



NATIONAL FISHERIES AUTHORITY

**Biological Survey Trip Report
(23rd March – 12th April 2004)**

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1. Introduction

The three-year Australian Centre for Industrial Agricultural Research (ACIAR) Prawn Project in the Gulf of Papua Prawn Fishery (GoPPF) began last year after the National Fisheries Authority (NFA) (following the restructure) wrote to ACIAR identifying that research on the economics, biology and management strategy evaluation for the Gulf of Papua Prawn Fishery was a high priority. This proposal had developed through a meeting with the ACIAR program leaders for Economics and Fisheries with CSIRO in Canberra in June 2002. It was agreed soon after in a workshop that research into the economic and biological sustainability of the fishery was valuable and necessary for the significant social and economic benefits from the fishery to continue thus the result in the three-year project.

The two projects biological and the other economic, have similar objectives, but will address the overall sustainability of the fishery from different perspectives. As part of the biological project, a trawl survey of the Gulf of Papua was conducted from the 23rd March – 12th April this year on board the *FV Siwi*. The survey was carried out from the north of the Fly River (in west) to Iokea village (in east). The objectives of the survey were:

- I. To establish the recruitment index of banana prawns for the fishery
- II. Obtain information on species composition and spatial variation in prawn catch
- III. Size distribution of banana prawns and its spatial variation prior to the fishing season and
- IV. If possible, obtain an annual estimate of the catch rates and size and species composition within the three mile restricted zone.

Four NFA officers (two observers and two biologists), a Commonwealth & Scientific Institute Research Organization (CSIRO) officer (biologist) and a provincial fisheries officer from Gulf Province carried out the survey. The vessel crew played a huge component in this regard as well.

The survey used an adaptive method to design this biological survey. Initially we had planned to do a completely stratified random survey, but because it required more sites to cover (as it meant doing various depth/regions) and there was a set period by which to have the survey completed, we settled for the adaptive method. The adaptive method had mainly two depth strata (< 15m and > 15m). A total of 104 shots were made.

At each shot, shot information, bycatch information and length frequency information of the *P. merguensis* (white banana) and the *P. indicus* (Indian banana) was collected. Shot information accounted for; the shot number, the positions of the shot away and winch up, trawl speed, temperature, salinity, sea state, sky state, the start & end times, maximum and minimum depths and the prawn catch by species (total count and weight). Bycatch information recorded information of the weight of the small bycatch, identification of the larger ones, their weight and lengths. Length Frequency information for *P. merguensis* and *P. indicus* collected measurements (carapace length), weight, sexes and gonad stages (maturity) of these banana prawns.

At each site, there was a 45 minutes of trawling time. The catches were then sorted, identified, counted, measured, sexed and recorded. Once recorded, the catches were then processed. Those not edible were discarded others edible for consumption or had commercial value were retained, skilfully processed, packed in packages and frozen. Then the facilities washed and cleaned up.

2. Activities

2.1 Narrative

23rd March 2004

At 1600h we made our way to the main wharf to board the vessel *FV Siwi*. The skipper had a stroke the day before so could not make the trip on that date. First Officers were to ensure that we departed that day. We steamed off at 1900h. Cabin arrangements were made once we began steam and after settling in dinner was served soon after. After the dinner, everyone retired for the night.

24th March 2004

Woke up and had breakfast at 0700h. We were still steaming so it was decided that to capitalize on saving daylight we should start at the sites in the Iokea area (east of the GoPPF). A total of 6 shots were completed. Shot numbers are 124, 116, 102, 86, 90, and 85. (Please see attached map for location of the shots). Catches were processed as explained and accounted for. The last shot ending at 1713h. We made steady steam for Umuda, the North Fly Region. It would take at least 12 hours to reach that area. We had dinner at 2000h and after cleaning up we all retired for the night.



Fig: 1 Catch is let out into the main tray

25th March 2004

Woke up and had breakfast at 0645h. A total of 9 shots were done today. Shot numbers were 174, 177, 178, 173, 167, 172, 171, 166 and 160. As explained, the catch was processed and accounted for. The last shot ended at 1845h. We continued steam to the next site. Once we reached the site we dropped anchor. Dinner was served at 2030h. After dinner, everyone retired for the night.

26th March 2004

Woke up had breakfast at 0600h. The first shot was made at 0643h. A total of 10 shots were made today. The shot numbers were 161, 153, 145, 146, 147, 139, 140, 133 and 134. Catches were processed as explained and recorded. Once we were on site of the next site to sample we anchored for the night. Dinner was served at 2045h. After dinner, we cleaned up, had data entered till midnight then retired for the night.

27th March 2004

Woke up and had breakfast at 0630. First shot away was at 0702h. 10 shots were done today. The shot numbers were 135, 127, 141, 111, 110, 109, 117, 92, 75, 76 and 77. Catches were processed and accounted for. Continued steam to next site for first shot away and anchored once we reached it. Dinner was at 1800h, a discussion of the days sampling was carried out, after that we cleaned ourselves up, more data entering was done till midnight before retiring for the night.



Fig: 2 Catches are sorted; prawns are separated from the bycatch.

28th March 2004

Woke up and had breakfast at 0645am. We had to steam for the next site again owing to the strong winds causing us to go adrift away from the site. First shot away was then at 0740h. We managed to do only 8 shots today. The shot numbers were 94, 59, 60, 47, 28, 63, 72 and 48. Catches were then processed and accounted for. Shots were done east and west of the rig. We anchored at our last shot site. After cleaning up, dinner was at 2100h. More data entering was carried out till midnight then we retired for the night.

29th March 2004

We made steady steam at 0600h for our first site, which was further east of the rig. Breakfast was at 0700h. First shot away was at 0840h. 9 shots were done today. The shot numbers were 39, 29, 30, 32, 16, 05, 23, 09 and 17. Catches were processed and recorded. By now we had covered areas at Akoma. Completion of the days sampling was at 1757h. After cleaning up, we had dinner and then we all retired for the night.



Fig: 3 Prawns are sorted into species, graded before packed.

30th March 2004

Woke up and had breakfast at 0615h. First shot away was at 0702h. A total of 9 shots were done. Shots were in the Akoma to Orokolo Bay area. The shot numbers were 23, 09, 17, 06, 18, 07, 19, 20, 21 and 24. Catches were then processed and recorded. During the days sampling there was exchange of goods 'fish for vegetables and betel-nut' a common trade between the seamen and the villagers. Dinner was early (1945h), which after led to more data entering till midnight before we retired for the night.

31st March 2004

Woke up and had breakfast at 0600h. The first shot was underway at 0646h. A total of 8 shots were done, at the deeper depths of Orokolo Bay and towards the west of Kerema. The shot numbers were 33, 34, 35, 36, 58, 53, 53 and 55. Catches were processed and recorded. After cleaning up, we had dinner at 2045h. More data entering was done till midnight before we retired for the night. The crew had asked to do commercial trawl so all night they trawled.



Fig: 4 Prawns are packed and frozen onboard.

1st April 2004

Woke up and had breakfast at 0630h. First shot away was at 0707h. 9 shots were done today west of Kerema and towards Kerema Bay. Shot numbers were 69, 106, 115, 118, 114, 100, 83, 68, and 67. Catches were processed and recorded. We anchored for the night. Dinner was at 2015h, after there was more data entering till eleven o'clock and then we retired for the night. The crew commercial trawled for 4 hours only and were asked to stop after. Dropped anchor for the night.

2nd April 2004

Woke up and had breakfast 0630h. First shot away was at 0727h. The last of the 8 shots were completed today. Shots were done in Freshwater Bay. Shot numbers were 67, 66, 81, 89, 73, 65, 41, and 57. All catches were processed and accounted for. We made steam for Kerema Bay. Upon reaching the Bay we dropped anchor. Dinner was at 2045h. A discussion of the sites to redo was carried out, as well as shot and trawl data was brought to date. We retired then after.

3rd April 2004

Woke up and had breakfast at 0800h. Vessel steamed into less than two miles offshore from Kerema town. Dropped anchor at 6m. We then waited for a dinghy to come out which one arrived at 11 0'clock. A deal struck with the operator we boarded the dinghy and got ferried across to Kerema town. We then went straight to the airport to have David checked in and once that was done we walked back into town. We met the Provincial advisor along the way and he then suggested that we rest and pass time sitting on the lawn of Kerema Hotel. We had to leave David at one o'clock since the boat operator had other things to do and wanted to ferry us back to the boat at that the moment. Enoch (provincial fisheries officer) joined us here on. We then left David and got ferried across to the vessel. Upon arrival we found out that Captain Alec had come aboard. We then pulled anchor and made steam to the deeper depths of the bay where they commercially trawled. The weather by now had picked up. We decided henceforth to wait the weather out before heading back to Umuda, the North of the Fly River. The crew then continued commercial fishing. Johnson and Richard henceforth collected observer data. We retired for the night.



(a)



(b)



(c)



(d)



(e)



(f)

Fig: 5 Large bycatch included sharks, rays, snakes, turtle and fishes.

4th April 2004

Woke up at 0700h and had breakfast. The weather had picked up some more so we decided to wait the day out but by evening make steam for Umuda nonetheless. Throughout the day, the crew commercially trawled. We helped behead the prawns and took large bycatch data from the catches caught. Johnson and Richard still continued to collect observer data. By evening despite the weather still looking bad, we made steam for the closet site near where we were. By nightfall, we were anchored and after dinner retired for the night.

5th April 2004

Woke up and had breakfast at 0615h. We managed to do only 5 shots today. The weather was rough and because of the spatial distance we did not cover much ground. The shot numbers were 52, 64, 88, 96 and 104. Catches were processed and recorded. We made steady steam where once reached we anchored. We had dinner at 2110h. After cleaning up we then retired for the night.

6th April 2004

Woke up and had breakfast at 0600h. First shot away was at 0635h. The weather was terrible. It rained and the wind was blowing at 10-15 knots. The current was strong causing big swirls and the boat was not stabilized. We managed to do 10 shots nonetheless. This was because the sites were nearby and the trawling speed had increased in the shots in order to help keep the fishing gear in tow (not jeopardizing it) and us still going the direction intended. The shots were 108, 120, 130, 132, 138, 142, 155, 150, 158, and 164.. Catches were then processed and recorded. We all had dinner at 2100h and retired straight after.



Fig: 6 mending nets was a common task onboard.

7th April 2004

Woke up and had breakfast at 0545h. The first shot away was at 0619h. The last remaining shots were done today. The weather had not toned down; it still was bad, much worse than the day before. The shots were 165, 148, 125 and 121. Catches were processed and recorded. After the last shot, we made steady steam for Akoma. Reached Akoma at 1800h were the crew commenced commercial trawling henceforth. We retired for the night.

8th – 11th April 2004

Commercial trawling was carried out during this period. Observer and large bycatch data was collected at these times. We helped where necessary, mostly in the sorting of catches and heading of prawns. The trawls were trawled at an average of 4 hours per shot. Meals were taken in between the working times. Towards the evening on the 11th of April we steamed for Port Moresby. We anchored at Fisherman Island at one o'clock am (12th April). The weather coming back was rough.

12th April 2004

At 0600r, we arrived at the main wharf. We walked up to the office and made a call to Mr. Polon where he picked us and had we dropped off respectively.



Fig: 7 Flocks of birds always followed the vessel.

2.2 The commercial vessel

The commercial vessel, Siwi, once fished in the Northern Prawn Fishery (NPF). She's 26.8m in length and is a fully furnished vessel with generally good cabins. Other facilities included a dining and kitchen area. A wheelhouse equipped with VHF radio, GPS, a computer, radar, echo sounder, and sonar. It was unfortunate that the Vessel Monitoring System (VMS) was out of order. The vessel is air-conditioned, has superb lighting facilities and has excellent freezer facilities. There is a water distillatory onboard which ensures the vessel having much water as it needs.

3. Results

3.1 Results of the Biological Survey

A total of 12 prawn species were caught. Eleven of which are mainly targeted except the *Heterocarpus spp* which is a by-product of the prawn trawling (Table 1). Other by-products such as a range of fishes were caught but are not tabulated.

Table: 1 Prawn species names (survey code, scientific & common name) as well as its catch status in regard to prawn trawling.

Species names			
Code names	Scientific name	Common name	Catch category
Caridacea	Caridacea	Mixed carids	target species
Carrot prawn	Parapenaeus sp 1	Carrot prawn	target species
Flower prawn	Parapeneiopsis sculptilis	Flower prawn	target species
Pdem	Metapeneus demani	green endeavour	target species
Pend	Metapeneus endeavouri	blue endeavour	target species
Pens	Metapeneus ensis	red endeavour	target species
Pind	Peneaus indicus	Indian banana	target species
Pink carid	Heterocarpus sp	Pink carid	By-product
Pjap	Paneaus japonicus	Japanese tiger	target species
Pmerg	Peneaus merguensis	white banana	target species
Pmon	Peneaus monodon	Giant tiger/ Black tiger	target species
Psemi	Peneaus semisulcatus	Grooved tiger	target species

Table 2 portrays total weights (kg) by prawn species. The highest is P. merguensis (733.55 kg) and the lowest Caridacea (5.04 kg). P monodon had the second highest catch (169.87kg) followed by Metapeneaus ensis (104.66kg). (Table 2).

Table: 2 Total weight (Kg) by species.

Species names, by catch (kg) of survey	
Scientific name	Total weight
Caridacea	5.04
Parapeneaeus sp	8.6935
Parapeneiopsis sculptilis	129.76
Metapeneus demani	95.11
Metapeneus endeavouri	4.545
Metapeneus ensis	104.66
Peneus indicus	43.345
Heterocarpus sp	6.125
Panaeus japonicus	6.958
Peneaus merguiensis	733.5455
Peneaus monodon	169.872
Peneaus semisulcatus	6.74

Table 3 shows prawn average and standard deviated catch rates by weight and of their total count by depth stratum. Two depths strata were used. Depth strata 1 = 8-15m and depth strata 2 = 15-30m. Out of the 12 prawns species, 5 prawn species (Caridacea, Heterocarpus sp, Metapeneus endeavouri, Metapeneus ensis & Peneaus semisulcatus) were found in depth strata 2 while the remaining 7 in depth strata 1. This is so despite the fact that in overall there was more prawn trawling done in depth strata 1 than in 2.

Table: 3 Average prawn catch rates (kg/hr & no./hr) by depth stratum.

Scientific name	Depth Stratum	Avg Catch rate kg	StDev Catch rate kg	Avg Catch rates Numbers	StDev Catch rates Numbers	Count Catch rate kg
Caridacea	1	0.47	0.81	37.08	53.95	6
Caridacea	2	0.78	0.75	111.73	121.32	5
Heterocarpus sp	1	0.51	0.83	69.58	83.04	8
Heterocarpus sp	2	1.03	1.28	142.93	162.17	4
Metapeneus demani	1	2.63	4.14	394.65	726.68	43
Metapeneus demani	2	1.39	3.25	127.49	320.45	11
Metapeneus endeavouri	1	1.00	2.08	147.48	321.91	6
Metapeneus endeavouri	2	2.57		1.28		1
Metapeneus ensis	1	1.77	2.88	146.25	232.904	39
Metapeneus ensis	2	2.17	3.04	176.32	242.69	33

Scientific name	Depth Stratum	Avg Catch rate kg	StDev Catch rate kg	Avg Catch rates Numbers	StDev Catch rates Numbers	Count Catch rate kg
Paneaus japonicus	1	0.29	0.21	14.58	11.60	16
Paneaus japonicus	2	0.25	0.45	13.56	20.75	18
Parapeneaus sp	1	1.13	2.24	152.06	293.59	10
Parapeneaus sp	2	0.06	0.10	4.49	2.70	5
Parapeneiop sis sculptilis	1	3.62	3.65	327.28	313.42	41
Parapeneiop sis sculptilis	2	2.21	3.42	169.49	252.98	14
Peneaus indicus	1	3.42	5.27	148.07	252.61	16
Peneaus indicus	2	1.06		133.33		1
Peneaus merguiensis	1	15.63	20.48	753.76	977.12	50
Peneaus merguiensis	2	7.62	11.98	379.63	607.07	26
Peneaus monodon	1	5.05	6.55	103.36	132.11	41
Peneaus monodon	2	0.53	0.57	9.90	10.79	27
Peneaus semisulcatus	1	0.24	0.26	9.6	9.58	5
Peneaus semisulcatus	2	0.33	0.52	13.04	22.77	23

Prawn catch rates by weight and total count by area can be seen in table 4 & 5. The area was defined into two categories. Area 1, the area surveyed by Gwyther (the Gwyther area) and Area 2, the area zoned on its closeness to the rivers (recruitment survey area).

The Gwyther area has 5 regions (0,1,23,34,& 67) and the Survey area has 9 regions (0,0.1,1,2,3,4,5,6, & 7). The catch rates of P.merguiensis, P.monodon, and P.indicus & P.semiselcatus were high in areas 67, 34, & 24 and low in 0 & 1 in the Gwyther area. In the recruitment survey area, the catch rates for the 4 main targeted species were high in regions 5, 6, 7 although P. monodon had some high rates in area 4 and were low in 0.1,1 & 3. The other prawn species varied in their catch rates by area (Table 4 & 5).

Table: 4 Catch rates by species of the Gwyther area surveyed.

Catch rates by species by area (Gwyther)

Scientific name	Region	AvgCatch (kg/hr)	StDev (kg/hr)	AvgCatch in (No./hr)	SDev (No./hr)
Caridacea	0	8.78		21.96	
Caridacea	1	1.03	0.81	99	55.27
Caridacea	23	1.87		306.67	
Caridacea	34	0.16	0.15	13.81	12.12
Caridacea	67	6.66		1.33	
Heterocarpus sp	0	1.33	1.17	170.4	109.76
Heterocarpus sp	1	3.58	2.49	7.17	5.53
Heterocarpus sp	23	0.47	0.75	82.57	129.42
Metapeneus demani	0	1.96	2.53	211.18	253.69
Metapeneus demani	1	0.58	0.54	57.87	59.71
Metapeneus demani	23	0.51	0.52	71.24	68.45
Metapeneus demani	34	6.34	6.39	1066.22	1136.21
Metapeneus demani	67	0.92	1.24	81.31	113.70
Metapeneus endeavouri	0	1.48	2.51	219.98	389.47
Metapeneus endeavouri	67	4.18	4.01	2.09	1.44
Metapeneus ensis	0	1.08	1.43	77.89	94.01
Metapeneus ensis	1	1.42	1.83	103.61	130.61
Metapeneus ensis	23	4.16	4.42	369.47	332.84
Metapeneus ensis	34	2.82	3.69	254.45	304.22
Metapeneus ensis	67	0.86	1.80	51.99	113.46
Paneaus japonicus	0	0.74	0.49	39.67	19.12
Paneaus japonicus	1	8.17	0.13	4.83	6.37
Paneaus japonicus	23	0.29	0.29	13.35	13.13
Paneaus japonicus	34	8.29	3.63	6.68	3.24
Paneaus japonicus	67	6.67	5.03	2.42	0.99
Parapenaeus sp 1	0	8.62	6.88	14.88	11.54
Parapenaeus sp 1	1	1.55	2.63	206.38	343.26
Parapenaeus sp 1	23	0.13	0.18	4.58	4.59
Parapeneiopsis sculptilis	0	3.44	2.61	351.91	284.50
Parapeneiopsis sculptilis	1	4.05	4.26	322.90	330.28
Parapeneiopsis sculptilis	23	3.08	4.96	209.47	350.82
Parapeneiopsis sculptilis	34	0.72	0.65	77.59	78.31
Peneaus indicus	0	1.06		133.33	
Peneaus indicus	34	0.36	0.67	16.59	28.69
Peneaus indicus	67	5.26	6.01	226.96	295.73
Peneaus merguiensis	0	4.54	5.02	218.87	252.36
Peneaus merguiensis	1	7.66	11.44	442.57	628.58
Peneaus merguiensis	23	13.62	12.63	732.59	620.65
Peneaus merguiensis	34	15.04	12.91	845.13	655.28
Peneaus merguiensis	67	20.38	30.79	771.88	1467.85
Peneaus monodon	0	0.40	0.36	10.28	9.88
Peneaus monodon	1	0.22	0.26	4.73	4.55

Catch rates by species by area (Gwyther)					
Scientific name	Region	AvgCatch (kg/hr)	StDev (kg/hr)	AvgCatch in (No./hr)	SDev (No./hr)
Peneaus monodon	23	0.98	0.86	16.50	14.15
Peneaus monodon	34	5.38	5.80	118.66	119.55
Peneaus monodon	67	6.96	7.95	132.51	160.14
Peneaus semisulcatus	0	0.51	0.84	20.79	26.98
Peneaus semisulcatus	1	6.17	5.69	3	2
Peneaus semisulcatus	23	7.32	8.51	1.32	2.09
Peneaus semisulcatus	34	0.26	0.36	9.33	12.72
Peneaus semisulcatus	67	0.33	0.33	13.31	23.34

Table: 5 Catch rates by species of the recruitment survey area

Scientific name	Region	AvgCatch (kg/hr)	SDevCatch (kg/hr)	AvgCatch (No./hr)	SDevCatch (No./hr)
Caridacea	0	0.09		21.96	
Caridacea	1	1.03	0.81	99.00	55.27
Caridacea	2	1.87		306.67	
Caridacea	3	0.21	0.15	17.97	10.79
Caridacea	4	0.01		1.33	
Caridacea	6	0.01		1.33	
Heterocarpus sp	0	1.11	1.17	143.00	118.93
Heterocarpus sp	1	0.04	0.03	7.56	6.71
Heterocarpus sp	2	0.47	0.75	82.57	129.42
Metapeneus demani	0	1.94	2.87	191.59	281.81
Metapeneus demani	0	1.89	1.29	244.38	154.76
Metapeneus demani	1	0.50	0.52	49.19	56.24
Metapeneus demani	2	0.58	0.57	79.73	74.78
Metapeneus demani	3	6.62	7.06	1139.89	1250.29
Metapeneus demani	4	3.44	4.51	527.13	752.12
Metapeneus demani	6	0.07	0.07	6.00	6.60
Metapeneus demani	7	1.34	1.36	118.96	125.94
Metapeneus endeavouri	0	1.48	2.51	219.98	389.47
Metapeneus endeavouri	7	0.04	0.04	2.09	1.44
Metapeneus ensis	0	1.16	1.46	84.27	99.38
Metapeneus ensis	1	1.40	1.87	101.51	132.33
Metapeneus ensis	2	5.44	4.71	466.25	345.81
Metapeneus ensis	3	2.25	2.23	277.36	260.45
Metapeneus ensis	4	2.85	4.77	219.76	333.54
Metapeneus ensis	5	3.25		5.33	
Metapeneus ensis	6	1.43	2.38	86.96	150.09
Metapeneus ensis	7	0.22	0.22	12.64	18.44
Paneaus japonicus	0	0.74	0.49	39.67	19.12
Paneaus japonicus	1	0.08	0.13	4.83	6.37
Paneaus japonicus	2	0.22	0.19	9.91	9.63
Paneaus japonicus	3	0.38	0.45	18.10	19.16

Paneaus japonicus	4	0.10	0.00	8.44	1.54
Paneaus japonicus	5	0.08		6.67	
Paneaus japonicus	6	0.07	0.05	2.42	0.99
Parapenaeus sp 1	0	0.84	2.14	94.92	225.31
Parapenaeus sp 1	1	0.92	2.02	154.93	338.99
Parapenaeus sp 1	3	0.13	0.18	4.58	4.59
Parapeneiopsis sculptilis	0	2.83	2.52	298.03	296.05
Parapeneiopsis sculptilis	0	4.92	2.24	499.23	209.35
Parapeneiopsis sculptilis	1	4.37	4.54	326.67	336.08
Parapeneiopsis sculptilis	2	4.31	5.57	292.76	397.02
Parapeneiopsis sculptilis	3	0.62	0.58	63.70	70.76
Parapeneiopsis sculptilis	4	0.01		1.33	
Peneaus indicus	0	1.07		133.33	
Peneaus indicus	3	0.02	0.01	1.94	0.86
Peneaus indicus	4	0.53	0.80	23.91	34.03
Peneaus indicus	6	2.25	1.62	106.67	77.85
Peneaus indicus	7	6.55	6.84	278.52	344.72
Peneaus merguiensis	0	6.38	8.23	309.52	410.41
Peneaus merguiensis	0	0.04		1.33	
Peneaus merguiensis	1	6.41	10.22	392.22	594.57
Peneaus merguiensis	2	14.79	13.61	785.94	666.61
Peneaus merguiensis	3	11.08	8.47	711.28	477.93
Peneaus merguiensis	4	14.93	13.97	830.38	793.51
Peneaus merguiensis	5	38.53		1392.00	
Peneaus merguiensis	6	23.65	37.25	943.86	1850.56
Peneaus merguiensis	7	16.30	22.00	556.90	857.02
Peneaus monodon	0	0.38	0.36	9.83	9.64
Peneaus monodon	1	0.23	0.27	4.80	4.80
Peneaus monodon	2	1.01	0.87	16.69	14.10
Peneaus monodon	3	2.64	2.96	68.04	71.73
Peneaus monodon	4	6.55	7.10	145.65	149.78
Peneaus monodon	5	10.59		125.33	
Peneaus monodon	6	4.12	6.89	81.58	148.70
Peneaus monodon	7	9.81	8.34	183.45	164.05
Peneaus semisulcatus	0	0.51	0.84	20.80	26.98
Peneaus semisulcatus	1	0.06	0.06	3.00	2.00
Peneaus semisulcatus	2	0.13		1.33	
Peneaus semisulcatus	3	0.01		1.30	
Peneaus semisulcatus	4	0.36	0.45	12.67	16.03
Peneaus semisulcatus	5	0.07		2.67	
Peneaus semisulcatus	6	0.23	0.35	18.67	33.12
Peneaus semisulcatus	7	0.44	0.30	7.96	5.66

P. merguiensis, P. indicus, P. monodon and P. semisulcatus had higher catch rates in the closed (inside the three mile zone) than outside. The other species varied. The endeavours showed a similar catch trend to that of the bananas (Table 6).

Table: 6 Prawns Catches by the closure area.

Scientific name	Open/closed	AvgCatch (kg/hr)	SDevCatch (kg/hr)	AvgCatch (No./hr)	SDevCatch (No./hr)
Caridacea	Closed	0.04		5.58	
Caridacea	Half	0.29	0.02	24.16	1.66
Caridacea	Open	0.76	0.85	90.91	104.73
Heterocarpus sp	Open	0.68	0.97	94.03	113.43
Metapeneus demani	Closed	5.81	4.61	921.36	875.46
Metapeneus demani	Half	4.85	6.50	797.43	1152.89
Metapeneus demani	Open	1.23	1.94	134.68	197.73
Metapeneus endeavouri	Half	0.05	0.05	2.49	1.79
Metapeneus endeavouri	open	1.19	2.27	176.24	351.18
Metapeneus ensis	Closed	2.33	2.86	266.12	285.40
Metapeneus ensis	Half	2.40	4.12	206.07	323.69
Metapeneus ensis	Open	1.80	2.65	139.13	207.03
Paneaus japonicus	Closed	0.07	0.07	2.33	1.33
Paneaus japonicus	Open	0.28	0.36	14.78	17.10
Parapeneaus sp 1	Open	0.77	1.88	102.88	246.17
Parapeneiopsis sculptilis	Closed	0.41		19.53	
Parapeneiopsis sculptilis	Half	0.79	0.71	89.21	81.58
Parapeneiopsis sculptilis	Open	3.58	3.71	312.78	312.75
Peneaus indicus	Closed	7.22	11.05	359.81	557.79
Peneaus indicus	Half	2.72	3.22	106.75	120.81
Peneaus indicus	open	0.74	0.46	71.04	88.09
Peneaus merguensis	Closed	21.54	22.98	1061.55	1012.27
Peneaus merguensis	Half	23.79	27.77	1094.24	1364.79
Peneaus merguensis	Open	8.16	10.88	413.95	543.18
Peneaus monodon	Closed	7.90	8.30	163.41	167.63
Peneaus monodon	Half	8.57	6.93	182.02	136.09
Peneaus monodon	Open	0.82	1.66	13.70	21.72
Peneaus semisulcatus	Half	0.47	0.64	12.00	15.08
Peneaus semisulcatus	Open	0.30	0.48	12.46	21.54

The average carapace lengths ranged from 24.12 – 31.53 cm (P.indicus) & 25.03 - 41.55 cm (P.merguensis) in the recruitment survey area. For the Gwyther area, the average carapace length ranged from 28.26 – 33.83 cm (P. indicus) and 26.87 – 35.41 cm. There average sizes of the bananas are small and most of the small sizes are in depth strata 1 (8-15m) (Table 7).

Table: 7 Average Carapace lengths of Banana prawns in Gwythers survey area

Average CL of Bananas in Gwythers Area				
Species	AvgCL	CountCL	Region	Depth Stratum
Pind	28.26	71	34	1
Pind	30.83	723	67	1
Pmerg	28.39	758	0	1
Pmerg	30.37	411	0	2
Pmerg	27.18	549	1	1
Pmerg	27.13	545	1	2
Pmerg	27.29	730	23	1
Pmerg	29.62	450	23	2
Pmerg	26.87	1443	34	1
Pmerg	35.41	60	34	2
Pmerg	32.843	1031	67	1
Pmerg	37.85	6	67	2

Table: 8 Average Carapace lengths of Banana prawns in the Recruitment survey area

Average CL of bananas by recruitment area				
Species	AvgCL	CountCL	Region	Depth Stratum
Pind	24.13	3	3	1
Pind	28.44	68	4	1
Pind	29.22	218	6	1
Pind	31.53	505	7	1
Pmerg	28.59	952	0	1
Pmerg	30.37	411	0	2
Pmerg	23.7	1	0.1	1
Pmerg	26.01	354	1	1
Pmerg	27.13	545	1	2
Pmerg	27.68	630	2	1
Pmerg	30.20	350	2	2
Pmerg	25.02	819	3	1
Pmerg	27.62	100	3	2
Pmerg	28.17	621	4	1
Pmerg	35.42	60	4	2
Pmerg	31.74	103	5	1
Pmerg	31.872	610	6	1
Pmerg	36	4	6	2
Pmerg	34.25	421	7	1
Pmerg	41.55	2	7	2

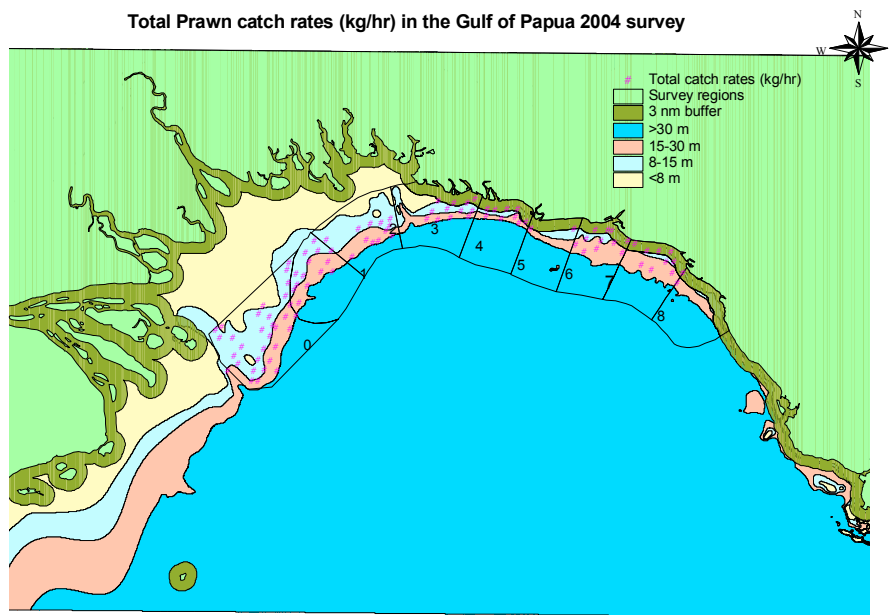


Figure: 1 Total prawn catch rates (kg/hr) at each site trawled during the survey.

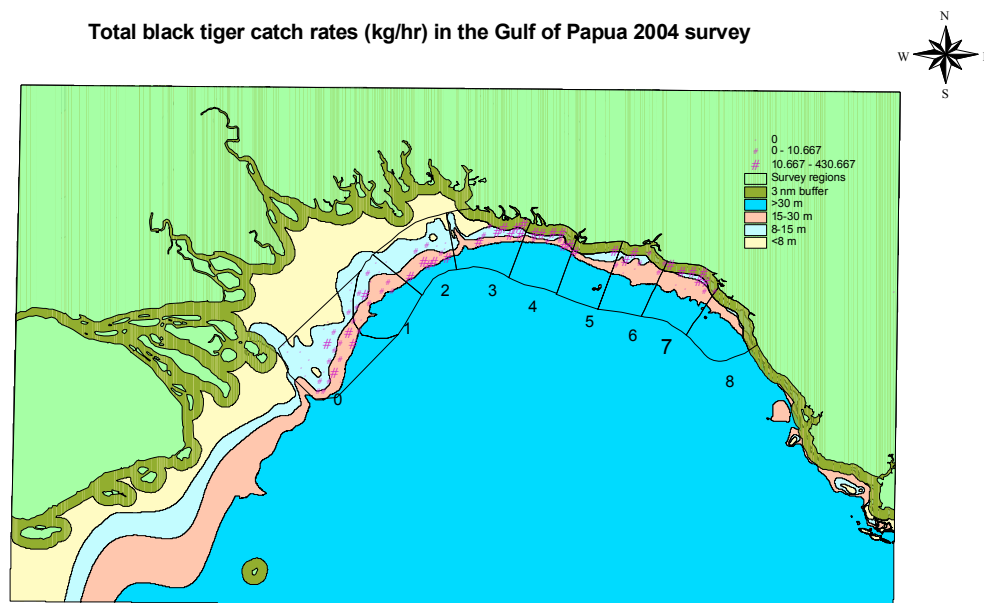


Figure: 2 Black tiger (*P.monodon*) catch rates (kg/hr) at each site trawled during the survey.

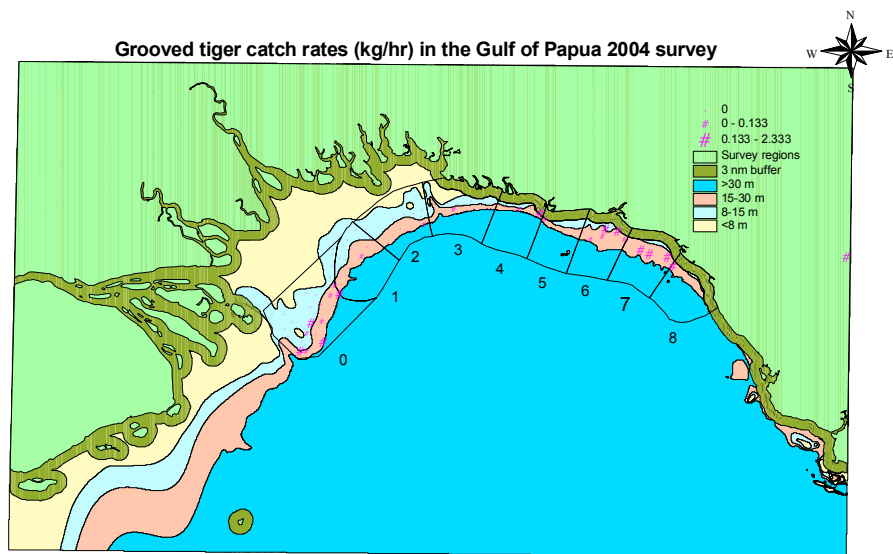


Figure: 3 Grooved tigers (*P.semisulcatus*) catch rates (kg/hr) at each site trawled during the survey.

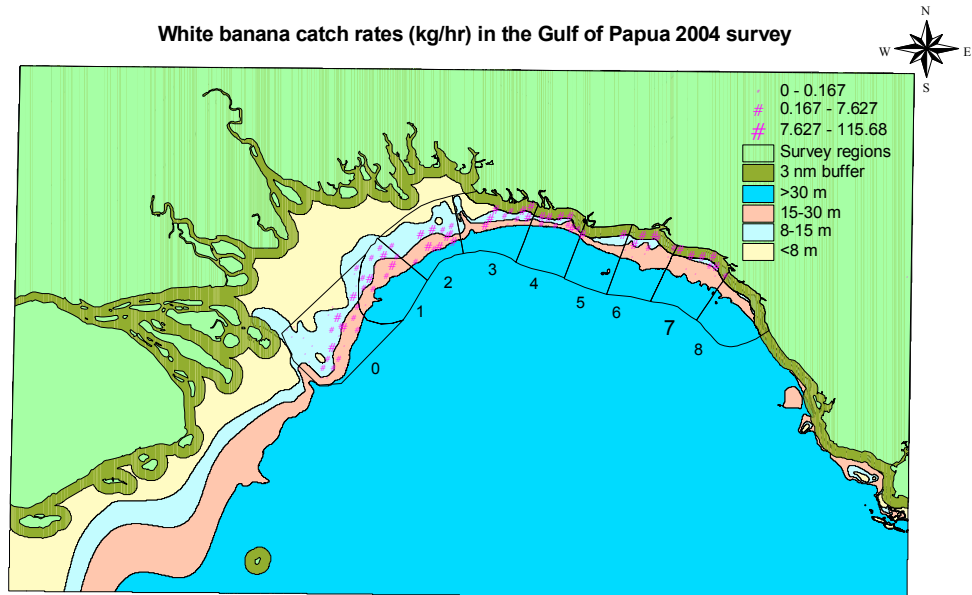


Figure: 4 White banana (*P.merguensis*) catch rates (kg/hr) at each trawled during the survey.

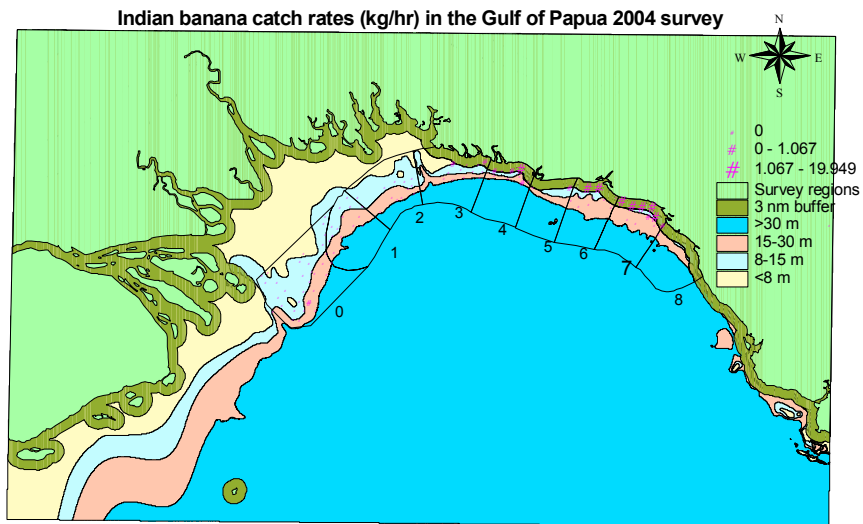


Figure: 4 Indian banana (*P.indicus*) prawn catch rates (kg/hr) at each site trawled during the survey.

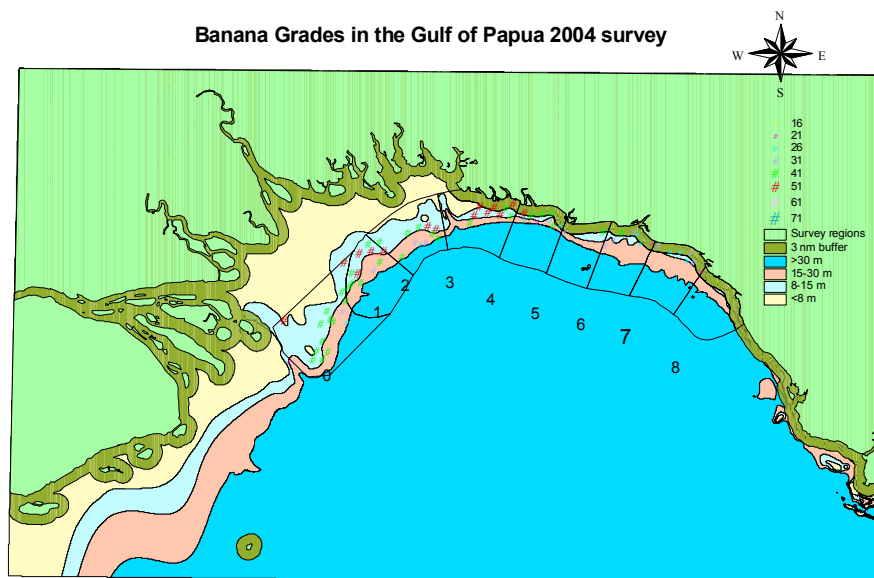


Figure: 5 Banana grades (size distribution) at each site trawled during the survey.

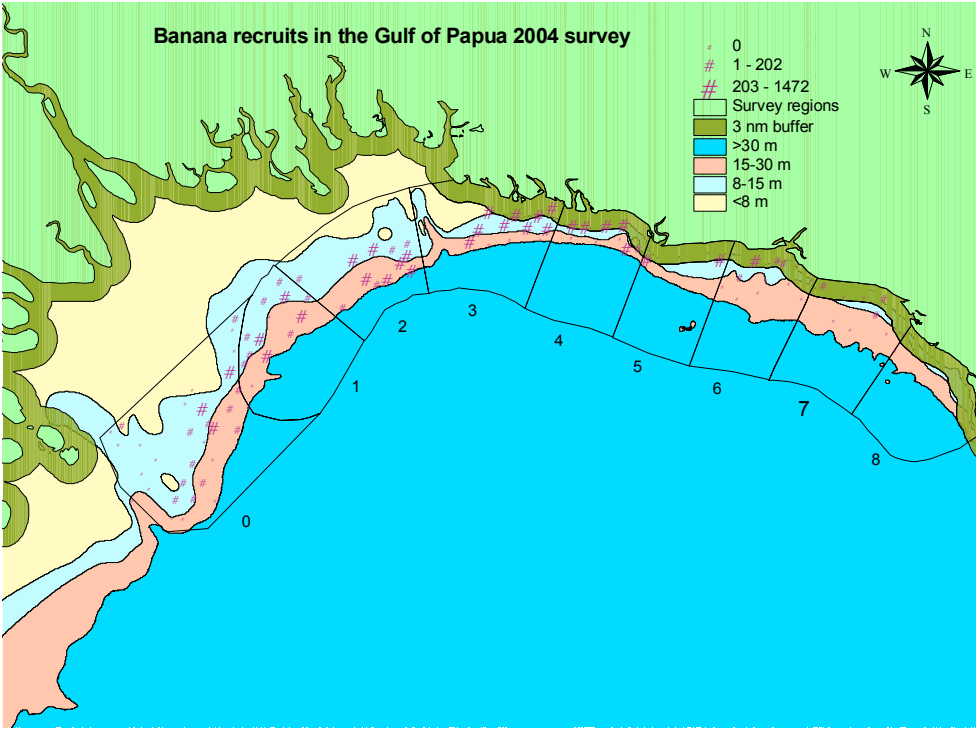
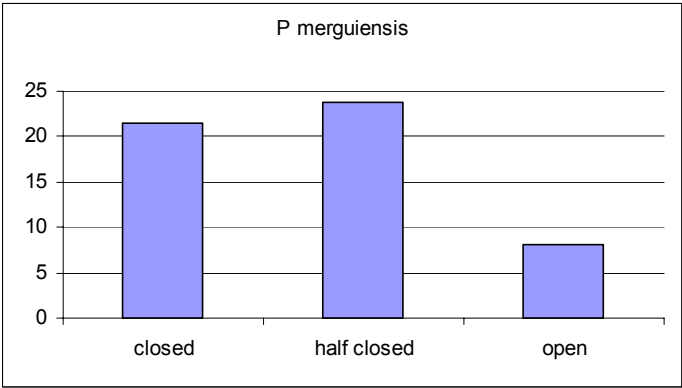
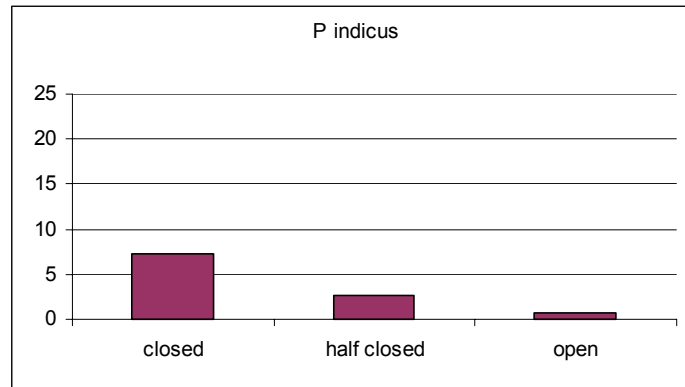


Figure: 6 Banana recruits into the Gulf of Papua Prawn Fishery.

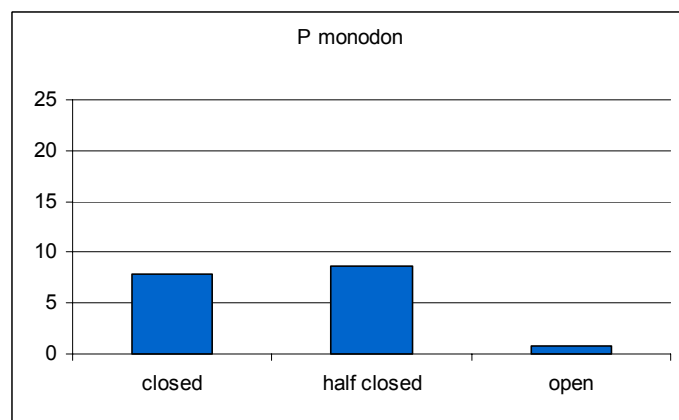
P.merguensis, *P.indicus* and *P.monodon* average catch rates (kg/hr) seem to be caught more in the closed area than in the open area (Figure: 7a, b and c).



(a)



(b)



(c)

Figure: 7 a, b and c Average catch rates (kg/hr) in closed and open areas in the Gulf of Papua Fishery.

3.2 General Comments and Recommendations

Except for little to no catches caught during the redoing of certain sites, the overall trip was a huge success. Processing of prawns was more difficult when the catch was large and the shots sites were not far apart but the job was done nonetheless. Without the ever hardworking crew the survey would not have ventured as much. We owe much to them who tirelessly gave every effort to see that this trip was a success. The meals were no different, very impressive.

The next biological survey would be conducted next year hopefully in the same time frame as of the one carried out this year. It must be noted however that tides and moon phase play a major part in prawn catches. It is recommended that we take note of this and plan exactly the next survey coinciding in respect to tides and moon phase.

