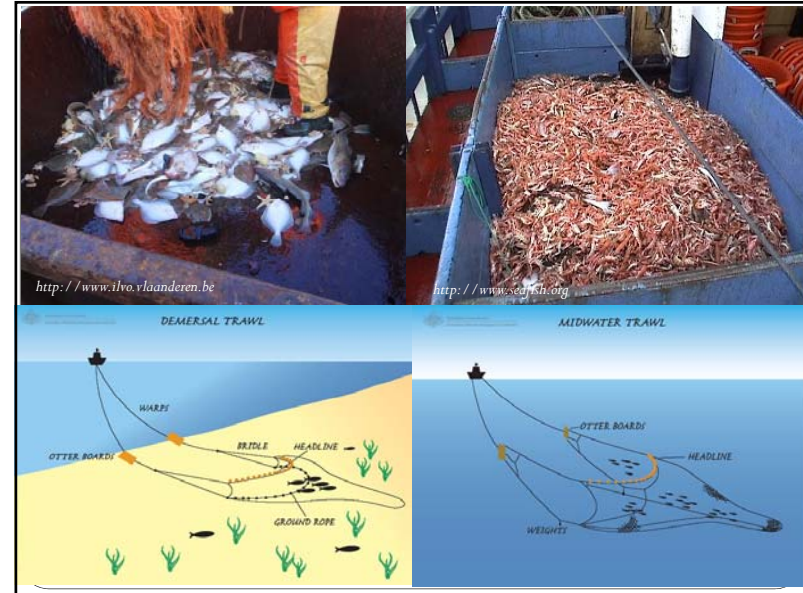


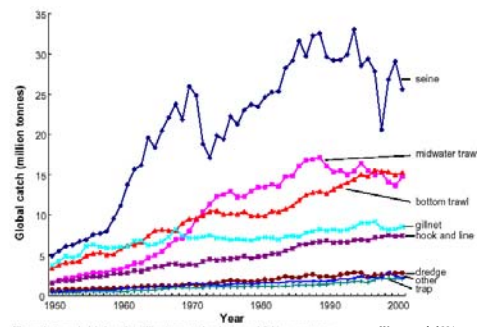
## Trawl – Gear description (fish & shrimp)

INSERT INSTRUCTOR Name



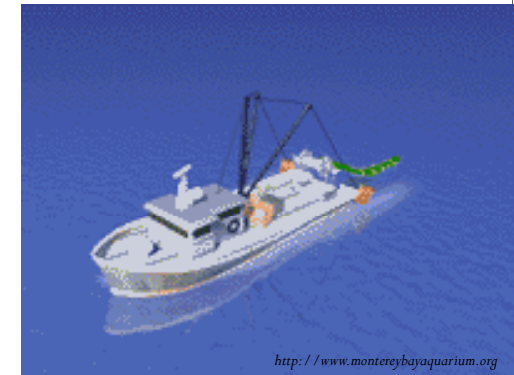
## Introduction

- Fish & invertebrates
- Bottom (demersal) and midwater (pelagic)
- ~ 50% global catch



## Introduction

- Fish & invertebrates
- Bottom (demersal) and midwater (pelagic)
- 50% global catch
- Active
- Cone-shaped net



## Introduction

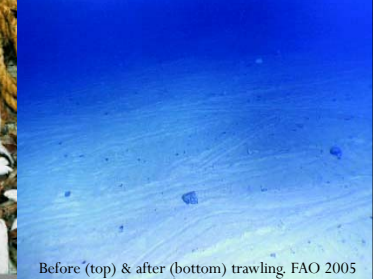
- Fish & invertebrates
- Bottom (demersal) and midwater (pelagic)
- 50% global catch
- Active using cone-shaped net
- Small & large vessels



## Introduction - Impacts

- Bycatch
  - Juvenile fish in shrimp trawl
  - Protected species
- Bottom habitat

Shrimp fishing bycatch (Madagascar) <http://www.ird.fr/>



## Objectives

- Describe how trawl gear works
- List 4 components of a trawl and describe 2 pieces of specialized equipment
- Demonstrate ability to complete the gear description form

## Sampling Priorities

1. Collect information on fishing effort
2. Randomly sample catch for catch composition
3. **Record gear characteristics**
4. Collect length-frequency data on target and non-target catch

## Trawl configurations

- Varies by target & fish behavior
- Beam trawl** / otter trawl / pair



<http://www.scotland.gov.uk/>



<http://www.qc.dfo-mpo.gc.ca/>



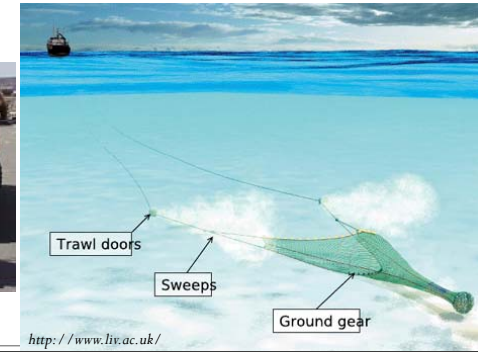
<http://www.sanctuarysimon.org/>

## Trawl configurations

- Varies by target & fish behavior
- Beam trawl / **otter trawl** ([animation from http://www.dantrawl.com/](http://www.dantrawl.com/)) / pair



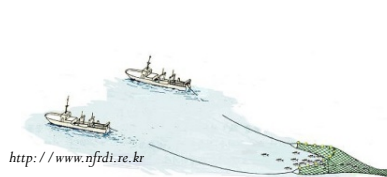
<http://www.crimond.com/bison.htm>



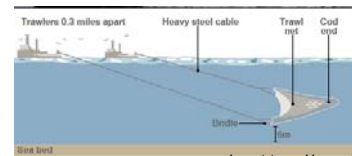
<http://www.liv.ac.uk/>

## Trawl configurations

- Varies by target & fish behavior
- Beam trawl / otter trawl / **pair** (2 vessels)



<http://www.nfrdi.re.kr>

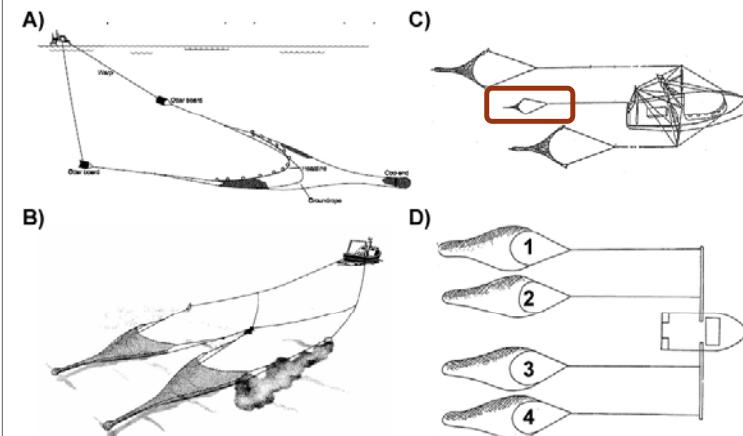


<http://news.bbc.co.uk>



Photos: <http://www.boatdesign.net/forums/open-discussion/beam-trawl-query-17413.html>

## Trawl configurations



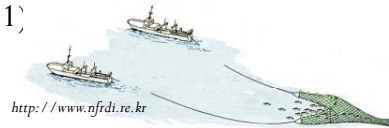
Images modified from FAO (2001b), Lokkeborg (2005) and <http://www.crimond.com>



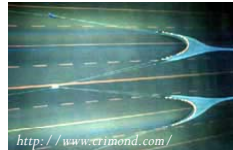
## Trawl configurations

- Confusing terminology (#1)

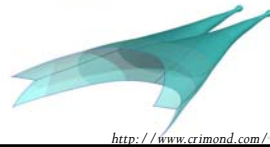
- Pair trawl – 2 vessels



- Twin trawl – 2 nets

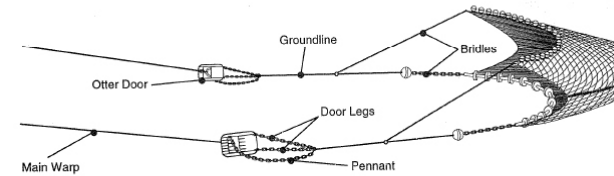


- Duplex (separator) trawl – 2 codends

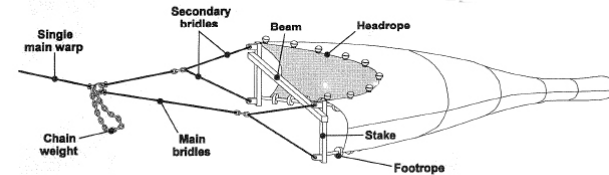


## Net components (Manual Fig.6-2)

### A) Otter Trawl



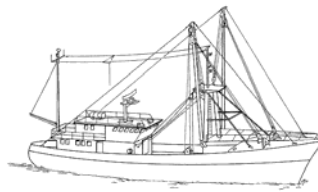
### B) Beam Trawl



## Trawl configurations

- Confusing terminology (#2)

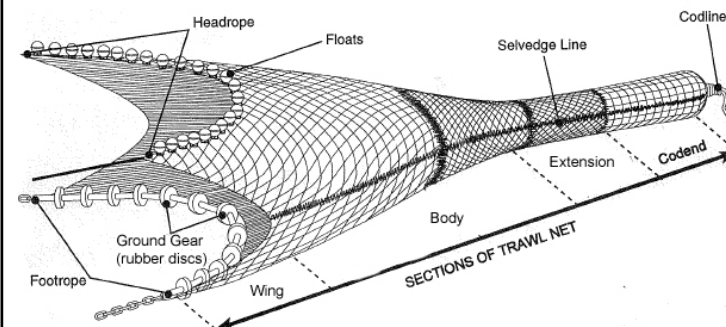
- Beam trawler – vessels which deploy nets from abeam; also outrigger trawler

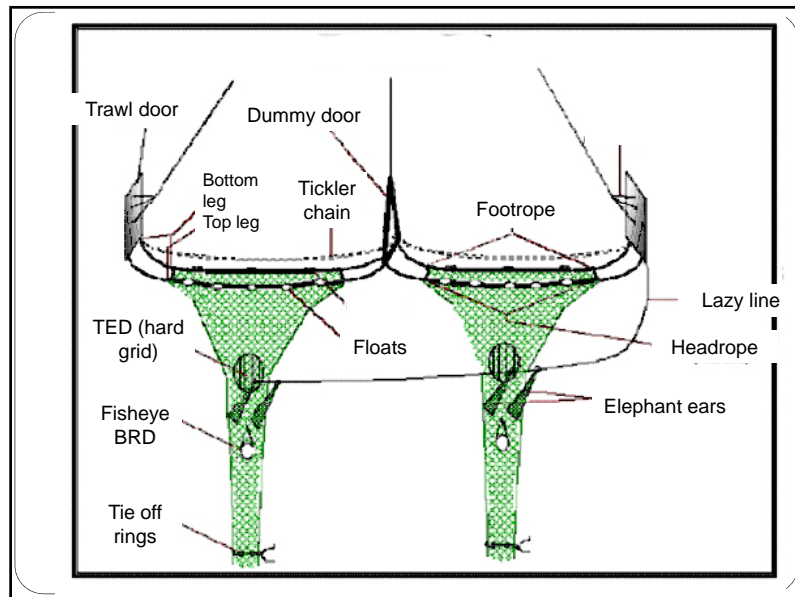


- Beam trawl – type of net



## Net components (Manual Fig.6-3)





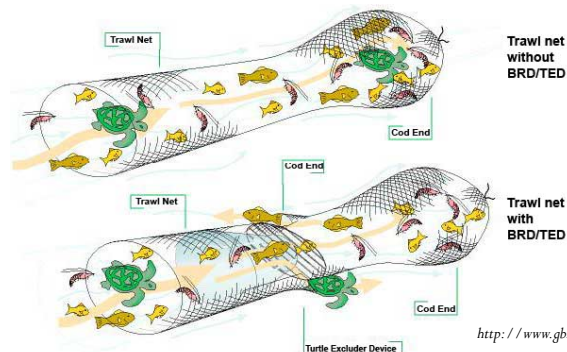
## Gear Deployment & Retrieval

- Video - [hauling](#)



## Bycatch reduction

- Bycatch reduction device (BRD)
- Junk fish excluder (JTED)
- Turtle excluder device (TED)

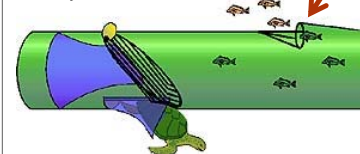


<http://www.gbrmpa.gov.au>

## Bycatch reduction

- Bycatch reduction device (BRD)
- Junk fish excluder (JTED)

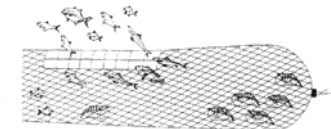
Fish eye (<http://www.seagrassfish.lsu.edu>)



Radial escape section  
(<http://www.seagrassfish.lsu.edu>)



Square mesh window (FAO)

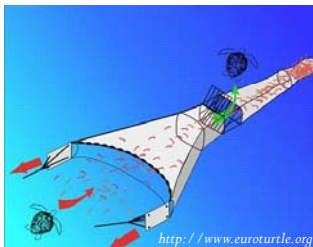
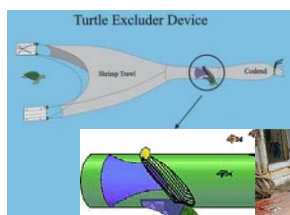


Square mesh  
codend  
(<http://bayjournal.com.au>)

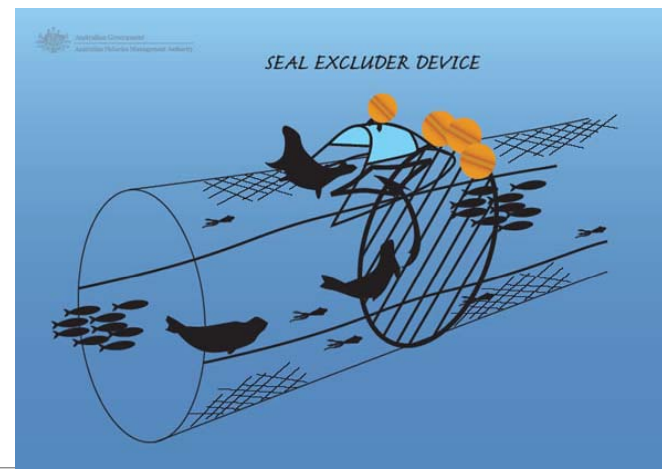


## Bycatch reduction

- Bycatch reduction device (BRD)
  - Junk fish excluder (JTED)
  - Turtle excluder (TED [video](#))



## Bycatch reduction



## Gear Description - Finfish

Gear Description - Finfish Trawl

Page \_\_\_\_ of \_\_\_\_

Observer code	Vessel code	Trip ID
Net type (check one):	Midwater	Bottom
Configuration (check one):	Otter trawl	Beam trawl
Net deployment position (check one):	Stern	Port
Net Manufacturer / design name:		
Otter Trawl		
Doors - Main		Doors - Dummy
Material: Aluminum / Steel / Wood / Other	Material: Aluminum / Steel / Wood / Other	
Length (m)	Height (m)	Length (m)
Weight (kg)	Type	Weight (kg)
Square / Oval / V / Other		Square / Oval / V / Other
Length (m)	Diameter (mm)	Material
Door logs - top		
Door logs - bottom		
Penant		
Groundline		
Bridle (top leg)		
Bridle (bottom leg)		

## Gear Description - Finfish

Gear Description - Finfish Trawl

Page \_\_\_\_ of \_\_\_\_

Observer code	Vessel code	Trip ID
Net type (check one):	Midwater	Bottom
Configuration (check one):	Otter trawl	Beam trawl
Net deployment position (check one):	Stern	Port
Net Manufacturer / design name:		
Otter Trawl		
Doors - Main		Doors - Dummy
Material: Aluminum / Steel / Wood / Other	Material: Aluminum / Steel / Wood / Other	
Length (m)	Height (m)	Length (m)
Weight (kg)	Type	Weight (kg)
Square / Oval / V / Other		Square / Oval / V / Other
Length (m)	Diameter (mm)	Material
Door logs - top		
Door logs - bottom		
Penant		
Groundline		
Bridle (top leg)		
Bridle (bottom leg)		



## Gear Description - Finfish

### Gear Description - Finfish Trawl

Page \_\_\_\_ of \_\_\_\_

Observer code		Vessel code		Trip ID	
Net type (check one)		Midwater	Bottom	Net #	
Configuration (check one)		Otter trawl	Beam trawl	Other	
Net deployment position (check one)		Stern	Port	Stbd	
Net Manufacturer / design name:					
Otter Trawl					
Doors - Main			Doors - Dummy		
Material: Aluminum / Steel / Wood / Other			Material: Aluminum / Steel / Wood / Other		
Length (m)	Height (m)	Type	Length (m)	Height (m)	Type
Weight (kg)		Square / Oval / V / Other	Weight (kg)		Square / Oval / V / Other
Length (m)		Diameter (mm)	Material		Other
Door legs - top					
Door legs - bottom					
Penant					
Groundline					
Bridle (top leg)					
Bridle (bottom leg)					

## Gear Description - Finfish

Beam Trawl				
	Length (m)	Weight (kg)	Material	Other
Beam				
Stake				
Otter and Beam Trawl				
	Length (m)	Diameter (mm)	Material	Other
Bridle (main)				
Bridle (secondary-top)				
Bridle (secondary-bottom)				
Chain weight				Weight:
Otter and Beam Trawl				
	Length (m)	Diam (mm)	Material	Other
Warp				
3rd wire				
Head rope				# floats:
Foot rope				
Selvedge line				
Tickler chain				Weight:
Other				

## Gear Description - Finfish

### Gear Description - Finfish Trawl

Page \_\_\_\_ of \_\_\_\_

	Width (cm)	Diam (cm)	Material	Other
Metal bobbins				How many?
Metal spacers				How many?
Rubber discs				How many?
Rubber spacer				How many?
Other				





# Gear Description - Finfish

Gear Description - Finfish Trawl

Page \_\_\_\_ of \_\_\_\_

	Width (cm)	Diam (cm)	Material	Other
Metal bobbins				How many?
Metal spacers				How many?
Rubber discs				How many?
Rubber spacer				How many?
Other				

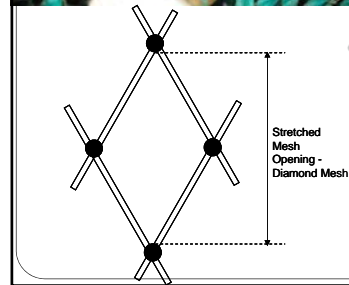
Net Characteristics							
Total length (m):		Mouth width:		Mouth height:			
	Material	Diam. (mm)	Mesh open (cm)	W / D	# meshes long	# meshes around	Other
Wing			.				
Trawl body			.				
Extension			.				
Codend			.				◇ / □
Other							
Other							

Other rigging present? Check all that apply.

Chaffing gear	Vert. Streng. Strap	Lazy line	Other:
Elephant ears	Horiz. Streng. Strap		Other:
	Splitting Strap		

Photos? Y / N

Courtesy of S. Sei, Sierra Leone



## on - Finfish

tion - Finfish Trawl

Page \_\_\_\_ of \_\_\_\_

**STRENGTHENING ROPES**

Horizontal strengthening ropes are also referred to as buntline ropes.

Other rigging present? Check all that apply.

Chaffing gear	Vert. Streng. Strap	Lazy line	Other:
Elephant ears	Horiz. Streng. Strap		Other:
	Splitting Strap		

Photos? Y / N

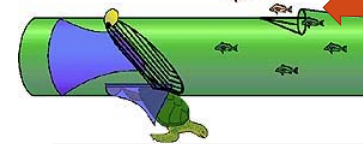
## Gear Description - Finfish

Type: <input checked="" type="checkbox"/> Fisheye	Bycatch Reduction Device (BRD)		
<input type="checkbox"/> Radial escape section	<input type="checkbox"/> Square-mesh window	<input type="checkbox"/> Other	
<input type="checkbox"/> Funnel	<input type="checkbox"/> Yes	Distance of escape opening from the	
	<input type="checkbox"/> No	Distance of escape opening from the	

Fisheye	Offset	Radial escape section
Opening (cm)	Width	Opening (cm)
Shape	Height	Width
<input type="checkbox"/> Oval	<input type="checkbox"/> Diamond	<input type="checkbox"/> Square-mesh window
<input type="checkbox"/> Square	<input type="checkbox"/> Halfmoon	Opening (cm)
<input type="checkbox"/> Rectangle	<input type="checkbox"/> Triangle	Width
Other:		

BRD notes/drawing



Fish eye (<http://www.seagrantfish.lsu.edu>)





## Gear Description - Finfish

Bycatch Reduction Device (BRD)

Type: ☐ Fisheye ☐ Square-mesh window ☐ Other: ☐  
☒ Radial escape section ☐ Square-mesh codend

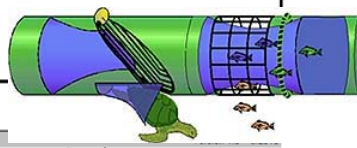
ape opening from headrope:  
 ape opening from tie off rings:

**Radial escape section**  
 Opening (cm) Width Height  
 Length  
 If not all the way around, #openings

**Square-mesh window**  
 Opening (cm) Width Height

Images from Eayrs (2007)

Radial Escape Section (<http://www.seagrantfish.lsu.edu/>)



## Gear Description - Finfish

Bycatch Reduction Device (BRD)

Type: ☐ Fisheye ☐ Square-mesh window ☒ Other: ☐  
☐ Radial escape section ☐ Square-mesh codend

Funnel ☐ Yes Distance of escape opening  
☐ No Distance of escape opening

**Fisheye** Offset  
 Opening (cm) Width Height  
 Shape ☐ Oval ☐ Diamond  
☐ Square ☐ Halfmoon  
☐ Rectangle ☐ Triangle  
 Other: ☐

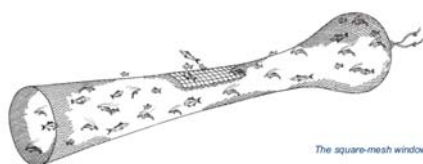
**Radial escape section**  
 Opening (cm) Width Height

**Square-mesh window**  
 Opening (cm) Width Height

BRD notes/drawing

Comments:

Images from Eayrs (2007)



## Gear Description - Shrimp

Gear Description - Shrimp Trawl

Page \_\_\_\_ of \_\_\_\_

Observer code Vessel code Trip ID

Total # nets: Vessel configuration: ☐ Outrigger

Net # / position (check one or more if nets are identical)

1	Port - outside	3	Stbd - inside	5	Try net
2	Port - inside	4	Stbd - outside		Location:

Net Manufacturer / design name:

D)

Material: Length (m) Weight (kg)

1

2

3

4

iod /

e / Oval / V

Other

r

Bottom

## Gear Description - Shrimp

Gear Description - Shrimp Trawl

Page \_\_\_\_ of \_\_\_\_

Observer code Vessel code Trip ID

Total # nets: Vessel configuration: ☐ Outrigger

Net # / position (check one or more if nets are identical)

1	Port - outside	3	Stbd - inside	5	Try net
2	Port - inside	4	Stbd - outside		Location:

Net Manufacturer / design name:

Doors - Main				Doors - Dummy			
Material: Aluminum / Steel / Wood / Other				Material: Aluminum / Steel / Wood / Other			
Length (m)	Width (m)	Type	Weight (kg)	Length (m)	Width (m)	Type	Weight (kg)
		Square / Oval / V / Other				Square / Oval / V / Other	
Length (m)		Diameter (mm)		Material		Other	
Bridle (door chain)							
Top leg line							
Bottom leg line							
Top leg line-dummy							
Bottom leg line - dummy							
Warp							
Head rope						# floats:	
Foot rope						Weight:	
Tickler chain							
Loop chain							

## Gear Description - Shrimp

Net Characteristics							
Total length (m):		Mouth width:		Mouth height:			
	Material	Diameter (mm)	Mesh open (cm)	W / D	# meshes horiz	# meshes vert	Hanging ratio
Wing							
Trawl body							
Extension							
Codend							
Other							
Other							

Other rigging present? Check all that apply.

<input type="checkbox"/> Elephant ears	<input type="checkbox"/> Choke rings	<input type="checkbox"/> Lazy line	<input type="checkbox"/> Other:
<input type="checkbox"/> Chafing gear			<input type="checkbox"/> Other:

Comments:

## Gear Description - Shrimp

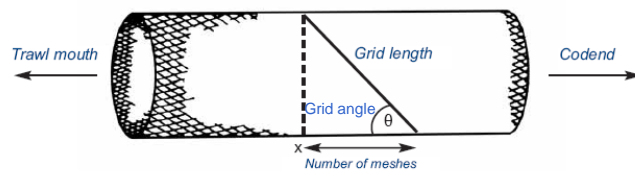
Gear Description - Shrimp Trawl

Page \_\_\_\_ of \_\_\_\_

Bycatch Reduction Device (BRD)							
Type: <input type="checkbox"/> Fisheye <input type="checkbox"/> Square-mesh window <input type="checkbox"/> Other: <input type="checkbox"/> Radial escape section <input type="checkbox"/> Square-mesh codend							
Funnel		<input type="checkbox"/> Yes <input type="checkbox"/> No		Distance of escape opening from headrope:		<input type="text"/> m	
				Distance of escape opening from tie off rings:		<input type="text"/> m	
Fisheye		Offset		Radial escape section			
Opening (cm)	Width	Height		Opening (cm)	Width	Height	
Shape				Length			
<input type="checkbox"/> Oval	<input type="checkbox"/> Diamond			If not all the way around, #openings	<input type="text"/>		
<input type="checkbox"/> Square	<input type="checkbox"/> Halfmoon						
<input type="checkbox"/> Rectangle	<input type="checkbox"/> Triangle						
Other:							
BRD notes/drawing				Square-mesh window			
				Opening (cm) Width Height			

## Gear Description - Shrimp

Turtle Excluder Device (TED)			
Name:		Type: Hard / Soft	
Opening: Top / Bottom	Funnel	Yes / No	Flap Yes / No
Material:		Shape Rectangle / Oval / Other:	
Angle (°):	Design Curved bar / Straight bar / Other:		
Dimensions		Distance of TED from headrope: <input type="text"/> m	
Length: <input type="text"/> cm	# TED Floats:		
Width: <input type="text"/> cm	Float material Sponge / Foam / Plastic / Other:		
Bar Spacing: <input type="text"/> cm	Float shape Round / Cylinder / Bullet / Ellipsoid		
TED notes/drawing			



## Activity

- Handout
- Groups of 2 or 3
- 10 minutes

## Summary

- Describe how trawl gear works
- List 4 components of a trawl
- Describe 2 pieces of specialized equipment

## References

- Eayrs, S. 2007. A Guide to Bycatch Reduction in Tropical Shrimp-Trawl Fisheries. Revised edition. Rome, FAO. 108 p.
- Kelleher, K. 2005. Discards in the world's marine fisheries: An update. FAO Fisheries Technical Paper, FAO, Rome.
- Watson, R., E. Hoshino, J. Beblow, C. Revenga, Y. Kura, and A. Kitchingman. 2004. Fishing Gear Associated With Global Marine Catches. Fisheries Centre Research Reports 12.



## Activity – Finfish Trawl Gear Description form

Names:

Complete the blank Finfish Trawl Gear Description form using the following information and the net samples in the front of the room.

You board the Observer code: FS345, Vessel code: LIB9997, Trip #7

Your vessel is fishing with a Crimond Nova Demersal trawl net deployed from the back of the boat.

The steel trawl doors measure 2m x 2.4 m and weigh 1000 kg. They look like this:



The door legs & penant are made of 1.2mm chain. The top leg is 4.03m, bottom is 3.5m and penant is 4.2m. The groundline is 2cm steel wire cable and is ~6m in length. The bridles are 1.5 cm steel cable and are 7.2 (top) and 6 m (bottom).

The vessel uses a steel warp cable that is 25mm in diameter. They have ~400m on each winch. The headrope is made of 2cm nylon line and is 52m. There are 18 hard, round plastic floats (25cm diameter) attached to the headrope. The footrope is made of 2.2cm weighted line and is 60m. The chain along the footrope weighs ~ 100kg and is made of chain links that are 1cm in diameter and each is ~5.5 cm in length. The selvedge line is 11m in length and made of 6cm Dyneema®. The 4 vertical straps are made of the same material and placed every 2.5m

The net doesn't have any metal bobbins or spacers but does have 15 rubber discs and 32 spacers. Each disc is 8cm wide and 25cm in diameter. Spacers are 15cm wide & 10cm in diameter.

The total length of the net is 24m. The mouth width is 10m by 4.5m high

Net material is all 3.5mm polyethylene line. Wing mesh is 15cm and extends 25 meshes in length and 100 around. The body has 12 cm mesh and extends 30 meshes in length and 65 around. The codend is diamond mesh with an 8.25cm opening that was measured when it was wet.\* The codend is ~110 meshes long by 76 around. The net also has some chaffing gear attached.

No photos were taken and there were no BRDs.

\*If actual mesh samples available, have the class use wedge gauge to take their own measurements.

# Gear Description - Finfish Trawl

Page \_\_\_\_ of \_\_\_\_

Observer code		Vessel code		Trip ID	
Net type (check one):		Midwater		Bottom	
Configuration (check one):		Otter trawl		Beam trawl	
Net deployment position (check one):		Stern		Port	
				Stbd	
Net Manufacturer / design name: _____					
<b>Otter Trawl</b>					
<b>Doors - Main</b>			<b>Doors - Dummy</b>		
Material:	Aluminum / Steel / Wood / Other _____		Material:	Aluminum / Steel / Wood / Other _____	
Length (m)		Height (m)		Length (m)	
Weight (kg)		Type	Square / Oval / V / Other	Weight (kg)	
	Length (m)	Diameter (mm)	Material	Other	
Door legs - top					
Door legs - bottom					
Penant					
Groundline					
Bridle (top leg)					
Bridle (bottom leg)					
<b>Beam Trawl</b>					
	Length (m)	Weight (kg)	Material	Other	
Beam					
Stake					
	Length (m)	Diameter (mm)	Material	Other	
Bridle (main)					
Bridle (secondary-top)					
Bridle (secondary-bottom)					
Chain weight				Weight:	
<b>Otter and Beam Trawl</b>					
	Length (m)	Diam (mm)	Material	Other	
Warp					
3rd wire					
Head rope				# floats:	
Foot rope					
Selvedge line					
Tickler chain				Weight:	
Other					

	Width (cm)	Diam (cm)	Material	Other
Metal bobbins				How many?
Metal spacers				How many?
Rubber discs				How many?
Rubber spacer				How many?
Other				

Net Characteristics							
Total length (m):		Mouth width:			Mouth height:		
	Material	Diam. (mm)	Mesh open (cm)	W / D	# meshes long	# meshes around	Other
Wing			.				
Trawl body			.				
Extension			.				
Codend			.				◇ / □
Other							
Other							

**Other rigging present? Check all that apply.**

<input type="checkbox"/> Chaffing gear	<input type="checkbox"/> Vert.Streng.Strap	<input type="checkbox"/> Lazy line	<input type="checkbox"/> Other:
<input type="checkbox"/> Elephant ears	<input type="checkbox"/> Horiz.Streng.Strap	<input type="checkbox"/>	<input type="checkbox"/> Other:
<input type="checkbox"/>	<input type="checkbox"/> Splitting Strap		

Photos? Y / N

Bycatch Reduction Device (BRD)			
<b>Type:</b>	<input type="checkbox"/> Fisheye	<input type="checkbox"/> Square-mesh window	<input type="checkbox"/> Other:
<input type="checkbox"/> Radial escape section	<input type="checkbox"/> Square-mesh codend		
<b>Funnel</b>	<input type="checkbox"/> Yes	Distance of escape opening from headrope:	<input type="text"/> m
	<input type="checkbox"/> No	Distance of escape opening from tie off rings:	<input type="text"/> m

<b>Fisheye</b>	Offset	<input type="text"/>	<input type="text"/>	<b>Radial escape section</b>
Opening (cm)	Width	<input type="text"/>	Height	<input type="text"/>
Shape				Opening (cm)
<input type="checkbox"/> Oval	<input type="checkbox"/> Diamond			Width
<input type="checkbox"/> Square	<input type="checkbox"/> Halfmoon			Height
<input type="checkbox"/> Rectangle	<input type="checkbox"/> Triangle			Length
<input type="checkbox"/> Other:				If not all the way around, #openings
				<input type="text"/>
				<b>Square-mesh window</b>
				Opening (cm)
				Width
				Height

BRD notes/drawing

Comments:



# Gear Description - Shrimp Trawl

Page \_\_\_\_ of \_\_\_\_

Observer code				Vessel code				Trip ID			
Total # nets:				Vessel configuration:				Outrigger			
Net # / position (check one or more if nets are identical)											
	1	Port - outside		3	Stbd - inside		5	Try net			
	2	Port - inside		4	Stbd - outside			Location:			
Net Manufacturer / design name:											
<b>Doors - Main</b>						<b>Doors - Dummy</b>					
Material:	Aluminum / Steel / Wood / Other:					Material:	Aluminum / Steel / Wood / Other:				
Length (m)		Width (m)		Length (m)		Width (m)					
Weight (kg)		Type	Square / Oval / V / Other		Weight (kg)		Type	Square / Oval / V / Other			
		<b>Length (m)</b>	<b>Diameter (mm)</b>	<b>Material</b>				<b>Other</b>			
Bridle (door chain)											
Top leg line											
Bottom leg line											
Top leg line-dummy											
Bottom leg line - dummy											
Warp											
Head rope								# floats:			
Foot rope											
Tickler chain								Weight:			
Loop chain											
<b>Net Characteristics</b>											
<b>Total length (m):</b>				<b>Mouth width:</b>				<b>Mouth height:</b>			
	<b>Material</b>	<b>Diameter (mm)</b>	<b>Mesh open (cm)</b>	<b>W / D</b>	<b># meshes horiz</b>	<b># meshes vert</b>	<b>Hanging ratio</b>				
Wing			.								
Trawl body			.								
Extension			.								
Codend			.								
Other											
Other											
Other rigging present? Check all that apply.											
	Elephant ears		Choke rings		Lazy line		Other:				
	Chafing gear						Other:				
Comments:											

Bycatch Reduction Device (BRD)									
<b>Type:</b>		<input type="checkbox"/> Fisheye	<input type="checkbox"/> Square-mesh window	<input type="checkbox"/> Other:					
		<input type="checkbox"/> Radial escape section	<input type="checkbox"/> Square-mesh codend						
<b>Funnel</b>		<input type="checkbox"/> Yes	Distance of escape opening from headrope:				<input type="text"/>		m
		<input type="checkbox"/> No	Distance of escape opening from tie off rings:				<input type="text"/>		m
<b>Fisheye</b>			<b>Offset</b>	<input type="text"/>	<input type="text"/>	<b>Radial escape section</b>			
Opening (cm)		Width	<input type="text"/>	Height	<input type="text"/>	Opening (cm)		Width	<input type="text"/>
Shape						Height		<input type="text"/>	
<input type="checkbox"/> Oval	<input type="checkbox"/> Diamond								
<input type="checkbox"/> Square	<input type="checkbox"/> Halfmoon								
<input type="checkbox"/> Rectangle	<input type="checkbox"/> Triangle								
<input type="checkbox"/> Other:									
						<b>Square-mesh window</b>			
Opening (cm)		Width	<input type="text"/>	Height	<input type="text"/>				
BRD notes/drawing									
Turtle Excluder Device (TED)									
<b>Name:</b>						<b>Type:</b> Hard / Soft			
<b>Opening:</b> Top / Bottom			<b>Funnel</b> Yes / No			<b>Flap</b> Yes / No			
<b>Material:</b>					<b>Shape</b> Rectangle / Oval / Other:				
<b>Angle (°):</b>		<b>Design</b> Curved bar / Straight bar / Other:							
<b>Dimensions</b>			Distance of TED from headrope:				<input type="text"/>	m	
Length:		cm	<b># TED Floats:</b>						
Width:		cm	<b>Float material</b> Sponge / Foam / Plastic / Other:						
Bar Spacing:		cm	<b>Float shape</b> Round / Cylinder / Bullet / Ellipsoid						
TED notes/drawing									
Photos? Y / N									
Version 1.0 6/2010									