

# **CRUISE REPORT SS 10/95**

October 10 – November 5, 1995

CSIRO Division of Fisheries

Marine Laboratories

Headquarters

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**DIVISION OF FISHERIES**

## **ITINERARY**

### **LEG 1**

Departed Weipa: 1845 h Tuesday, October 10, 1995  
Arrived Weipa: 1100 h Tuesday, October 24, 1995

### **LEG 2**

Departed Weipa: 1600 h Tuesday, October 24, 1995  
Arrived Weipa: 1000 h Sunday, November 5, 1995

## **AREA OF OPERATION**

West of Weipa, Gulf of Carpentaria between 12°S - 13°S, and 140° 50'E and 141° 35'E (see Fig. 1).

## **CRUISE OBJECTIVES**

1. To test various prawn net modifications for their effectiveness in reducing the catch of non-target species in the tiger prawn fishery off Weipa without significant loss of commercial prawns.
2. To obtain daytime video images of these devices and their effects on fish behaviour in the net during trawling
3. To test the catchability of fishes using long (90 m) and no sweeps in a semi-pelagic fish trawl.
4. To collect a variety of saurids for genetic analysis in Hobart.
5. To obtain video images of the Environmentally Friendly Net's (EFN) performance over structured benthos and of fish behaviour in the codend.

## RESULTS

- 1 Five Bycatch Reduction Devices (BRDs) and a control or standard prawn net codend were tested during 26 consecutive nights and 93 paired 120 minute trawls. Four of these BRDs were retained or modified and compared more intensively during the second leg.
- 2 Video images were obtained of fish behaviour in the BRD codends of the prawn net and the EFN, and of the performance of the EFN over benthic structure.
- 3 Ten days of EFN fish trawls, 50 trawls, were completed on the fish grounds about 25 nm west of Duyfken Point.
- 4 Three shark longline sets of up to 40 hooks were successfully completed with about one shark caught on every second hook on the second set.
5. Several boxes of representative bycatch species were frozen for reference specimens.
6. Two afternoons were dedicated to public relations when prawn trawler crews visited *Southern Surveyor* to inspect the BRDs, underwater video tapes, scanmar and related equipment.
7. Samples of saurids were frozen for the Hobart genetics group.

## CRUISE NARRATIVE

*Southern Surveyor* left Weipa at 1845 h on Tuesday, October 10, 1995. The ship's crew lost able seaman Tony Hearne at the last hour due to a serious illness in his family, leaving the deck crew undermanned on the midday to midnight shift. At a cruise debriefing soon after departure, Leg 1 objectives were explained, shifts allocated and first-time participants informed of ship safety and day to day housekeeping procedures. The Master, Bruce Wallis, advised of a Muster and Fire drill the next day at 1300 h; this drill was successfully completed. After arriving at the prawn trawl grounds five nautical miles west of Duyfken Point, the paired Florida Flyer prawn trawl nets were tested for even-catching ability using normal codends (diamond mesh). The first trawl was successfully deployed at 2330 h. Trial trawls continued through the day until after nine trawls, the nets recorded similar catches. All night prawn trawls were of 120 minutes duration and continued throughout the entire cruise, with a maximum of four trawls per night. Trawling commenced 30-60 minutes after sunset and generally finished at least 30 minutes before sunrise. The pattern of trawling during a complete day involved night prawn trawling in approximately 20 m west of Duyfken Point and daytime trawling in clearer (30 - 40 m depth) water further west. Towards the end of the first leg and all through the second leg, daytime fish trawling with the EFN (which replaced video trawls of the BRDs) took place about 25 nm west of Duyfken Point (see Fig. 1). These EFN trawls were of 30 min duration. This cruise was blessed by idyllic weather conditions with no seasonal storms.

On two afternoons, once each during the first and second legs, *Southern Surveyor* anchored among nearby commercial prawn trawlers and played host to visiting crew members from the trawlers. The scientific crew arranged displays of the various BRDs and showed interested visitors underwater videos of the BRDs. The cooperation of the ship's crew, in particular the Chief Engineer's tour of the engine room, was clearly appreciated by all the visitors.

During the changeover of scientific personnel in Weipa (October 24), Able Seaman Tony Hearne's replacement, Terry Stinchcome arrived. October 24 also marked an unusual natural event visible only from northern Australia. A partial eclipse of the sun occurred at about 1445 h and was witnessed by many of the cruise participants by projection through binoculars or direct viewing using appropriate solar filters.

## NIGHT TIME SAMPLING

All night prawn trawling was carried out in approximately 20 m along a north-south path centred 5 nm west of Duyfken Point. Wednesday night, October 11, marked the beginning of the BRD comparison trawls. The sampling design for BRD paired comparison trawls consisted of a different combination of all BRDs, such that each BRD was paired once against all others. This required 10 trawls, representing two and a half nights of trawling, to complete one round of all possible pairings. Within each round, each BRD was equally used on both port and starboard sides. Four such rounds were completed during Leg 1. From an assessment of the results at the end of these four rounds, one BRD was removed from further comparisons and the size and position of the square mesh window was changed, as was the angle of the Nordmore grid. There was a slight change to the position of the fisheye in both the Supershooter/Fisheye and the Nordmore/Fisheye BRDs. All these modifications were then used during Leg 2 when a round

was completed in six trawls — or one and a half nights. This allowed a maximum of eight rounds over the 12 nights available on Leg 2. A total of six and a half rounds were completed because of occasional invalid trawls which were repeated, and time lost due to gear problems. The codend skirts used during the last two cruises (SS295 and SS595) again prevented any loss of catch as a result of shark bites.

*Southern Surveyor* sailed for Weipa soon after completion of the last trawl on the morning of Sunday, 5th November and tied up at the Evans Landing wharf at 1000 h.

#### DAYTIME SAMPLING

Prawn nets were tested on the first day for catch uniformity between port and starboard nets using standard (control) nets. On the second day, Wednesday 12th October, the first of eleven days of videotaping of all the BRDs commenced. These BRD video trawls were carried out in ~35 m water which was less turbid than the 20 m depth used for night-time trawling. Some excellent tapes of fish behaviour in the various devices was obtained from the codend mounted cameras despite difficulties with the cameras and their housings. Turbidity varied from day to day and in a search for better visibility some trawls were located further south in Albatross Bay. The domestic video camera from NTDPIE proved to be reliable. The AMC high resolution, low light camera suffered from numerous electrical faults that were corrected during the course of the cruise. Matt Sherlock dedicated many hours to trouble-shooting this camera. Fortunately, some good images were obtained eventually.

Both cameras were used on the EFN during the second leg and some excellent video images were obtained of fish behaviour in the codend and of the net's performance in relation to the bottom.

The EFN fish trawl was tested using long and no sweeps. The last day of Leg 1 was dedicated to setting up and testing the EFN. Each day was organised into five, two hour windows, 0800-1000, 1000-1200, 1200-1400, 1400-1600 and 1600-1800 h with one trawl per two hours. Area A (Fig. 1) consisted of 25 grids (2 x 2 nm); five grids were chosen at random every two days. These five grids were then trawled on the first day using long sweeps and in the same sequence the next day using zero sweeps. The set of five grids was chosen to exclude previously sampled grids so that after 10 days, all 25 grids were sampled. Catches of commercial finfish, mainly lutjanids and lethrinids, were patchy as expected, with many grids producing little or no commercial species. However, many good catches of red snappers, mainly *Lutjanus erythropterus* and *L. malabaricus* were made and this should allow a meaningful comparison of catch rates with long and zero sweeps.

On the last day of the cruise, shark longlines were set near the night time trawl site. This method may be used on a future research project to capture useful numbers of sharks as part of a study of their relationships with trawl discards. The method proved extremely successful for capturing small carcharhinids and numerous gut samples were obtained by this method. Because of the baited hooks used, there was some concern about whether any sharks with food in their stomachs would be captured. Longlining did not produce only empty stomachs. Baits dyed with methylene blue were used to see to what extent the dye persisted in shark stomachs.

The first line was set for three hours to ensure some sharks were captured. Many large and small sharks were hooked but most large sharks fell off the hook on retrieval of the line. The second line set was hauled in after 30 minutes and produced a shark on every second hook! Dyed bait was still identifiable in shark stomachs from the first line set, suggesting the dye persisted for at least two and a half to three hours.

In the afternoon of the last day, local trawler crews visited *Southern Surveyor* to inspect the BRDs and other associated equipment. This proved highly successful with strong interest in all aspects of the BRD research especially the underwater videos of large and small fishes escaping or being excluded from the prawn net codends.

All the biological data were copied to a cassette tape for downloading to the Cleveland SUN Sparc station.

## **SUMMARY**

The Bycatch Reduction in Prawn Trawls project tested five devices over 50 paired trawls during the first leg (Nordmore grid with fish eye, Supershooter with fish eye, Nordmore grid with square mesh window, fish eye and AusTed2) and three devices over 42 trawls on the second leg (Nordmore with fish eye, Supershooter with fish eye, Nordmore with square mesh window). Clear video images of fish behaviour in codends and escaping from the various devices were obtained. The 50 EFN trawls used to compare catches from trawls with long or zero length sweeps were the final stage of an assessment of the new 'environmentally friendly net' recommended for the Northern Trawl Fishery. The Tropical Fish Ecology project now has valuable catch and video information about the operation of the type of net envisaged for the fishery.

Samples of saurids were obtained for population genetic studies in the Hobart genetics laboratory. Longlining was successfully used to demonstrate its effectiveness at obtaining large numbers of sharks over short time intervals.

## **REPORTING OF RESULTS**

The results will be analysed and reported in the scientific literature where appropriate. All the collected data resides on the Oracle database at the CSIRO Marine Laboratories in Cleveland.

## PERSONNEL

(Note: unless otherwise stated, all personnel are staff of the CSIRO Division of Fisheries or students based at CSIRO Cleveland.)

### SCIENTIFIC CREW

#### LEG 1 (OCT 10-24, 1995)

- 1 John Salini, Cruise Leader
- 2 Gary Fry
- 3 Nick Rawlinson
- 4 Margaret Farmer
- 5 Ted Wassenberg
- 6 Matt Sherlock
- 7 Steve Eayrs (AMC)
- 8 Brian McDonald (AMC)
- 9 John MacCartie (NTDPIE)
- 10 Paul Johnson (NTDPIE)
- 11 Samantha Miller
- 12 Anders Cormie (AMC)

#### LEG 2 (OCT 24 - NOV 5, 1995)

- 1 John Salini, Cruise Leader
- 2 Gary Fry
- 3 David Brewer
- 4 Yougan Wang
- 5 Jonathan Staunton Smith
- 6 Jeff Cordell
- 7 Steve Eayrs (AMC)
- 8 Brian McDonald (AMC)
- 9 Neville Gill (NTDPIE)
- 10 Clive Liron
- 11 Miroslaw Ryba
- 12 Anders Cormie (AMC)

### SHIP'S CREW

Bruce Wallis  
 Roger Pepper  
 John Boyes  
 Ian McAllister  
 Ian Murray  
 John Hinchliffe  
 Noel Anderson  
 Alan Smith  
 Don Collins  
 Len Darling  
 Alan Brownlie  
 Malcolm McDougall  
 Phil Lee  
 John Walsham  
 Chris Williams  
 Terry Stinchcome  
 Laurie Cregan

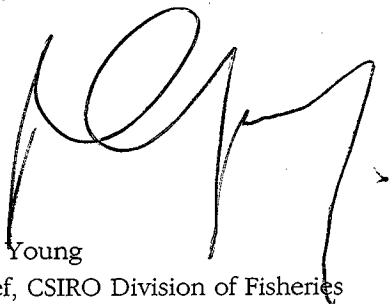
Master  
 First Mate/Fishing Master  
 Second Mate/Fishing Master  
 Chief Engineer  
 First Engineer  
 Electrical Engineer  
 Chief Steward  
 Chief Cook  
 Second Cook  
 Bosun  
 A. B.  
 A. B.  
 Greaser  
 A. B.  
 A. B.  
 A. B.  
 A. B.

## ACKNOWLEDGEMENTS

We thank the Master, Bruce Wallis; the Fishing Masters, Roger Pepper and John Boyes and the crew of *Southern Surveyor* for their skills and frequent enthusiastic help in the fish laboratory. The crew's cooperation by sailing short-handed on the first Leg is especially appreciated. Steve Eayrs, Brian McDonald and Anders Cormie (AMC), John MacCartie, Paul Johnson and Neville Gill (NT Fisheries) contributed many extra hours of duty setting-up and testing the BRDs (prawn trawling) and the EFN as well as managing the video taping of both the fish and prawn nets.



John Salini  
Cruise Leader



P.C. Young  
Chief, CSIRO Division of Fisheries  
Date:

## CONTACTS

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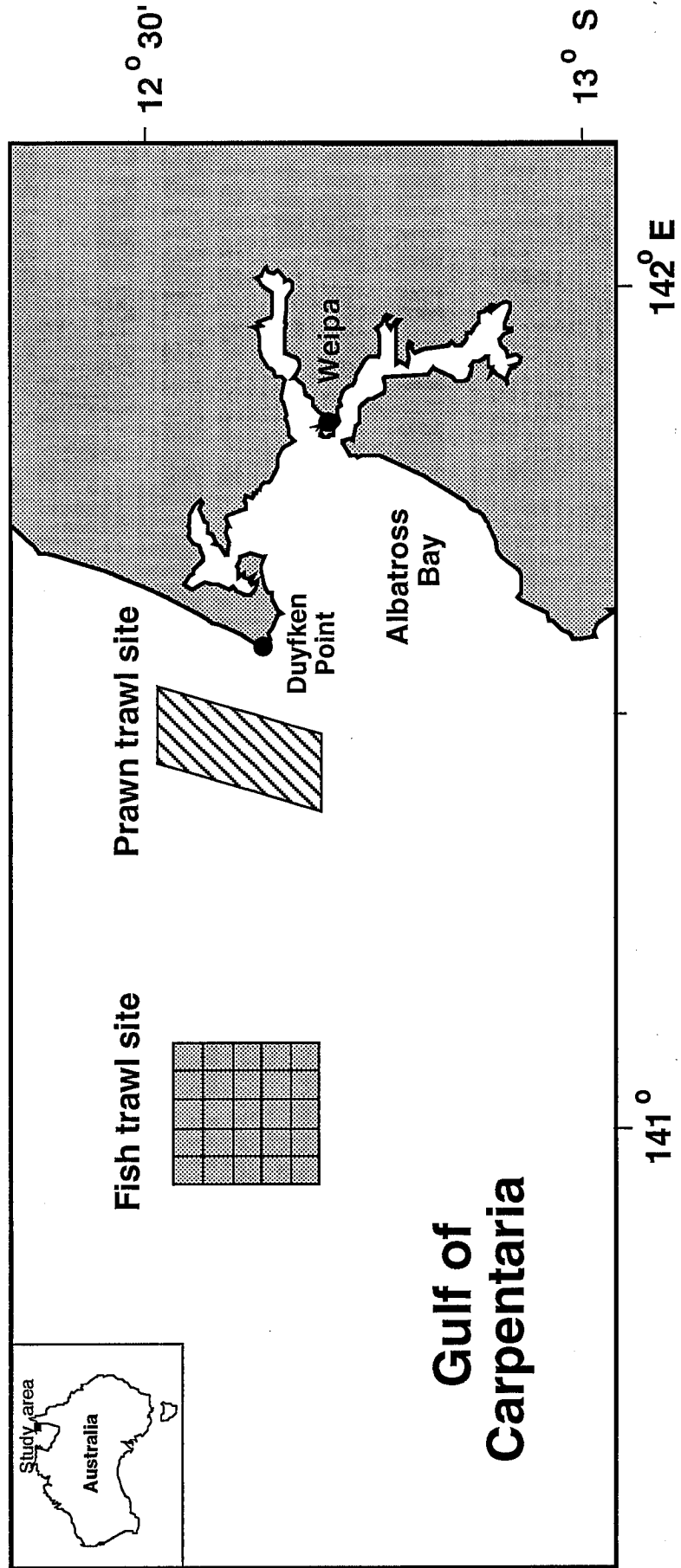
Normal circulation  
Cruise participants



**FIGURE 1.**

Locations of the i) EFN study areas, 50 stations ii) Prawn Bycatch, 92 stations. Daytime video taping of prawn bycatch reduction devices, 42 trawls, was located between the two sites for optimum light penetration and clarity. Three longline sets (stations) were located near the prawn trawling site.

The 2 nm grids in Area A were sampled with the EFN using long (90 m) and zero sweeps.



## APPENDIX 1

Stations occupied by *Southern Surveyor* during Cruise SS1095.

Time: start time in decimal hours;  
 FF: Florida Flyer prawn trawl, daytime trawls included a video camera;  
 Fish/Video: Frank & Bryce fish trawl with video camera;  
 EFNLong: Environmentally Friendly fish trawl Net with Long (90 m) sweeps;  
 EFNZero: Environmentally Friendly fish trawl Net with Zero (0 m) length sweeps;  
 StartLat: start latitude;  
 StartLong: start longitude;  
 EndLat: end latitude;  
 EndLong: end longitude;  
 Depth: depth in metres.

Station	Time	Date	Gear	Depth	StartLat	StartLong	EndLat	EndLong
1	21.1	11-Oct-95	FF	18	12° 34.5'	141° 30.2'	12° 32.5'	141° 30.4'
2	0.75	12-Oct-95	FF	22	12° 24.3'	141° 30'	12° 30'	141° 29.1'
3	3.67	12-Oct-95	FF	22	12° 31.8'	141° 29.3'	12° 24.4'	141° 29.8'
4	10.47	12-Oct-95	FF	31	12° 26'	141° 24.9'	12° 27.7'	141° 26.4'
5	14.70	12-Oct-95	FF	25	12° 32.9'	141° 28.2'	12° 31.1'	141° 28.1'
6	16.08	12-Oct-95	FF	27	12° 30.7'	141° 27.7'	12° 32.3'	141° 28.2'
7	19.00	12-Oct-95	FF	20	12° 33.2'	141° 30'	12° 27.1'	141° 32.1'
8	21.75	12-Oct-95	FF	18	12° 24.3'	141° 33.1'	12° 30.2'	141° 30.9'
9	0.43	13-Oct-95	FF	16.5	12° 32.3'	141° 30.7'	12° 24.5'	141° 33.3'
10	2.72	13-Oct-95	FF	15.3	12° 23.4'	141° 34'	12° 31.4'	141° 31.3'
11	10.00	13-Oct-95	FF	32	12° 27.6'	141° 24.8'	12° 26.1'	141° 24.5'
12	12.42	13-Oct-95	FF	33	12° 25.4'	141° 24.4'	12° 27'	141° 24.1'
13	14.75	13-Oct-95	FF	31	12° 28.8'	141° 25'	12° 27.2'	141° 25'
14	16.75	13-Oct-95	FF	30.5	12° 30'	141° 25.3'	12° 31.5'	141° 24.7'
15	19.00	13-Oct-95	FF	16.8	12° 33.7'	141° 30.8'	12° 26.9'	141° 30.8'
16	21.77	13-Oct-95	FF	18.2	12° 27.26	141° 32.6''	12° 34.1'	141° 30.8'
17	1.00	14-Oct-95	FF	19	12° 33.5'	141° 29.6'	12° 26.9'	141° 32.3'
18	3.58	14-Oct-95	FF	18	12° 25.3'	141° 33.2'	12° 30.2'	141° 30.8'
19	8.75	14-Oct-95	FF	37.7	12° 25.3'	141° 20'	12° 23.4'	141° 20'
20	10.55	14-Oct-95	FF	36.5	12° 18.6'	141° 20.2'	12° 19.8'	141° 21.6'
21	13.50	14-Oct-95	FF	35	12° 27.6'	141° 22.8'	12° 29.4'	141° 5.1'
22	16.00	14-Oct-95	FF	32	12° 30.2'	141° 23.9'	12° 28.8'	141° 24.4'
23	17.42	14-Oct-95	FF	32	12° 26.1'	141° 25.3'	12° 28.1'	141° 25.3'
24	19.08	14-Oct-95	FF	23	12° 30.8'	141° 29.4'	12° 25.9'	141° 33'
25	21.92	14-Oct-95	FF	18	12° 27.6'	141° 32.2'	12° 33.7'	141° 29.3'
26	0.50	15-Oct-95	FF	16.4	12° 34.9'	141° 29.6'	12° 28'	141° 32.1'
27	3.03	15-Oct-95	FF	15	12° 27.5'	141° 33.4'	12° 32.9'	141° 30.7'
28	9.42	15-Oct-95	FF	14	12° 26.8'	141° 34.3'	12° 28.3'	141° 33.6'
29	13.58	15-Oct-95	FF	16	12° 26.2'	141° 33.8'	12° 24.9'	141° 34.4'
30	15.75	15-Oct-95	FF	17	12° 28.9'	141° 32.3'	12° 30.8'	141° 31.7'
31	18.75	15-Oct-95	FF	17	12° 30.8'	141° 31.9'	12° 24.6'	141° 34.2'

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Station	Time	Date	Gear	Depth	StartLat	StartLong	EndLat	EndLong
32	21.33	15-Oct-95	FF	17.5	12° 24.5'	141° 33.8'	12° 31.8'	141° 31'
33	0.08	16-Oct-95	FF	17	12° 29.8'	141° 31.6'	12° 23.5'	141° 33.5'
34	2.67	16-Oct-95	FF	19	12° 22.9'	141° 32.9'	12° 28.4'	141° 30.8'
35	9.00	16-Oct-95	FF	39.5	12° 25'	141° 17.4'	12° 24.5'	141° 19.6'
36	11.05	16-Oct-95	FF	40	12° 23.5'	141° 16.3'	12° 23.1'	141° 14.5'
37	13.50	16-Oct-95	FF	35	12° 24.2'	141° 22.9'	12° 25.9'	141° 28.3'
38	16.08	16-Oct-95	FF	27	12° 27.6'	141° 27.8'	12° 31.2'	141° 27.3'
39	18.83	16-Oct-95	FF	19	12° 32.2'	141° 30.4'	12° 26.4'	141° 32.7'
40	21.50	16-Oct-95	FF	19	12° 26.1'	141° 32.3'	12° 32.6'	141° 29.5'
41	0.22	17-Oct-95	FF	17.2	12° 31.3'	141° 31.1'	12° 29.6'	141° 32'
42	3.80	17-Oct-95	FF	15	12° 30.4'	141° 32'	12° 28.6'	141° 32.7'
43	9.42	17-Oct-95	FF	26	12° 47.8'	141° 25.1'	12° 44.1'	141° 25.7'
44	15.00	17-Oct-95	FF	23	12° 47'	141° 27.5'	12° 43.9'	141° 27.9'
45	17.33	17-Oct-95	FF	23	12° 37.7'	141° 27.7'	12° 36.3'	141° 27.7'
46	19.23	17-Oct-95	FF	15.3	12° 30.3'	141° 32.2'	12° 23.8'	141° 34.9'
47	22.00	17-Oct-95	FF	16.3	12° 25.2'	141° 34.2'	12° 32'	141° 31.3'
48	0.50	18-Oct-95	FF	17	12° 33.1'	141° 30.7'	12° 27.1'	141° 32.6'
49	3.17	18-Oct-95	FF	17	12° 25.9'	141° 33.3'	12° 31.5'	141° 30.4'
50	8.50	18-Oct-95	FF	22	12° 34.7'	141° 27.4'	12° 30.7'	141° 27.4'
51	10.83	18-Oct-95	FF	25	12° 35.8'	141° 27.1'	12° 34.6'	141° 23.6'
52	19.70	18-Oct-95	FF	17	12° 27.3'	141° 32.8'	12° 34.1'	141° 30.4'
53	22.17	18-Oct-95	FF	19	12° 35.1'	141° 29.8'	12° 29.2'	141° 29.4'
54	1.10	19-Oct-95	FF	16.2	12° 27'	141° 33.4'	12° 33.3'	141° 30.8'
55	3.53	19-Oct-95	FF	15	12° 32'	141° 31.5'	12° 25'	141° 34.6'
56	8.25	19-Oct-95	FF	36	12° 23.3'	141° 22.2'	12° 26'	141° 21.7'
57	11.17	19-Oct-95	FF	39	12° 21.6'	141° 17.7'	12° 21.6'	141° 14.6'
58	13.75	19-Oct-95	FF	40	12° 25.4'	141° 17.9'	12° 28.9'	141° 18.4'
59	16.33	19-Oct-95	FF	33.2	12° 31.1'	141° 21.3'	12° 27.8'	141° 23.8'
60	18.97	19-Oct-95	FF	20	12° 37.8'	141° 28.6'	12° 44.9'	141° 28.6'
61	21.62	19-Oct-95	FF	19.8	12° 46'	141° 29.1'	12° 39.1'	141° 29.1'
62	0.25	20-Oct-95	FF	17	12° 39.3'	141° 29.4'	12° 45.6'	141° 28.5'
63	2.75	20-Oct-95	FF	19	12° 44.7'	141° 28.9'	12° 37.7'	141° 29'
64	8.93	20-Oct-95	FF	29.5	12° 48.2'	141° 21.1'	12° 47.2'	141° 17.7'
65	11.75	20-Oct-95	FF	37.5	12° 46.3'	141° 14.5'	12° 46.5'	141° 18.1'
66	14.83	20-Oct-95	FF	30	12° 46.6'	141° 23.8'	12° 45'	141° 20.2'
67	17.08	20-Oct-95	FF	34	12° 44.5'	141° 19.1'	12° 45'	141° 22'
68	19.17	20-Oct-95	FF	21	12° 43.4'	141° 27.9'	12° 37.7'	141° 29.5'
69	21.75	20-Oct-95	FF	18	12° 34.5'	141° 30'	12° 28'	141° 32.5'
70	0.45	21-Oct-95	FF	17.3	12° 27.8'	141° 33.7'	12° 34.8'	141° 30.4'
71	3.07	21-Oct-95	FF	18.1	12° 37.9'	141° 29.6'	12° 45.1'	141° 29.4'
72	9.17	21-Oct-95	FF	33	12° 43.8'	141° 19.9'	12° 45.2'	141° 17.3'
73	13.42	21-Oct-95	FF	37	12° 46.6'	141° 16.1'	12° 46.8'	141° 12.7'
74	15.25	21-Oct-95	FF	37	12° 47.1'	141° 15.4'	12° 47.7'	141° 18.8'
75	17.50	21-Oct-95	FF	30	12° 46.7'	141° 22.2'	12° 44.7'	141° 23'
76	18.93	21-Oct-95	FF	18.9	12° 44.8'	141° 28.3'	12° 38.4'	141° 29.8'
77	21.50	21-Oct-95	FF	18.5	12° 35.2'	141° 29.7'	12° 28.1'	141° 32.8'
78	0.00	22-Oct-95	FF	18	12° 26.9'	141° 32.6'	12° 32.7'	141° 30.5'
79	3.00	22-Oct-95	FF	19	12° 31.8'	141° 30.7'	12° 25.3'	141° 33.4'
80	8.13	22-Oct-95	FF	37	12° 29.7'	141° 21.3'	12° 18.6'	141° 24.1'
81	11.00	22-Oct-95	FF	37	12° 19.1'	141° 20.2'	12° 18.6'	141° 24.1'
82	19.25	22-Oct-95	FF	18	12° 24.7'	141° 33.2'	12° 30.8'	141° 30.8'
83	21.92	22-Oct-95	FF	17	12° 30.6'	141° 31.4'	12° 23.6'	141° 33.6'

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Station	Time	Date	Gear	Depth	StartLat	StartLong	EndLat	EndLong
84	0.40	23-Oct-95	FF	18	12° 24.1'	141° 33.5'	12° 30.3'	141° 32'
85	2.83	23-Oct-95	FF	16	12° 31.1'	141° 31.6'	12° 24.5'	141° 34.4'
86	15.08	23-Oct-95	efn trial	40	12° 25.8'	141° 17.2'	12° 24.3'	141° 17.8'
87	16.42	23-Oct-95	efn trial	39	12° 24.6'	141° 17.8'	12° 27.4'	141° 16.9'
88	22.55	23-Oct-95	FF	16	12° 30.5'	141° 31.7'	12° 24.1'	141° 34.1'
89	1.00	24-Oct-95	FF	18	12° 24.2'	141° 33.3'	12° 29.9'	141° 31.6'
90	3.58	24-Oct-95	FF	18	12° 30.2'	141° 31.8'	12° 23.7'	141° 34.3'
91	19.17	24-Oct-95	FF	17	12° 31'	141° 31.4'	12° 25'	141° 34'
92	21.83	24-Oct-95	FF	15.2	12° 23.9'	141° 34.2'	12° 30'	141° 32'
93	0.67	25-Oct-95	FF	14.4	12° 31.5'	141° 31.7'	12° 24.6'	141° 34.4'
94	3.20	25-Oct-95	FF	16.5	12° 24.4'	141° 33.9'	12° 30.6'	141° 31.9'
95	9.42	25-Oct-95	efn-long	48	12° 28.5'	141° 3.7'	12° 26.7'	141° 2.6'
96	11.00	25-Oct-95	efn-long	0	12° 25.1'	140° 58.1'	12° 26.5'	140° 59.4'
97	12.08	25-Oct-95	efn-long	53	12° 28.7'	141° 0.1'	12° 30.2'	141° 0.7'
98	14.25	25-Oct-95	efn-long	48	12° 32.3'	141° 4.3'	12° 30.9'	141° 5.3'
99	16.50	25-Oct-95	efn-long	46	12° 28.7'	141° 6'	12° 30.8'	141° 7.1'
100	0.00	25-Oct-95	FF	14	12° 31.4'	141° 31.9'	12° 25.3'	141° 34.7'
101	22.50	25-Oct-95	FF	15	12° 25.3'	141° 34.3'	12° 30.8'	141° 31.7'
102	1.17	26-Oct-95	FF	16	12° 32'	141° 31.3'	12° 25'	141° 34.2'
103	3.75	26-Oct-95	FF	16	12° 23.8'	141° 34'	12° 29.5'	141° 31.4'
104	9.75	26-Oct-95	efn-no	54	12° 29.3'	141° 0.2'	12° 27.4'	141° 59.7'
105	11.42	26-Oct-95	efn-no	55	12° 25.6'	140° 58.6'	12° 24.4'	140° 56.6'
106	13.50	26-Oct-95	efn-no	48.5	12° 29.8'	141° 4'	12° 31.8'	141° 4.07'
107	14.87	26-Oct-95	efn-no	47	12° 33.3'	141° 4.5'	12° 31.6'	141° 5'
108	16.17	26-Oct-95	efn-no	46	12° 29.1'	141° 6.3'	12° 27.6'	141° 7.3'
109	19.25	26-Oct-95	FF	17	12° 30.3'	141° 31.8'	12° 25.1'	141° 34.2'
110	21.75	26-Oct-95	FF	15	12° 24.3'	141° 34.1'	12° 30.6'	141° 32.1'
111	0.20	27-Oct-95	FF	0	12° 31.6'	141° 31.4'	12° 24.5'	141° 34.2'
112	2.60	27-Oct-95	FF	14.8	12° 23.7'	141° 34.4'	12° 30.4'	141° 32'
113	9.17	27-Oct-95	efn-no	52	12° 29.8'	141° 1.7'	12° 28.5'	141° 0.8'
114	11.08	27-Oct-95	efn-no	56	12° 27.7'	140° 57.6'	12° 27.9'	140° 59.6'
115	13.17	27-Oct-95	efn-no	54	12° 25.3'	141° 0.6'	12° 27.1'	141° 1'
116	14.70	27-Oct-95	efn-no	47	12° 31.5'	141° 5.9'	12° 33.7'	141° 5.8'
117	16.42	27-Oct-95	efn-no	50	12° 32.8'	141° 2'	aborted	aborted
118	17.08	27-Oct-95	efn-no	50	12° 32.9'	141° 2.5'	12° 32.8'	141° .5'
119	1.08	28-Oct-95	FF	17	12° 31.5'	141° 30.7'	12° 24.2'	141° 33.9'
120	3.67	28-Oct-95	FF	16	12° 24.1'	141° 34'	12° 29.7'	141° 32.1'
121	9.75	28-Oct-95	efn-long	54	12° 29.3'	141° 1'	12° 27.6'	140° 59.5'
122	11.00	28-Oct-95	efn-long	55	12° 27.6'	140° 58.1'	12° 27.4'	141° 0.2'
123	13.83	28-Oct-95	efn-long	53	12° 25.3'	141° 0.4'	12° 26.7'	141° 0.4'
124	14.50	28-Oct-95	efn-long	46	12° 30.9'	141° 6.1'	12° 33.1'	141° 5.8'
125	16.25	28-Oct-95	efn-long	51	12° 33'	141° 1.5'	12° 33.1'	141° 3.4'
126	19.70	28-Oct-95	FF	19	12° 31.4'	141° 31'	12° 26.5'	141° 33.4'
127	22.33	28-Oct-95	FF	16	12° 25.3'	141° 34'	12° 31.9'	141° 31.3'
128	1.13	29-Oct-95	FF	15	12° 32.4'	141° 31.1'	12° 25.3'	141° 34.9'
129	3.63	29-Oct-95	FF	13	12° 24.1'	141° 35.7'	12° 29.5'	141° 32.6'
130	8.92	29-Oct-95	efn-long	50	12° 24.6'	141° 4.5'	12° 26'	141° 4.1'
131	10.58	29-Oct-95	efn-long	54	12° 27'	141° 0.3'	12° 28.3'	140° 58.8'
132	12.92	29-Oct-95	efn-long	56	12° 30.7'	140° 57.7'	12° 30.8'	140° 59.2'
133	14.42	29-Oct-95	efn-long	54	12° 30.7'	141° 0.6'	12° 32.4'	141° 1.6'
134	15.83	29-Oct-95	efn-long	47	12° 32.6'	141° 5.9'	12° 31'	141° 5.9'
135	19.50	29-Oct-95	FF	16	12° 30.3'	141° 32.2'	12° 24.1'	141° 35.6'

Station	Time	Date	Gear	Depth	StartLat	StartLong	EndLat	EndLong
136	22.37	29-Oct-95	FF	15	12° 25.7'	141° 34.7'5	12° 32.4'	141° 31'
137	1.58	30-Oct-95	FF	15	12° 31.8'	141° 31.3'	12° 25'	141° 34.3'
138	8.33	30-Oct-95	efn-no	50	12° 24.5'	141° 5.4'	12° 26.4'	141° 4.8'
139	10.75	30-Oct-95	efn-no	54	12° 26.5'	141° 0.6'	12° 29.4'	141° 0.5'
140	12.83	30-Oct-95	efn-no	55	12° 30.5'	141° 57.8'	12° 32.2'	141° 58.3'
141	14.08	30-Oct-95	efn-no	53	12° 31.5'	141° 0.5'	12° 29.4'	141° 0.5'
142	16.00	30-Oct-95	efn-no	46	12° 32'	141° 5.9'	12° 33.7'	141° 5.6'
143	19.25	30-Oct-95	FF	20	12° 33.5'	141° 29.8'	12° 28.3'	141° 32.5'
144	21.92	30-Oct-95	FF	17	12° 27.2'	141° 33.7'	12° 33.7'	141° 30.2'
145	0.47	31-Oct-95	FF	15.5	12° 33.6'	141° 30.9'	12° 26.9'	141° 34.6'
146	3.50	31-Oct-95	FF	13.5	12° 26.3'	141° 34.6'	12° 32.1'	141° 31.4'
147	8.75	31-Oct-95	efn-no	51	12° 32.6'	141° 0.9'	12° 32.3'	140° 59.2'
148	10.17	31-Oct-95	efn-no	55	12° 33.3'	140° 57.2'	12° 31.9'	140° 58.3'
149	12.08	31-Oct-95	efn-no	49	12° 28.9'	141° 3.4'	12° 27.4'	141° 3.1'
150	14.08	31-Oct-95	efn-no	50	12° 27.1'	141° 4.1'	12° 27.3'	141° 5.7'
151	16.20	31-Oct-95	efn-no	46	12° 27'	141° 6'	12° 29.6'	141° 6.5'
152	19.70	31-Oct-95	FF	18	12° 29.9'	141° 31.8'	12° 22.4'	141° 35.1'
153	22.30	31-Oct-95	FF	0	12° 23.4'	141° 34.5'	12°	141'
154	1.00	01-Nov-95	FF	18	12° 31.9'	141° 30.7'	12° 25.7'	141° 32.6'
155	3.50	01-Nov-95	FF	15	12° 25'	141° 34.3'	12° 30.4'	141° 31.2'
156	8.75	01-Nov-95	efn-long	51	12° 32.6'	141° 0.6'	12° 35.2'	141° 0.6'
157	11.00	01-Nov-95	efn-long	53	12° 33.2'	140° 59'	12° 34.3'	140° 58.5'
158	13.00	01-Nov-95	efn-long	50	12° 29.8'	141° 2.9'	12° 27.8'	141° 2.5'
159	14.50	01-Nov-95	efn-long	50	12° 26.5'	141° 4.5'	12° 28.7'	141° 4.5'
160	16.17	01-Nov-95	efn-long	46	12° 27.1'	141° 6.4'	12° 25.7'	141° 6.3'
161	19.42	01-Nov-95	FF	23	12° 32.5'	141° 29.2'	12° 27.4'	141° 33'
162	21.83	01-Nov-95	FF	16	12° 27.1'	141° 33.5'	12° 32.9'	141° 29'
163	0.23	02-Nov-95	FF	24	12° 33.3'	141° 20.5'	12° 27.5'	141° 32.8'
164	2.67	02-Nov-95	FF	20	12° 27.3'	141° 33.8'	12° 33.3'	141° 28.3'
165	8.33	02-Nov-95	efn-long	47	12° 31'	141° 4.6'	12° 29.2'	141° 4.6'
166	10.17	02-Nov-95	efn-long	56	12° 28.4'	140° 57.8'	12° 26.9'	140° 59.2'
167	12.08	02-Nov-95	efn-long	52	12° 26.7'	141° 2.9'	12° 25.3'	141° 2.7'
168	14.17	02-Nov-95	efn-long	53	12° 25.1'	141° 2.7'	12° 24.1'	141° 3.7'
169	16.00	02-Nov-95	efn-long	0	12° 24.4'	141° 6.5'	12° 26.6'	141° 6.3'
170	19.42	02-Nov-95	FF	25	12° 33.9'	141° 27.9'	12° 27.8'	141° 32.8'
171	21.83	02-Nov-95	FF	21	12° 27.5'	141° 32.6'	12° 33.8'	141° 28.2'
172	0.42	03-Nov-95	FF	26	12° 34.4'	141° 27.6'	12° 29.2'	141° 31.5'
173	3.00	03-Nov-95	FF	18	12° 28.2'	141° 32'	12° 33.9'	141° 28'
174	9.00	03-Nov-95	efn-no	46	12° 31.4'	141° 4.9'	12° 28.8'	141° 4.7'
175	10.33	03-Nov-95	efn-no	56	12° 29'	140° 58.5'	12° 26.4'	140° 58.8'
176	13.92	03-Nov-95	efn-no	49	12° 27.8'	141° 2.9'	12° 26'	141° 3.9'
177	14.25	03-Nov-95	efn-no	53	12° 25.6'	141° 2.6'	12° 23.6'	141° 2.6'
178	16.08	03-Nov-95	efn-no	46	12° 24.6'	141° 6.3'	12° 26.4'	141° 6.2'
179	19.00	03-Nov-95	FF	26	12° 33'	141° 28'	12° 27.9'	141° 33'
180	0.50	04-Nov-95	FF	22	12° 34.3'	141° 27.7'	12° 27.7'	141° 32.2'
181	2.92	04-Nov-95	FF	18	12° 27.4'	141° 33'	12° 34.1'	141° 29.7'
182	8.50	04-Nov-95	longline	20	12° 26.6'	141° 30.5'		
183	11.25	04-Nov-95	longline	20	12° 26.4'	141° 30.5'		
184	12.50	04-Nov-95	longline	20	12° 26.5'	141° 30.5'		
185	19.57	04-Nov-95	FF	18	12° 23.5'	141° 33.8'	12° 29.8'	141° 30.4'
186	22.00	04-Nov-95	FF	20	12° 30.1'	141° 30.6'	12° 23.4'	141° 34.8'
187	0.42	05-Nov-95	FF	16	12° 23.7'	141° 34.2'	12° 29.2'	141° 30.8'