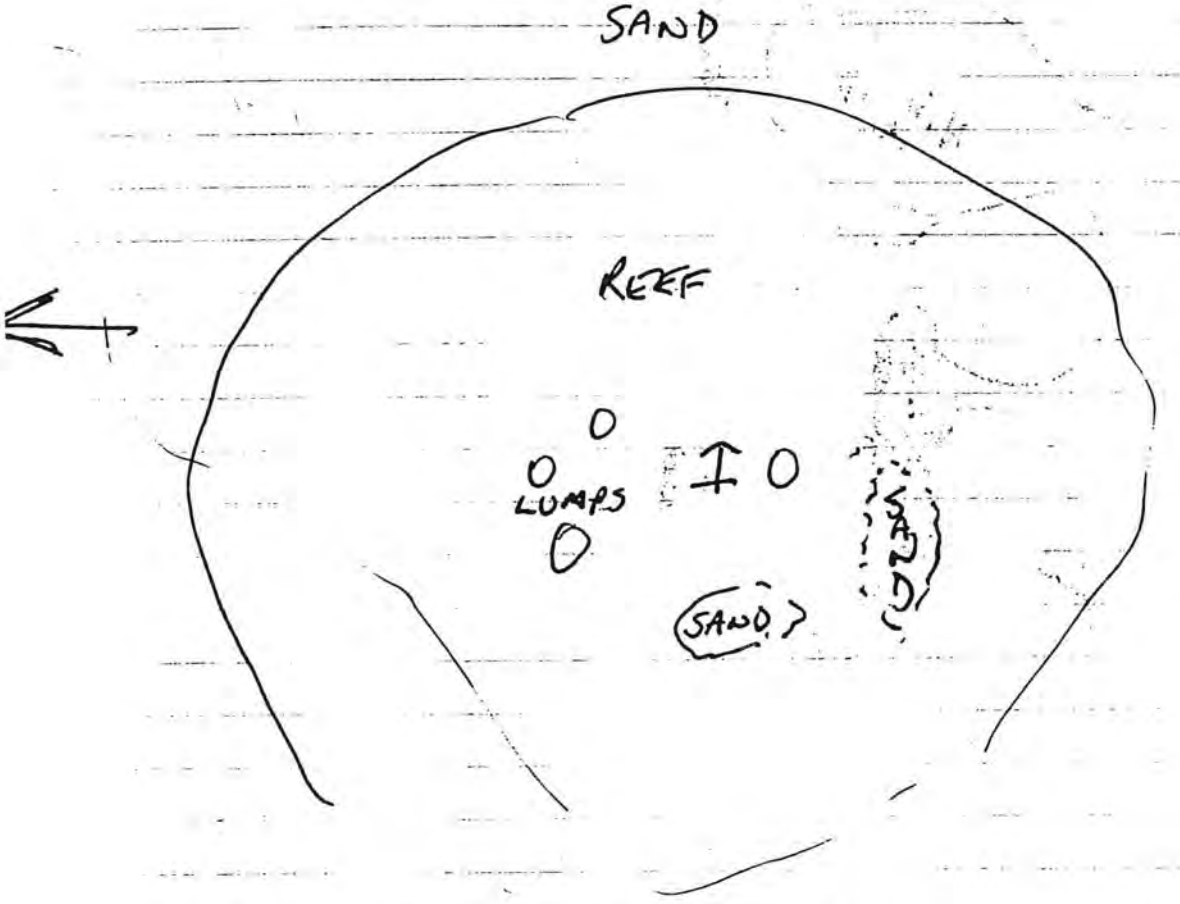
FISHERMENS Is.

N.

10 TANKS FILLED (47)

1-11-99 LONGMAN RF (OFF GRAY) 0900

BOAT 30° 40·135 S/M 30° 40·131
115° 07·329 115° 07·316



(17)

1-11-99 FLAT ROCK 1130

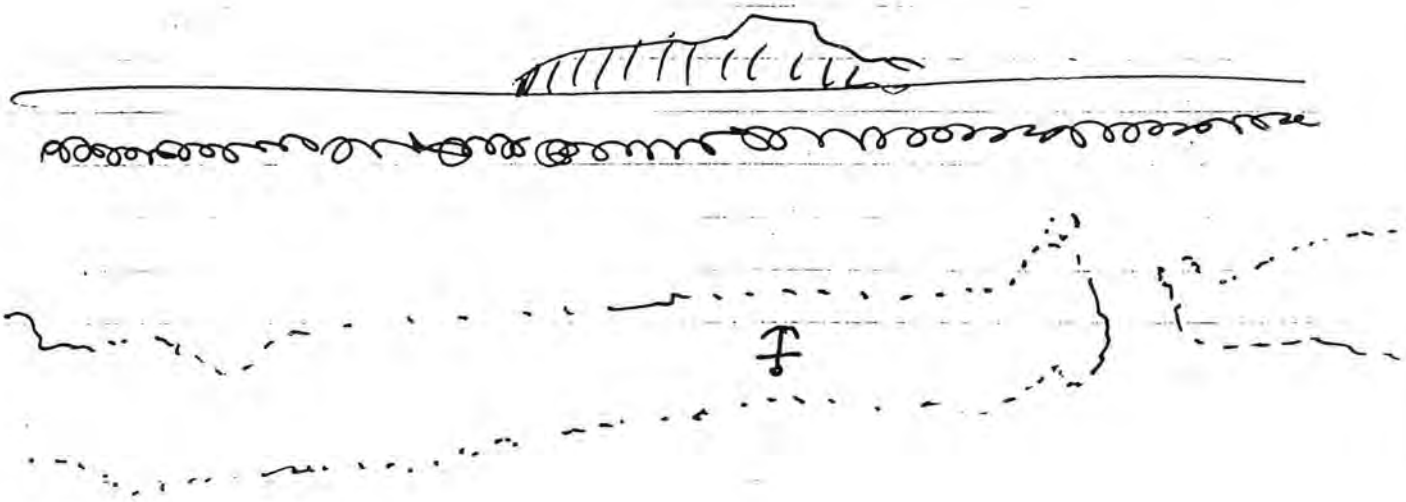
BOAT · 30° 45.356'
115° 09.910'

S/M 30° 45.382
115° 09.885

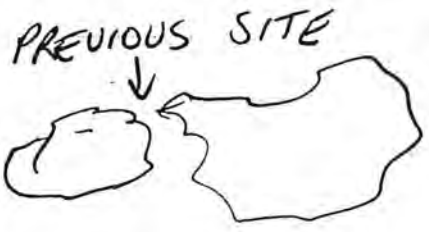
(18)

1-11-99 FLAT ROCK (SHORE) 1330

BOAT 30° 45.284' S/M 30° 45.234
115° 10.174' 115° 10.167



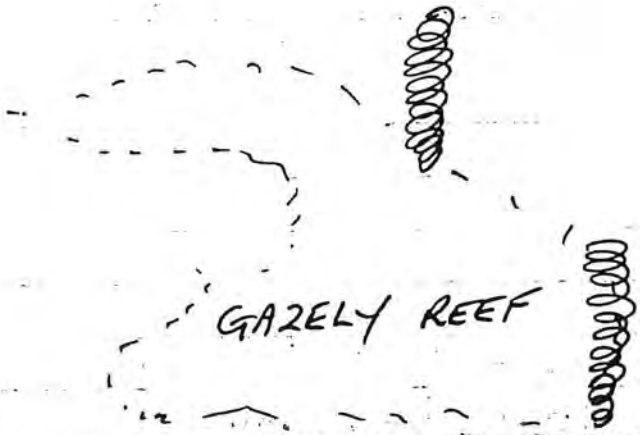
10 TANKS FOR REFILL (57)



2-11-99 GAZELY REEF 0830

BOAT 30° 42.580'
115° 07.136'

S/M 30° 42.557'
115° 07.084'

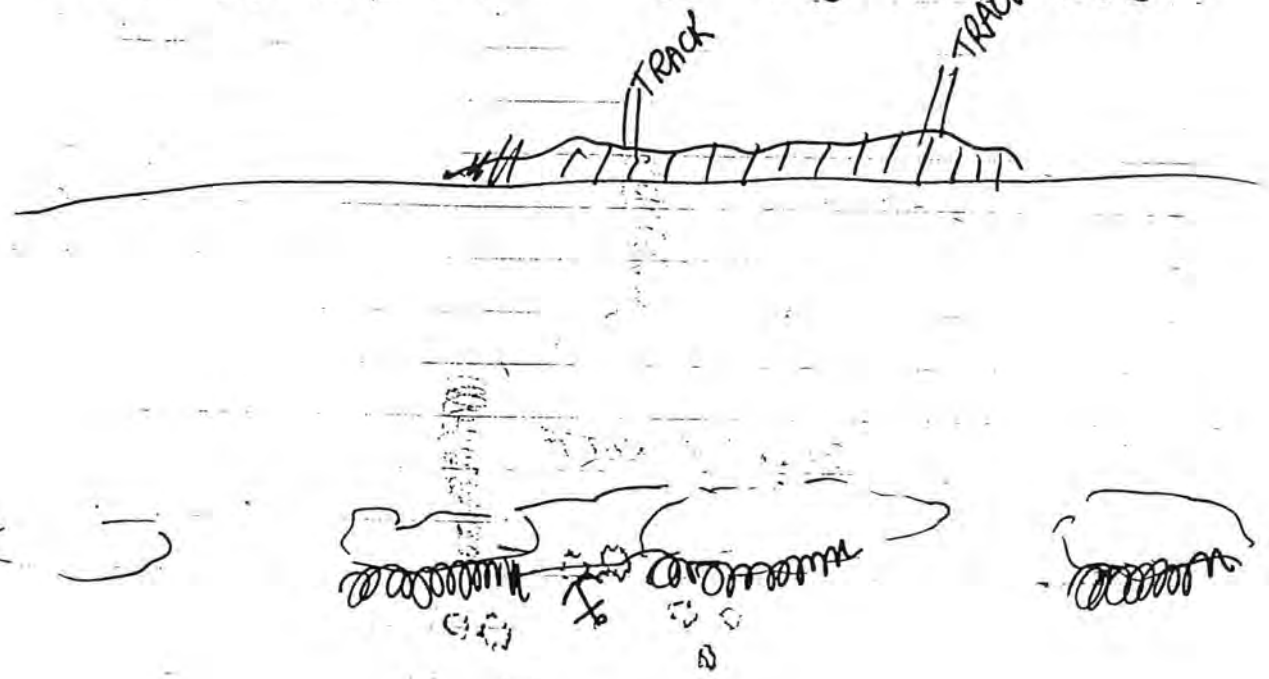


(20)

2-11-99 KEARN REEF 10.50

BOAT 30° 43.306
115° 09.057

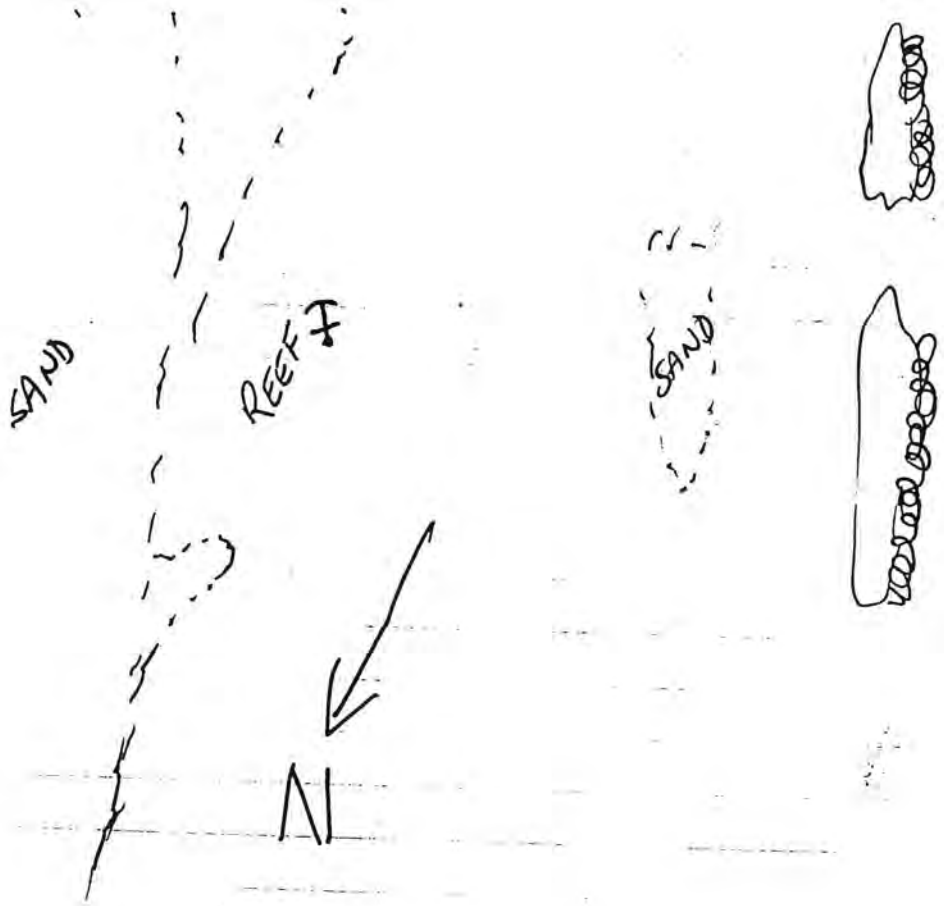
S/M 30° 43.324
115° 09.095



2-11-99 CAVENAGH REEF 1300 HRS

BOAT 30° 37·246
115° 06·132

S/M 30° 37. 246
115° 06. 143

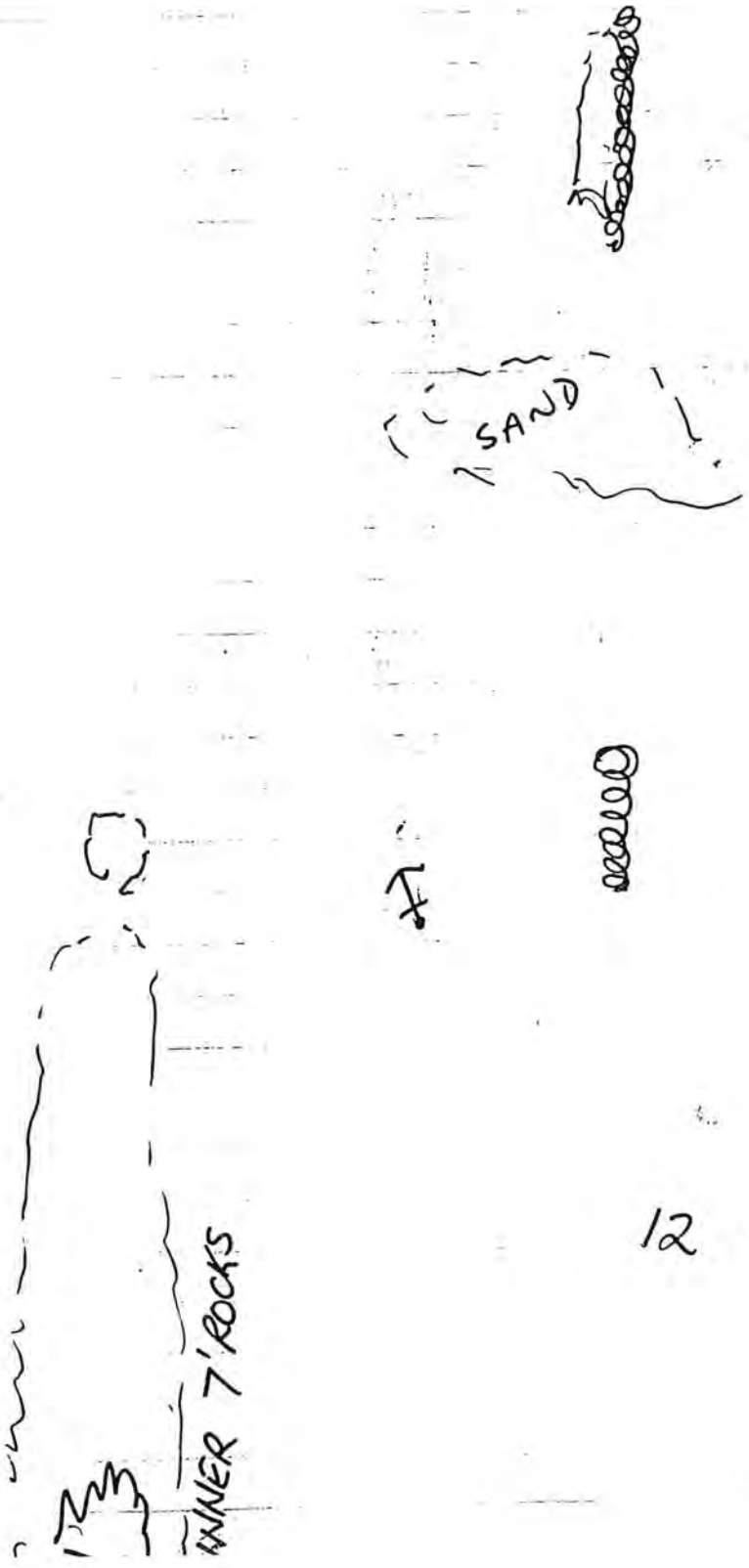


(22)

INNER SEVEN FT ROCKS. 1445 HRS

BOAT 30° 35.393
115° 03.875

S/M 30° 35.381
115° 03.888

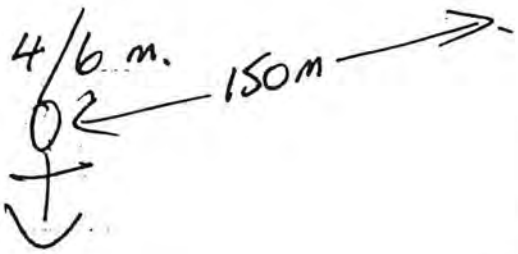


12 TANK FILLS (69)

(23)

3/11/99 SAMS REEF 0830

SAT 30° 29.087 — S/M 30° 29.108
115° 01.780 115° 01.799



SAND

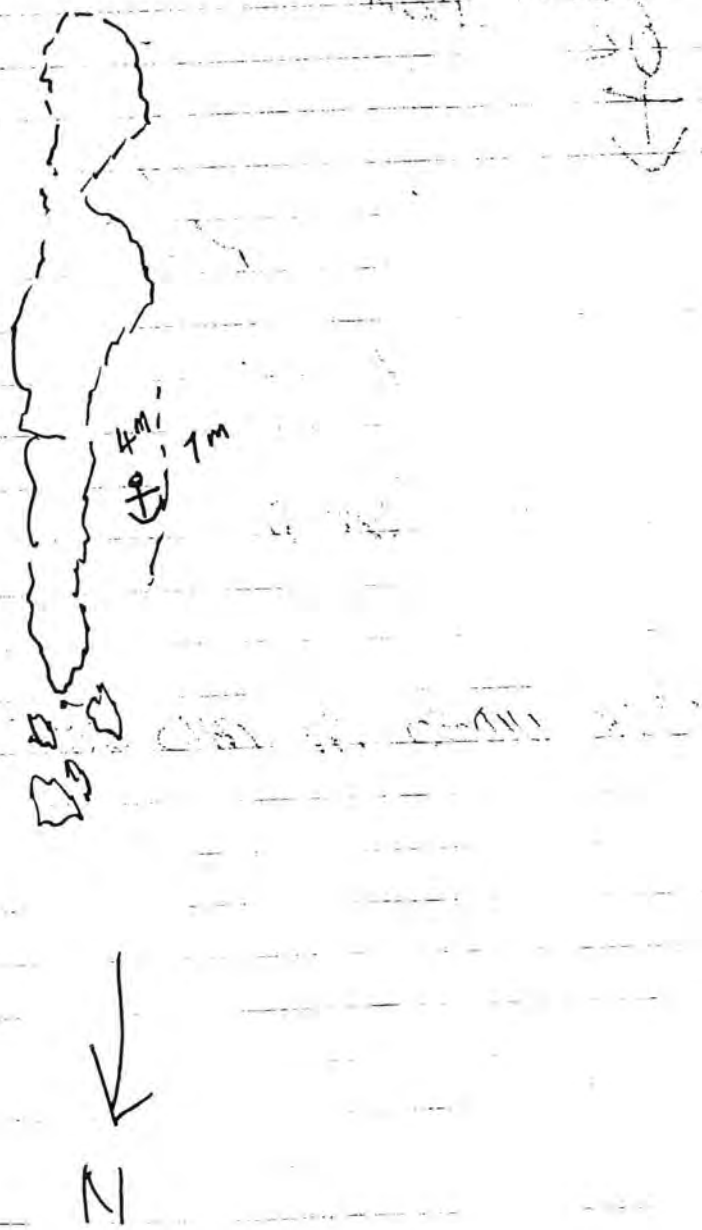
TOOK VIDEO AT THIS SITE

(24)

3-11-99 "NO NAME REEF" 1015

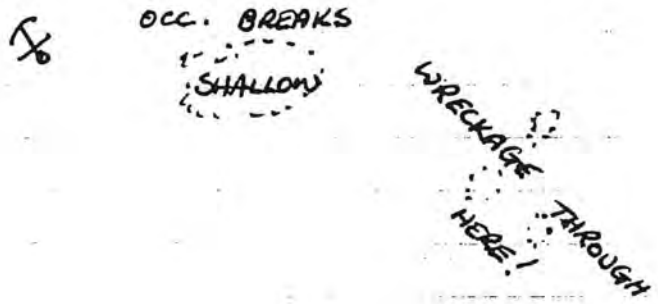
BOAT: 30° 26·106
115° 02·113

S/M 30° 26·119
115° 02·119



EUROPA WRECK.

NICE HOLES



VIDEO OF JEWIES, BIG BLUE (40 LB), LIONFISH, SEVERAL SPECIES OF LEATHERJACKET.

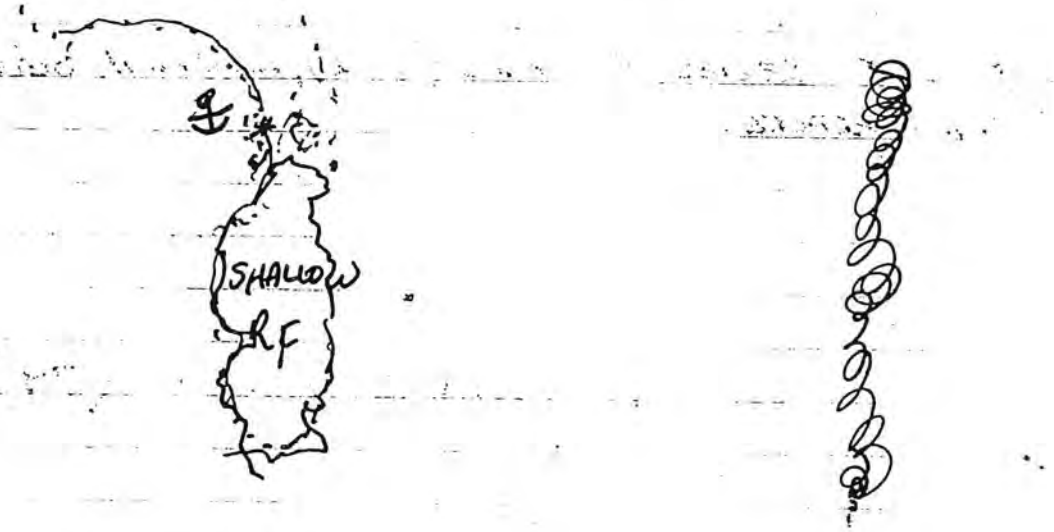
10 TANKS FILLED (79) $474

(25)

4-11-99 FISHERMANS Is (NORTH) 0950

BOAT 30° 07·250'
114° 57·205'

S/M. 30° 07·230
114° 57 195



4·11·99 DOGS HIND LEG. 0745

BOAT 30° 15·800
115° 00 980

S/M 30° 15. 823
115° 00 990

·11·99 MAIN RF (FISHERMANS Is SOUTH) WALL

'OAT 30° 10·018
114 56·420

S/M 30° 09·996
114° 56·435