

**Northern Territory
Department of
Business, Industry and Resource
Development**

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**A DESCRIPTION OF THE NT FINFISH
TRAWL FISHERY**

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1. INTRODUCTION

Romport Holdings Pty. Ltd., being aware of the Commonwealth ESD process, took the proactive step of asking NT Fisheries to independently observe and record all landed species during a typical fishing trip. This included by-product, discarded and threatened species landed by the fishing vessel, *Ocean Harvest* over a period of six days fishing in the Gulf of Carpentaria. The company financed this exercise and this is a report on the trip.

2. THE FINFISH TRAWL FISHERY

The Finfish Trawl Fishery currently has only one licence and is restricted to the fishing grounds generally seaward of a line 25 nautical miles from the shore to the outer limit of the Australian Fishing Zone (AFZ). It is excluded from the Timor Reef Fishery and some areas of the Gulf of Carpentaria. The Finfish Trawl Fishery targets red snappers (*Lutjanus malabaricus* and *Lutjanus erythropterus*).

The Finfish Trawl Fishery operates adjacent to the northern and northeastern coast of the NT and the northern portion of the Gulf of Carpentaria. The value of the finfish trawl fishery in 2001 was approximately \$4.0 million for reported landings of 1,000 tonnes (Lloyd 2001).

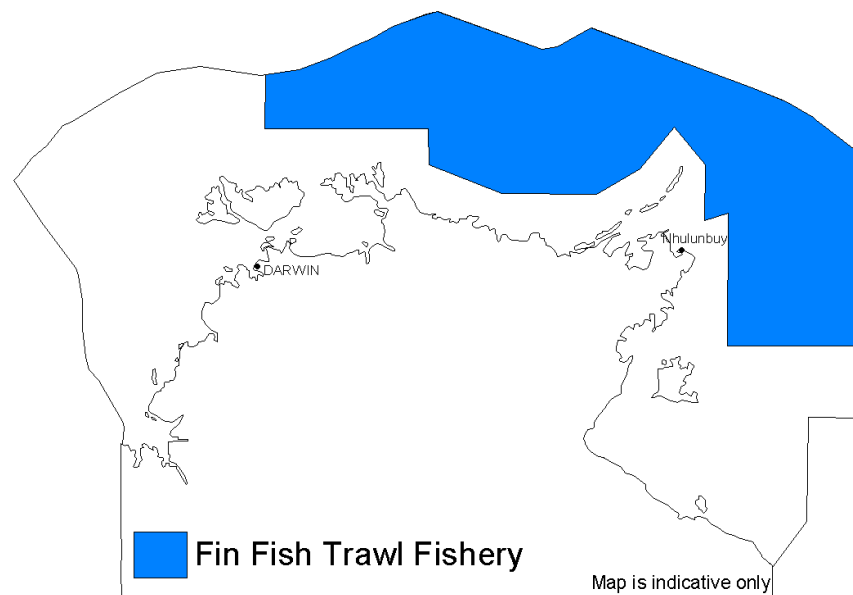


Figure 1. Finfish Trawl Fishery

3. HISTORY OF THE FINFISH TRAWL FISHERY

Foreign fishing operations have targeted tropical snappers and emperors in the Timor and Arafura Seas since the late 1950s. Foreign fleets continued fishing under licence agreements following the ratification of the AFZ in November 1979. These vessels were not licensed to operate in these waters since 1991 when they were phased out in response to an increased interest in domestic fishing and concerns of overfishing red snappers (Caton 2002).

In 1991, six Australian trawlers were licensed to operate in the then Commonwealth managed Northern Trawl Fishery, which extended from WA, across the NT and into Qld waters of the Gulf of Carpentaria. Further management controls were then instigated to link access with sustainable yield estimates (Ramm 1994).

A single trawl operator continues to harvest the demersal finfish resources in waters adjacent to the NT targeting red snappers. The remote location and associated high costs of operation have hindered the current development of the fishery along with NT legislation, which prevents more than one trawler operating in this area. The single trawl operator is currently based in Gove.

4. VESSEL DESCRIPTION

The *Ocean Harvest* is the only fish trawler operating in Northern Territory waters. It was designed and built in Fremantle specifically for trawl fishing in the Arafura Sea. It has a length of 25 m, a beam of 8 m and a draft of 3.5 m. A Cummins, Series 2, 500 hp diesel motor powers the vessel. It also has two Cummins, Series 2 gensets to power the other main systems on the vessel including the freezers. The gensets are 360 KVA and 125 KVA, respectively (Errity 2002).

The freezer capacity is 50 tonnes and there are also two snap freezers with a capacity of 1.8 tonnes each. There are two 6 cylinder, two stage Grasso compressors for the freezers on the vessel and one 2 cylinder, two stage Grasso compressor for the brine tanks. The vessel is also fitted with an oil mixer for environmental purposes. This device takes all the excess oil from the engines and mixes it with the diesel fuel so the oil is no longer expelled as waste.

The wheelhouse is fitted with two colour sounders, a GPS plotter, radar and a satellite phone. One sounder is a multifrequency model, an American Pioneer sounder fitted with four transducers. The other sounder is a Furuno model and the GPS plotter is a Microplot 6 model. The radar is also a Furuno model.



Two full wing Wendy trawl nets

5. FISHING METHOD

The *Ocean Harvest* has two trawl nets onboard. One is kept as a spare in case the net currently being used does not fish efficiently or is severely damaged. The full wing Wendy trawl nets were designed by the skipper, Bill Passey and are constructed from 9-inch mesh. They have been designed to be more environmentally friendly than conventional trawl nets and were based on the original 'Julie Anne' trawl net (Mounsey 1991; Allen 1997). The bridle design and cut of the net allow it to be high lifting and therefore more workable as the net does not come into contact with the seabed.

The semi pelagic design of the full wing Wendy net also limits the disturbance to the seabed as the headline is raised significantly above the substrate, while the footrope is raised off the bottom. It was specifically designed to minimise habitat disturbance while ensuring commercial

catch rates were maintained. This net design reduces the incidence of sponges, corals and other unwanted species that are associated with traditional demersal trawl operations. This improves the quality of the retained catch, which is ideal for the operator. Further commercial benefits of the new design include reduced wear and tear on the trawl net and rigging due to reduced contact with the substrate.

The headline on the net is 42.4 m in length and has 74 floats, each with buoyancy of 2.8 kg. The float concentrations are on the wing ends and in the centre of the headline. The ground chain gear is surrounded by rubber bobbins, which allow it to roll over the bottom with minimum impact on the occasions that they do come into contact with the bottom. The spread between the trawl boards is about 78.5 m when the net is fished in a depth of around 60 m. If the net is working well it will have a lift of about 7 m from the bottom. The net is specifically designed to catch red snappers, which school off the bottom.

The skipper searches for suitable bottom on the sounder before preparing the net for release. He searches for hard bottom that is not too irregular as this can cause damage to the net or cause the trawl boards to dig in, slowing the trawl speed. The skipper also takes into account the tidal direction and speed. The net is stored on a drum powered by a winch. The cod end of the net is released from the stern of the vessel. The trawl boards are then attached to the ends of the headline by two crew members prior to the net release to cause the wings to spread. When fishing in a depth of 60 m about 250 m of warp (wire ropes attaching the trawl boards to the vessel) is released. There are marks on the haul lines every 50 m so the skipper knows how much has been deployed. This takes about 10 minutes to complete.

The process of setting the net is extremely important, as it will fish more efficiently if it is sitting correctly in the current. The skipper aims to trawl with the current, as it is much easier to obtain the optimal trawl speed of 3.6 knots. The net will work best when trawled at this speed, which in turn assures a higher catch rate. The shots vary greatly in time according to the area fished. Shots are usually around three hours, but can be as short as 30 minutes if the skipper is fishing only a small patch of hard bottom.

The skipper determines when the net is hauled. As the warp is winched in, two crew members disconnect the trawl boards when they are hauled to the surface. The crew members then clean the wings of the net of any debris as it is hauled onto the deck. They also look for any damage to the wings of the net usually caused by sharks. These holes are repaired immediately before the next shot. The cod end is then secured above the hopper and the fish are released directly into the hopper. The hopper has bars across it arranged in a grid pattern of about 30 by 30 cm through which the fish fall. Most stingrays and sharks cannot pass through the bars and so remain on top of the hopper. A crew member then releases them as quickly as possible back to the ocean, generally within two minutes. This is easy to achieve as the hopper is at the extreme stern of the vessel and has a gate that when placed in position, slopes from the hopper towards the ocean. No sharks or rays are retained by the operator.

The hopper is then filled with sea water from a deck hose before the conveyor belt passes the catch to a sorting area. The retained catch is sorted by species into several brine tanks, which are placed on either side of the conveyor belt. The discarded fish, the majority of which are still alive, and the benthic biota, are sorted from the commercial catch and placed down a chute with running water. The discarded catch travel along the 5 m chute under the hopper to the stern of the vessel and are returned to the ocean. This chute was specifically disconnected during our trip on the vessel so that all discarded fish could be collected in bins and later counted and recorded for each shot.



A good catch of red snappers are released onto the hopper

6. PROCESSING THE CATCH

The *Ocean Harvest* targets saddletail snapper (*Lutjanus malabaricus*) and red snapper (*Lutjanus erythropterus*). All red snapper are bled before being placed in the brine tanks. These fish are kept whole and are placed in the brine for at least four hours before being packed. Other species that are kept whole are:

Red spot emperor (*Lethrinus lentjan*)
Frypan snapper (*Argyrops spinifer*)
Black pomfret (*Parastromateus niger*)
Moses snapper (*Lutjanus russelli*)
Maroon Perch (*Lutjanus lemniscatus*)
Gold spot cod (*Epinephelus areolatus*)
Grass emperor (*Lethrinus laticaudis*)
Spangled emperor (*Lethrinus nebulosus*)
Malabar cod (*Epinephelus malabaricus*)
Three lined cod (*Epinephelus heniochus*)

The following species are filleted:

Painted sweetlip (*Diagramma labiosum*)
Goldband snapper (*Pristipomoides multidens*)
Mangrove jack (*Lutjanus argentimaculatus*)
Red emperor (*Lutjanus sebae*)
Golden snapper (*Lutjanus johnii*)
Coral trout (*Plectropomus leopardus*)
Spanish mackerel (*Scomberomorus commerson*)
Spotted mackerel (*Scomberomorus munroi*)
Cobia (*Rachycentron canadus*)
Black jewfish (*Protonibea diacanthus*)
Large cod (Family Serranidae)

The fish that are filleted are held in the brine tanks before being processed at night, whereas whole fish are packed once the brine tanks become full. Whole fish are wrapped in plastic and packed into boxes. The boxes are weighed on a set of electronic scales. The red snappers and saddletail snappers have a size grading system, whereas the other whole fish packed are ungraded. The red snapper are graded into large (> 1 kg) and small fish (< 1 kg) and the saddletail snapper are graded into extra large (> 2 kg), large (1-2 kg) and small (< 1 kg) sizes. The fish species and size are clearly marked on the boxes for marketing purposes and to

determine the total weights of each species caught for the trip. Whole fish are weighed to 15 kg per box and filleted fish are weighed to 10 kg per box.

Once the fish are packed into boxes, they are placed in the snap freezers, where they are left for around 16 hours before being transferred into the main freezer in the hold. The boxes are transferred to the main freezer via a conveyor belt and are carefully packed according to the species and size of the fish.

7. MARKETING

Great care is taken when packing the fish as around 90% of the catch is exported to Asia. The fish are unloaded into refrigerated shipping containers on the Gove wharf around high tide via a conveyor belt. The skipper has a tally sheet and he records every box of fish that is unloaded from the main freezer to the shipping containers. These containers are then shipped to Darwin by barge where they are transferred to road trains, which travel to Perth. In Perth a small amount of the product is retained for the local market and the rest is exported to Asia.



Red snapper packed in a box prior to freezing

8. BIOLOGICAL MONITORING

A total of 3,991 fish were measured on this trip for the purpose of obtaining length-frequency distributions for both target and by-product species. The by-product species were especially noted, as very little length-frequency data is available for these species. The following tables show the common names and species of fish, the number measured and the percentage of the whole catch measured:

Fish name Target species	Number measured	% of catch measured
Red snapper (<i>L. erythropterus</i>)	692	20
Saddletail snapper (<i>L. malabaricus</i>)	681	20



The trawl net is hauled up on the winch

Fish name By-product species	Number measured	% of catch measured
Red spot emperor (<i>L. lentjan</i>)	683	100
Frying pan snapper (<i>A. spinifer</i>)	396	100
Painted sweetlip (<i>D. labiosum</i>)	389	100
Goldband snapper (<i>P. multidentis</i>)	367	100
Mangrove jack (<i>L. argentimaculatus</i>)	191	100
Moses snapper (<i>L. russelli</i>)	184	100
Gold spot cod (<i>E. areolatus</i>)	96	100
Red emperor (<i>L. sebae</i>)	77	100
Maroon snapper (<i>L. lemniscatus</i>)	69	100
Spanish mackerel (<i>S. commerson</i>)	63	90
Spotted mackerel (<i>S. munroi</i>)	40	90
Black jewfish (<i>P. diacanthus</i>)	13	100
Grass emperor (<i>L. laticaudis</i>)	13	100
Golden snapper (<i>L. johnii</i>)	11	100
Cobia (<i>R. canadus</i>)	9	100
Malabar cod (<i>E. malabaricus</i>)	6	100
Coral trout (<i>P. leopardus</i>)	4	100
Spangled emperor (<i>L. nebulosus</i>)	4	100
Three lined cod (<i>E. heniochus</i>)	3	100

The discarded catch was also observed and identified from every shot to at least family level in most cases and the numbers were recorded. In general, the discarded catch was significantly low (about 17% of the total catch) for a trawl operation with the majority of discarded catch consisting of sharks and rays (by weight), which were released alive almost immediately. See Appendix 1.

9. DISCUSSION

The *Ocean Harvest* is a well-organised and efficiently run fishing trawler. The nets are designed in such a way as to reduce the number of discarded species caught, minimise impact on the seafloor and to target the red snapper species. From our observations, the trawl nets achieve these goals. The system installed for returning discarded species to the ocean as quickly as possible works extremely well. Large rays, sharks and turtles are returned to the ocean alive almost immediately after being released from the cod end in the trawl net.

It was also observed that very few coral and sponges were collected in the trawl net. The net is designed to sit well off the bottom, which in turn greatly reduces the amounts of coral and sponge disturbed on the bottom. The only areas of the net that have regular contact with the bottom are the two trawl boards. These trawl boards kick up a few whip corals and small sponges into the wings of the net.

Only 17% (3 tonnes) of the total catch (18 tonnes) landed during this trip were discarded species. A high proportion of discarded species (by weight) were sharks and rays, which were returned to the water alive. The trawl operators as part of an agreement with NT Fisheries undertook the initiative to release all sharks and rays even though they can legally take these species under their licence.

We also discussed some of the discarded species with the skipper and the possibility of selling them as whole mixed reef fish to reduce the discarded catch. As a consequence of this discussion, the following discarded species were kept to gauge their marketability:

Striped sea perch	<i>Lutjanus vitta</i>
Monocle bream	<i>Scolopsis monogramma</i>
Black-banded kingfish	<i>Seriolina nigrofasciata</i>
Threadfin bream	Family Nemipteridae
Goat fish	Family Mullidae

Other species that are also marketable when caught in large numbers include golden trevally (*Gnathanodon speciosus*), silver trevally (*Pseudocaranx dentex*), scads (Family Carangidae), spotted javelinfinch (*Pomadasys kaakan*) and seapike (Family Sphyrnaeidae).

It was also noted that a very small percentage of commercial species were discarded because they were either damaged or too small to be marketable.

Only one threatened species was observed during this trip. A flatback turtle (*Natator depressus*) observed during one of the shots was returned to the water alive. The skipper commented that turtles were an extremely rare catch in this trawl operation and that when they were caught they were released alive almost immediately.



An albino leopard shark on the hopper just before release

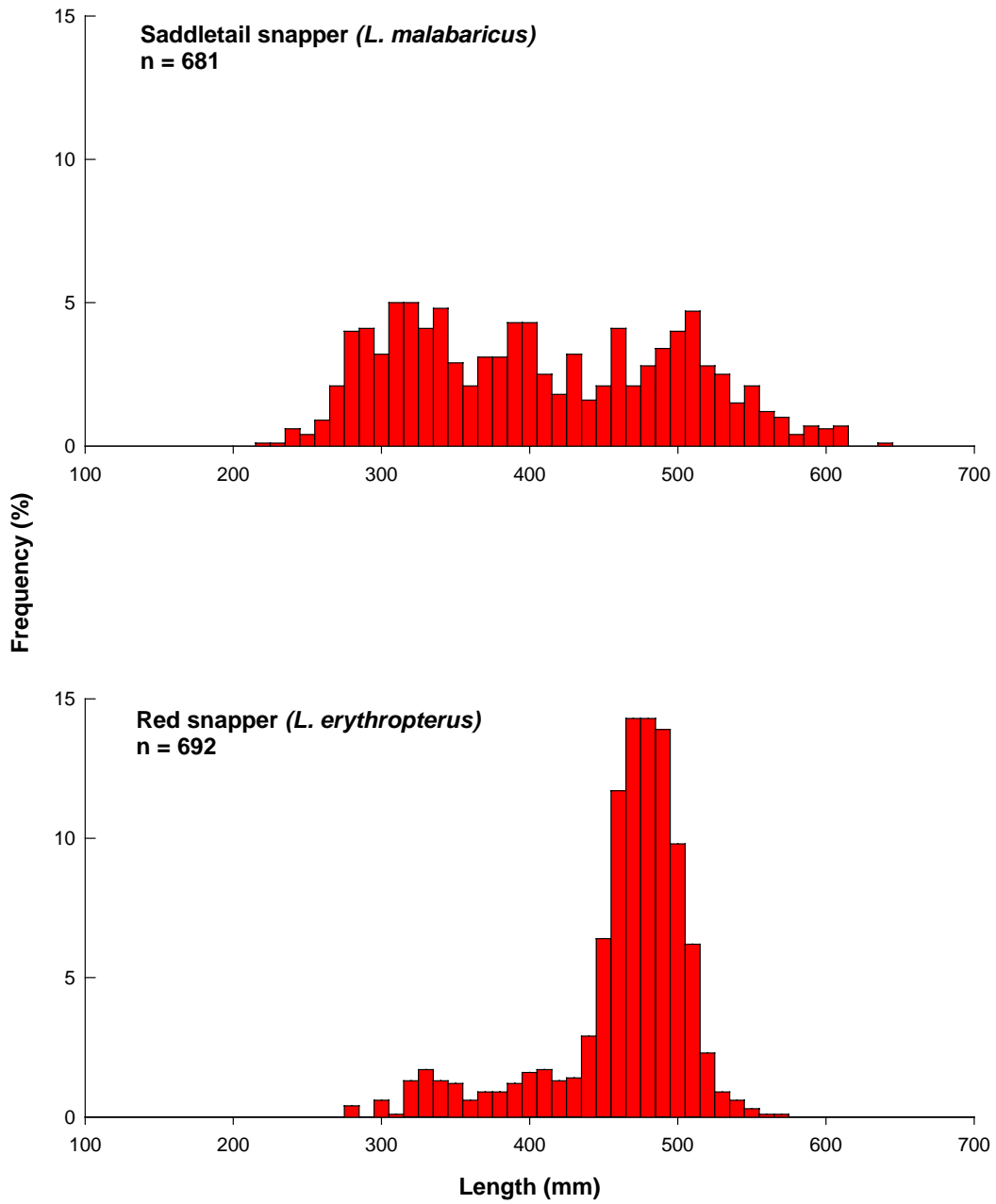


Figure 2. Length-frequency distributions of the two target species (*L. erythropterus*, *L. malabaricus*). Total length was recorded for these species.

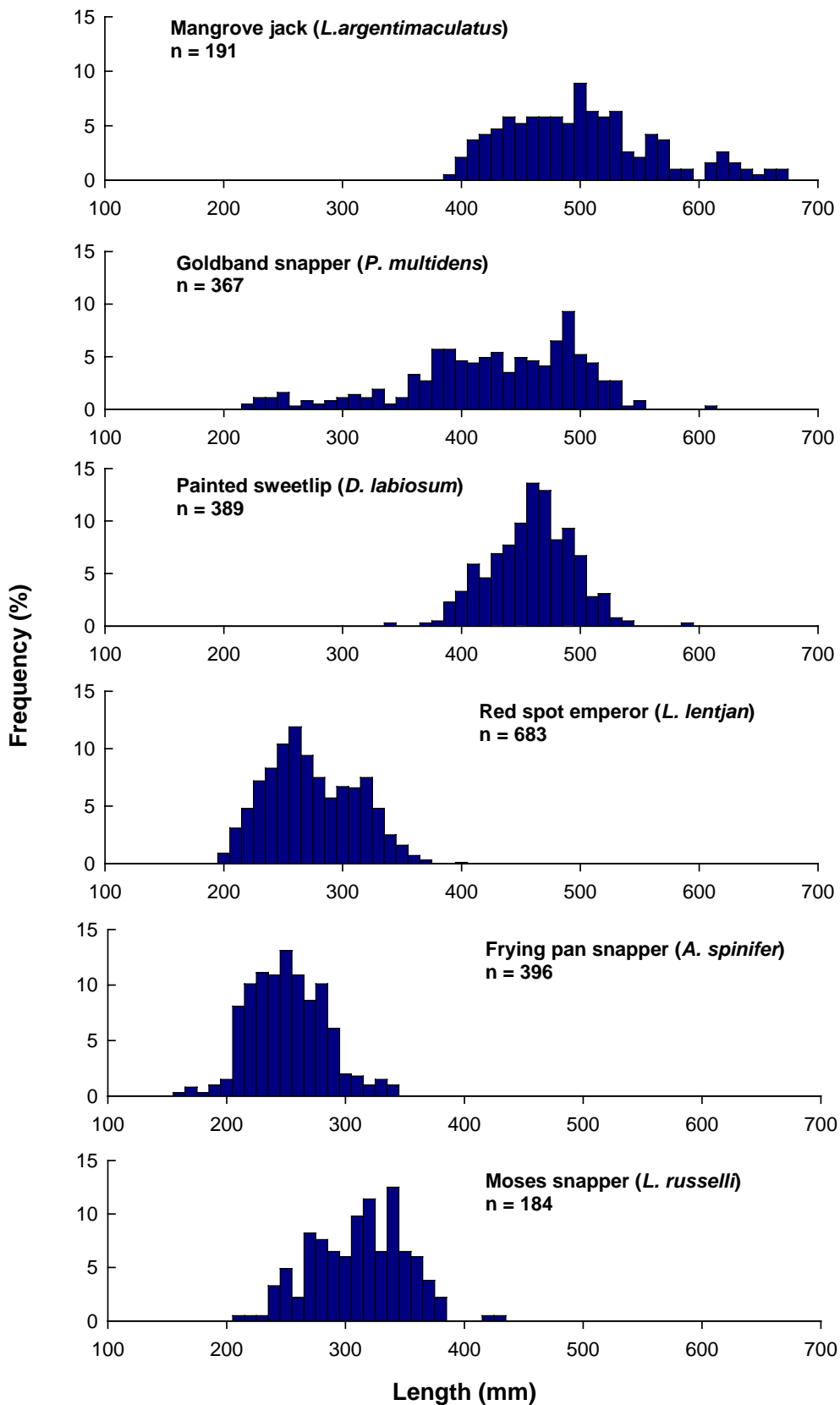


Figure 3. Length-frequency distributions of six common by-product species. (*L. argentimaculatus*, *P. multidentis*, *D. labiosum*, *L. lentjan*, *A. spinifer* and *L. russelli*). Fork length was recorded for *P. multidentis* and total length was recorded for the other species.

10. APPENDIX 1

The following tables show the individual number of discarded species recorded on this trip for each day per shot (Allen 1997):

Discarded Catch	27/02/02					
Name:	Shot 1	Shot 2	Shot 3	Shot 4	Shot 5	Shot 6
Barracuda Family Sphyraenidae	8		4	4	12	1
Batfish <i>Platax batavianus</i>	1	9	3	1	1	
Big eye <i>Priacanthus tayenus</i>	43	18	53	8	19	32
Black Banded King <i>Seriolina nigrofasciata</i>		10	10	2	2	
Blue striped seaperch <i>Lutjanus kasmira</i>					2	1
Boxfish Family Ostraciidae			1	1	3	1
Bugs <i>Thenus</i> sp.	1	1				
Butterfly fish Family Chaetodontidae			2	1		1
Cardinal fish Family Apogonidae						1
Catfish <i>Arius thalassinus</i>			4		1	5
Crab <i>Charybdis cruciata</i>			1	1	1	2
Cuttle fish <i>Sepia</i> sp.			1	1	2	3
Ditchelee <i>Pellona ditchela</i>	1				2	8
Flathead <i>Elates ransonnetti</i>		1			1	
Flounder <i>Pseudorhombus diplospilus</i>						1
Flutemouth <i>Fistularia petimba</i>		1	6	3	1	3
Fusilier Family Caesionidae			11			
Goatfish Family Mullidae	3		4		6	3
Gold spot Cod <i>Epinephelus areolatus</i>	1		1			
Hairtail Family Trichiuridae	8	1	2	3	7	4
Halibut <i>Psettodes erumei</i>		2	1	1	1	4
Leatherjacket Family Monacanthidae		2	5	2	7	5
Lizard fish Family Synodontidae	10	4	29	11	29	31
Monocle bream Family Nemipteridae			2		1	

Name	Shot 1	Shot 2	Shot 3	Shot 4	Shot 5	Shot 6
North-west ruffe <i>Psenopsis humerosa</i>		3	1	2		
Painted Sweetlip <i>Diagramma labiosum</i>	4		12		1	4
Pony fish Family Leiognathidae	32	6	41	8	54	14
Pufferfish Family Tetraodontidae	1		2	1		3
Rays	1	3	4	1	5	13
Red spot emperor <i>Lethrinus lentjan</i>					3	6
Scad Family Carangidae	13	7	22	21	24	5
Sharks	2		1		1	1
Silver Biddy Family Gerreidae	1	2	1	3	2	1
Spanish Mackerel <i>Scomberomorus commerson</i>	2		13	3	3	1
Spinefoot <i>Siganus fuscescens</i>			1			
Spotted Mackerel <i>Scomberomorus munroi</i>		3	13	14	5	1
Squid <i>Loligo</i> sp.	2	2	6	1	7	5
Squirrel fish <i>Sargocentron rubrum</i>	4	1	27		19	41
Suckerfish <i>Echeneis naucrates</i>						1
Striped seaperch <i>Lutjanus vitta</i>	5	3	18	3	23	13
Surgeon fish Family Acanthuridae	1					
Threadfin Bream Family Nemipteridae	12	3	23	4	17	55
Trevally Family Carangidae	37	16	85	13	90	26
Trigger fish <i>Abalistes stellatus</i>	4		7		1	1
Wolf Herring <i>Chirocentrus dorab</i>	2		2	2		

Discarded Catch	28/02/02					
Name:	Shot 1	Shot 2	Shot 3	Shot 4	Shot 5	Shot 6
Angler fish <i>Antennarius striatus</i>		1				
Barracuda Family Sphyraenidae	12	14	13	2	6	3
Batfish <i>Platax batavianus</i>	7		1		4	
Big eye <i>Priacanthus tayenus</i>	48	82	121	46	37	11
Big Eye perch <i>Lutjanus lutjanus</i>	16		1			
Black Banded King <i>Seriolina nigrofasciata</i>	5	4	3	2	2	1
Blue striped seaperch <i>Lutjanus kasmira</i>	26					1
Boxfish Family Ostraciidae	1	2		1	3	1
Bugs <i>Thenus sp.</i>	2					
Butterfly fish Family Chaetodontidae		2				
Cardinal fish Family Apogonidae					1	
Catfish <i>Arius thalassinus</i>	9	8			2	8
Crab <i>Charybdis cruciata</i>	2	1				2
Cuttle fish <i>Sepia sp.</i>	1					1
Ditchelee <i>Pellona ditchela</i>	4	1			2	
Flounder <i>Pseudorhombus diplospilus</i>	4	1			3	1
Flutemouth <i>Fistularia petimba</i>	3	5	11	9	6	2
Fusilier Family Caesionidae	13	4			2	
Goatfish Family Mullidae	13	10	4	2	3	
Grunter Family Terapontidae		1				
Hairtail Family Trichiuridae	11	1	2	1	2	5
Halibut <i>Psettodes erumei</i>		1	1		2	4
Leatherjacket Family Monacanthidae	3	5	2	2	3	1
Lizard fish Family Synodontidae	61	72	55	17	36	61
Mantis Shrimp Order Stomatopoda					1	1
Monocle bream Family Nemipteridae	7	1	2	3		4
North-west ruffe <i>Psenopsis humerosa</i>	5		2	2	1	
Painted Sweetlip <i>Diagramma labiosum</i>	24	1		4		5

Name	Shot 1	Shot 2	Shot 3	Shot 4	Shot 5	Shot 6
Parrot fish Family Scaridae	3			1		
Pony fish Family Leiognathidae	36	44	12	18	21	17
Puffer fish Family Tetraodontidae	2	5	2	1		3
Rays	6	1	1	3	3	18
Red spot emperor <i>Lethrinus lentjan</i>	6	5		3	1	
Red Emperor <i>Lutjanus sebae</i>	5	1		2		1
Saddletail snapper <i>Lutjanus malabaricus</i>	2	1		8	1	
Scad Family Carangidae	55	37	9	26	27	
Scallop <i>Mirapecten</i> sp.	1					
Scarlet snapper <i>Lutjanus erythropterus</i>	1					
Sharks	2		1	2		
Silver Bidy Family Gerreidae	24	12	10	2	5	1
Spanish Mackerel <i>Scomberomorus commerson</i>					1	
Spinefoot <i>Siganus fuscescens</i>	2	1	3			
Spotted Mackerel <i>Scomberomorus munroi</i>	5	3		8	1	
Squid <i>Loligo</i> sp.	10	3		3	2	3
Squirrel fish <i>Sargocentron rubrum</i>	64	10	5	4	14	29
Stargazer Family Uranoscopidae		1		2	2	
Striped seaperch <i>Lutjanus vitta</i>	46	4	10	13	14	13
Suckerfish <i>Echeneis naucrates</i>			1	1		
Surgeon fish Family Acanthuridae	1					
Threadfin Bream Family Nemipteridae	55	43	19	18	35	22
Trevally Family Carangidae	68	56	24	24	31	7
Trigger fish <i>Abalistes stellatus</i>	16	6	5	4	9	4
Wolf Herring <i>Chirocentrus dorab</i>	1	1				

Discarded Catch	1/03/02					
Name:	Shot 1	Shot 2	Shot 3	Shot 4	Shot 5	Shot 6
Angler fish <i>Antennarius striatus</i>					1	
Barracuda Family Sphyraenidae	8	8	22	8	13	3
Batfish <i>Platax batavianus</i>	1	1	1		2	
Big eye <i>Priacanthus tayenus</i>	207	109	133	44	48	5
Black Banded King <i>Seriolina nigrofasciata</i>	7	6			2	
Blenny <i>Congrogadus spinifer</i>		1				
Boxfish Family Ostraciidae			1			
Butterfly fish Family Chaetodontidae		2				
Catfish <i>Arius thalassinus</i>	26	5	3		1	
Crab <i>Charybdis cruciata</i>	4	4	1		2	
Cuttlefish <i>Sepia sp.</i>	5		1	1		1
Ditchelee <i>Pellona ditchela</i>	3					
Flounder <i>Pseudorhombus diplospilus</i>			1			
Flutemouth <i>Fistularia petimba</i>	9	14	13	8	3	2
Frypan Snapper <i>Argyrops spinifer</i>	2		1			
Fusilier Family Caesionidae					1	2
Goatfish Family Mullidae	23	15	14	5	1	
Gold spot Cod <i>Epinephelus areolatus</i>			1			
Grunter Family Terapontidae		1				
Hairtail Family Trichiuridae	6	13	4		2	5
Halibut <i>Psettodes erumei</i>	2	1		1	1	
Javelin fish <i>Pomadasys kaakan</i>						1
Leatherjacket Family Monacanthidae	57	64	57	3	8	4
Lizard fish Family Synodontidae	24	56	22	14	29	13
Mantis Shrimp Order Stomatopoda	1					
Maroon perch <i>Lutjanus lemniscatus</i>					1	
Monocle bream Family Nemipteridae	2	3	1	1		
North-west ruffe <i>Psenopsis humerosa</i>	10	15	3			

Name	Shot 1	Shot 2	Shot 3	Shot 4	Shot 5	Shot 6
Painted Sweetlip <i>Diagramma labiosum</i>	3	2				
Pony fish Family Leiognathidae	83	21	44	50	12	4
Puffer fish Family Tetraodontidae	6	3	5	2		
Queenfish <i>Scomberoides tol</i>			1			
Rays	5	2			2	4
Red spot emperor <i>Lethrinus lentjan</i>	1	2				
Scad Family Carangidae	33	24		5	16	1
Scallop <i>Mirapecten sp.</i>		1				
Sharks	8	7		3	2	
Silver Bidy Family Gerreidae	19	7	23	6	2	
Spanish Mackerel <i>Scomberomorus commerson</i>					1	2
Spinefoot <i>Siganus fuscescens</i>	1	1				
Spotted Mackerel <i>Scomberomorus munroi</i>	3	4	11	3	9	
Squid <i>Loligo sp.</i>	3		2	1		
Squirrel fish <i>Sargocentron rubrum</i>	6	14	14	1	2	6
Stargazer Family Uranoscopidae		1	1		1	1
Striped seaperch <i>Lutjanus vitta</i>	10	10	9	1	6	
Threadfin Bream Family Nemipteridae	34	22	28	41	14	5
Trevally Family Carangidae	127	78	136	28	53	5
Trigger fish <i>Abalistes stellatus</i>	3	2	3		5	
Tripod fish <i>Pseudotriacanthus strigilifer</i>	1					
Wolf Herring <i>Chirocentrus dorab</i>	2	2	1	1		

Discarded Catch	2/03/02							
Name:	Shot 1	Shot 2	Shot 3	Shot 4	Shot 5	Shot 6	Shot 7	Shot 8
Angler fish <i>Antennarius striatus</i>								1
Barracuda Family Sphyraenidae		2	2	3	8	5	4	1
Batfish <i>Platax batavianus</i>	1	2			3	4	1	1
Big eye <i>Priacanthus tayenus</i>	37	66	4	10	1	1	1	12
Black Banded King <i>Seriolina nigrofasciata</i>	2	5		2	3	2	1	
Blue striped seaperch <i>Lutjanus kasmira</i>		6					1	
Butterfly fish Family Chaetodontidae			1	1	1	1		
Catfish <i>Arius thalassinus</i>				2	1			3
Cobia <i>Rachycentron canadus</i>	1							
Crab <i>Charybdis cruciata</i>	2	1		1				
Cuttle fish <i>Sepia sp.</i>	7							1
Ditchelee <i>Pellona ditchela</i>	1							
Flathead <i>Elates ransonnetti</i>	1							
Flounder <i>Pseudorhombus diplospilus</i>		1	1				1	
Flutemouth <i>Fistularia petimba</i>	8	1	1		6	1		
Frypan Snapper <i>Argyrops spinifer</i>		2						2
Fusilier Family Caesionidae			1	4				
Goatfish Family Mullidae	5	6		7	3	2	1	1
Gold spot Cod <i>Epinephelus areolatus</i>		1						
Hairtail Family Trichiuridae	1	5		5	6	2	2	1
Halibut <i>Psettodes erumei</i>	1						1	4
Javelin fish <i>Pomadasys kaakan</i>						1		
Leatherjacket Family Monacanthidae	12							
Lizard fish Family Synodontidae	68	22	11	8	12		4	16
Monocle bream Family Nemipteridae	3	1			2		1	1
North-west ruffe <i>Psenopsis humerosa</i>	1	3			7	1		
Painted Sweetlip <i>Diagramma labiosum</i>			2	2	8	6	2	7
Parrot fish Family Scaridae					1			

Name	Shot 1	Shot 2	Shot 3	Shot 4	Shot 5	Shot 6	Shot 7	Shot 8
Pony fish Family Leiognathidae	12	3	2	11	4	3		1
Puffer fish Family Tetraodontidae	2	1		1			1	
Rays	11	3	2	4	2	1	7	28
Red spot emperor <i>Lethrinus lentjan</i>	1				1		1	3
Scad Family Carangidae	7	28	1	28	8	2	22	9
Seabream <i>Gymnocranius elongatus</i>				1				
Sharks		1	1	1				
Silver Bidy Family Gerreidae	7	14	2	7	3			
Spotted Mackerel <i>Scomberomorus munroi</i>		3	2	2	6		4	
Squid <i>Loligo sp.</i>	5	4	4	2	3	5		3
Squirrel fish <i>Sargocentron rubrum</i>	39	5	2	18		5	25	46
Striped seaperch <i>Lutjanus vitta</i>	6	25	4	10	37	3	10	11
Surgeon fish Family Acanthuridae				1				
Threadfin Bream Family Nemipteridae	43	32		13	6	4	9	19
Trevally Family Carangidae	29	31	13	33	63	31	12	
Trigger fish <i>Abalistes stellatus</i>	1	8	1	2	1	1	3	1
Wolf Herring <i>Chirocentrus dorab</i>		1					1	

Discarded Catch	3/03/02					
Name:	Shot 1	Shot 2	Shot 3	Shot 4	Shot 5	Shot 6
Barracuda Family Sphyraenidae	16	97	46	7	7	37
Batfish <i>Platax batavianus</i>	2	5	3	1	4	
Big eye <i>Priacanthus tayenus</i>	91	2	9	3	1	54
Black Banded King <i>Seriolina nigrofasciata</i>	3	2	14	4	1	2
Blue striped seaperch <i>Lutjanus kasmira</i>	6				1	4
Boxfish Family Ostraciidae	10	2			1	5
Bugs <i>Thenus sp.</i>	1	1	1	3		
Butterfly fish Family Chaetodontidae		1	5	2	5	1
Cardinal fish Family Apogonidae	1					
Catfish <i>Arius thalassinus</i>	16	1	1		2	1
Crab <i>Charybdis cruciata</i>	1	1		1	1	1
Cuttle fish <i>Sepia sp.</i>	2					1
Ditchelee <i>Pellona ditchela</i>	3	9	4	1		1
Flatback turtle <i>Natator depressus</i>				1		
Flounder <i>Pseudorhombus diplospilus</i>	1	4				2
Flutemouth <i>Fistularia petimba</i>		1	5	1		3
Frypan Snapper <i>Argyrops spinifer</i>	1				1	
Fusilier Family Caesionidae		3	2		3	
Goatfish Family Mullidae	8	7	13			2
Gold spot Cod <i>Epinephelus areolatus</i>	1					
Hairtail Family Trichiuridae	1	1	1			1
Halibut <i>Psettodes erumei</i>	1	1	1		2	
Leatherjacket Family Monacanthidae	1	2	19	6		2
Lizard fish Family Synodontidae	25	13	15	3	2	14
Mantis Shrimp Order Stomatopoda		1				
Monocle bream Family Nemipteridae	7	2	1			
North-west ruffe <i>Psenopsis humerosa</i>		2	4			
Painted Sweetlip <i>Diagramma labiosum</i>	5	5	3		1	6

Name	Shot 1	Shot 2	Shot 3	Shot 4	Shot 5	Shot 6
Pony fish Family Leiognathidae	66	15	4	6		4
Puffer fish Family Tetraodontidae		1	1	1	2	3
Queenfish <i>Scomberoides tol</i>		1	1			
Rays	12	4	4	2	1	18
Red Emperor <i>Lutjanus sebae</i>			1			
Red spot emperor <i>Lethrinus lentjan</i>	3	4	15		1	
Scad Family Carangidae	45	181	329	26	18	54
Sharks	5	58	13	5		3
Silver Bidy Family Gerreidae	11	3	7	5	4	8
Spanish Mackerel <i>Scomberomorus commerson</i>		1				
Spinefoot <i>Siganus fuscescens</i>	6	1	9	3	4	
Spotted Mackerel <i>Scomberomorus munroi</i>	2	27	12		4	
Squirrel fish <i>Sargocentron rubrum</i>	129	30		17	4	124
Stargazer Family Uranoscopidae	1		1			1
Striped seaperch <i>Lutjanus vitta</i>	17	69	29	7	5	2
Surgeon fish Family Acanthuridae		1	1			
Threadfin Bream Family Nemipteridae	15	9	3	1	2	8
Trevally Family Carangidae	143	81	79	34	39	16
Trigger fish <i>Abalistes stellatus</i>	2	12	10	4	9	5
Tripod fish <i>Pseudotriacanthus strigilifer</i>		1				
Wolf Herring <i>Chirocentrus dorab</i>	1	2	18	2		

Discarded Catch	4/03/02							
Name:	Shot 1	Shot 2	Shot 3	Shot 4	Shot 5	Shot 6	Shot 7	Shot 8
Barracuda Family Sphyraenidae		1	12	4	2		1	2
Batfish <i>Platax batavianus</i>	67		1	2	2			
Big eye <i>Priacanthus tayenus</i>	47	28	22	8	18	1	11	10
Big Eye perch <i>Lutjanus lutjanus</i>								
Black Banded King <i>Seriolina nigrofasciata</i>			3		2	1	1	1
Blue striped seaperch <i>Lutjanus kasmira</i>								2
Boxfish Family Ostraciidae	2	1			1			
Bugs <i>Thenus sp.</i>	1							
Butterfly fish Family Chaetodontidae			1					2
Catfish <i>Arius thalassinus</i>	5		1					3
Cobia <i>Rachycentron canadus</i>								1
Crab <i>Charybdis cruciata</i>					1		1	1
Cuttle fish <i>Sepia sp.</i>	2						1	
Ditchelee <i>Pellona ditchela</i>	1	3						1
Flathead <i>Elates ransonnetti</i>	1							
Flounder <i>Pseudorhombus diplospilus</i>			1				1	1
Flutemouth <i>Fistularia petimba</i>	1	2	2					1
Frypan Snapper <i>Argyrops spinifer</i>			2					
Goatfish Family Mullidae	1	1	1				3	5
Grunter Family Terapontidae							2	
Hairtail Family Trichiuridae	1	3	2	2	2	3	1	1
Halibut <i>Psettodes erumei</i>	3		2	1		1		1
Leatherjacket Family Monacanthidae	5						2	
Lizard fish Family Synodontidae	29	8	11	7	3	1	3	7
North-west ruffe <i>Psenopsis humerosa</i>		1	3	2	4	2	6	
Painted Sweetlip <i>Diagramma labiosum</i>	12	1	3	1	1			4
Parrot fish Family Scaridae					2			

Name	Shot 1	Shot 2	Shot 3	Shot 4	Shot 5	Shot 6	Shot 7	Shot 8
Pony fish Family Leiognathidae	2	8	20	4	5	8	2	18
Prawn <i>Penaeus semisulcatus</i>							1	
Puffer fish Family Tetraodontidae	2		1					
Rays	16	4	2	2	4		4	6
Red Emperor <i>Lutjanus sebae</i>			1			1		
Red spot emperor <i>Lethrinus lentjan</i>	5	2	1	1				5
Scad Family Carangidae	4	44	53	4	8	9	9	3
Sharks	2	2		2	3	3	1	
Silver Bidy Family Gerreidae	1	1	5		1	1	1	7
Spinefoot <i>Siganus fuscescens</i>		1						
Spotted Mackerel <i>Scomberomorus munroi</i>		4	16	6	2	4		
Squid <i>Loligo sp.</i>		1	6		2	4	3	
Squirrel fish <i>Sargocentron rubrum</i>	29	12	9	1		1	37	20
Striped seaperch <i>Lutjanus vitta</i>				1	1			
Suckerfish <i>Echeneis naucrates</i>					1			
Surgeon fish Family Acanthuridae				1				
Tarpon <i>Megalops cyprinoides</i>			1					
Threadfin Bream Family Nemipteridae	12	20	3	6	3	3	12	4
Trevally Family Carangidae	276	52	81	32	32	8	13	95
Trigger fish <i>Abalistes stellatus</i>	5	3	5	3				
Tripod fish <i>Pseudotriacanthus strigilifer</i>	1							
Wolf Herring <i>Chirocentrus dorab</i>		3			1			1

11. APPENDIX 2

The following list identifies in greater detail the discarded catch recorded on this trip:

Species list of discarded catch

Sharks

Leopard shark	<i>Stegostoma fasciatum</i>
Shovelnose rays	Family Rhinobatidae
Whaler sharks	Family Carcharhinidae
Hammerhead sharks	Family Sphyrnidae
Wobbegong sharks	Family Orectolobidae

Rays

Blue-spotted ray	<i>Dasyatis kuhlii</i>
Spotted eagle ray	<i>Aetobatus narinari</i>
Rat-tailed ray	<i>Gymnura australis</i>

Fish

Wolf herring	<i>Chirocentrus dorab</i>
Oxeye herring (tarpon)	<i>Megalops cyprinoides</i>
Ditchelee	<i>Pellona ditchela</i>
Giant salmon catfish	<i>Arius thalassinus</i>
Lizardfish	Family Synodontidae
Grinner	Family Harpodontidae
Striped anglerfish	<i>Antennarius striatus</i>
Golden cuskeel	<i>Sirembo imberis</i>
Red squirrelfish	<i>Sargocentron rubrum</i>
Crimson soldierfish	<i>Myripristis murdjan</i>
High-finned veifin	<i>Velifer hypselopterus</i>
Rough flutemouth	<i>Fistularia petimba</i>
Spotless firefish	<i>Pterois russelli</i>
Dwarf flathead	<i>Elates ransonnetti</i>
Grunters	Family Terapontidae
Threadfin bigeye	<i>Priacanthus tayenus</i>
Cardinal fishes	Family Apogonidae
Diamond trevally	<i>Alectis indicus</i>
Small mouth scad	<i>Alepes</i> sp.
Purse-eyed scad	<i>Selar crumentalmops</i>
Mackerel scad	<i>Decapterus russelli</i>
Slender scad	<i>Decapterus macrosoma</i>
Onion trevally	<i>Carangoides caeruleopinnatus</i>
Epaulet trevally	<i>Carangoides humerosus</i>
Malabar trevally	<i>Carangoides malabaricus</i>
Japanese trevally	<i>Carangoides uii</i>
Bigeye trevally	<i>Caranx sexfasciatus</i>
Silver trevally	<i>Pseudocaranx dentex</i>
Fringe-finned trevally	<i>Pantolobus radiatus</i>
Gold-spotted trevally	<i>Carangoides fulvoguttatus</i>
Hairtails	Family Trichiuridae
Needleskin queenfish	<i>Scomberoides tol</i>
Smooth-tailed trevally	<i>Selaroides leptolepis</i>
Black-banded kingfish	<i>Seriolina nigrofasciata</i>
Indian mackerel	<i>Rastrelliger kanagurta</i>
Slender suckerfish	<i>Echeneis naucrates</i>
Pony fishes	Family Leiognathidae
Blue-striped seaperch	<i>Lutjanus kasmira</i>
Striped seaperch	<i>Lutjanus vitta</i>
Bigeye seaperch	<i>Lutjanus lutjanus</i>
Many-lined sweetlip	<i>Plectorhinchus multivittatum</i>

Spotted javelinfinh	<i>Pomadasys kaakan</i>
Red-bellied fusilier	<i>Caesio lunaris</i>
Twin yellow-striped fusilier	<i>Pterocaesio digramma</i>
Swallowtail seabream	<i>Gymnocranius elongatus</i>
Rosy threadfin-bream	<i>Nemipterus furcosus</i>
Threadfin breams	Family Nemipteridae
Monocle bream	<i>Scolopsis monogramma</i>
Redspot monocle bream	<i>Scolopsis taeniopterus</i>
Silver biddys	Family Gerreidae
Spotted golden goatfish	<i>Parupeneus heptacanthus</i>
Goatfishes	Family Mullidae
Hump-headed batfish	<i>Platax batavianus</i>
Short-finned batfish	<i>Zabidius novemaculeatus</i>
Butterflyfishes	Family Chaetodontidae
Bannerfishes	Family Chaetodontidae
Spiny eel-blenny	<i>Congrogadus spinifer</i>
Seapikes (barracudas)	Family Sphyraenidae
Parrotfishes	Family Scaridae
Stargazers	Family Uranoscopidae
Blennies	Family Blenniidae
Black spinefoot	<i>Siganus fuscescens</i>
Surgeonfishes	Family Acanthuridae
Twinspot flounder	<i>Pseudorhombus diplospilus</i>
Queensland halibut	<i>Psettodes erumei</i>
Blotched tripodfish	<i>Pseudotriacanthus strigilifer</i>
Indian drifffish	<i>Ariomma indica</i>
North-west ruffe	<i>Psenopsis humerosa</i>
Starry triggerfish	<i>Abalistes stellatus</i>
Threadfin leatherjacket	<i>Paramonacanthus filicauda</i>
Leatherjackets	Family Monacanthidae
Boxfishes	Family Ostraciidae
Black-blotched turretfish	<i>Tetrasomus gibbosus</i>
Pufferfishes	Family Tetraodontidae
Porcupinefishes	Family Diodontidae

Molluscs

Squid	<i>Loligo sp.</i>
Cuttlefish	<i>Sepia sp.</i>
Scallop	<i>Mirapecten sp.</i>

Invertebrates

Bugs	<i>Thenus sp.</i>
Mantis shrimps	Order Stomatopoda
Grooved tiger prawn	<i>Penaeus semisulcatus</i>
Crucifix crab	<i>Charybdis cruciata</i>

Sponges

Order Poecilosclerida

Corals

Order Scleractinia

Jellyfish

Class Scyphozoa

Reptiles

Flatback turtle	<i>Natator depressus</i>
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