

Trawl – Gear description (fish & shrimp)

INSERT INSTRUCTOR Name



<http://www.safmc.net>



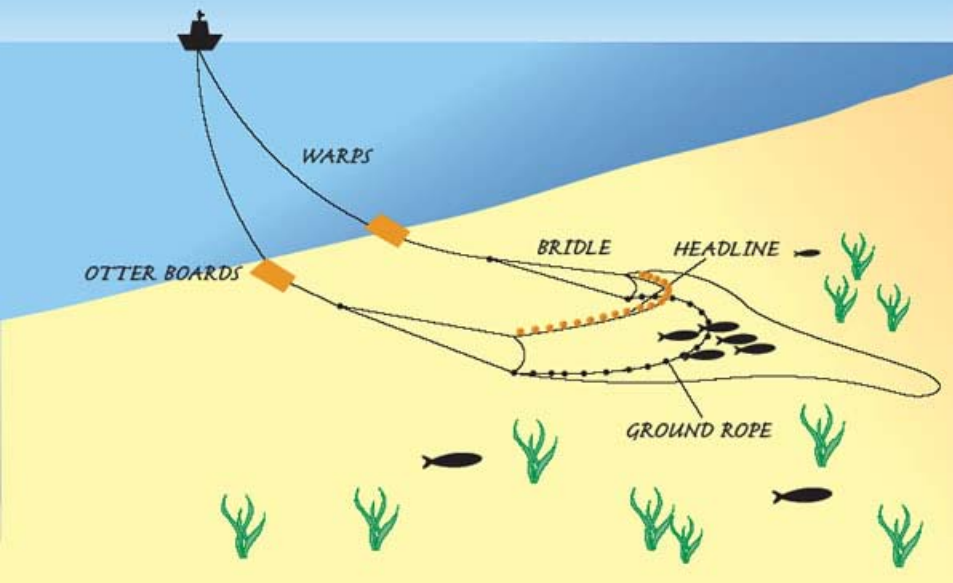
<http://www.whboat.com>



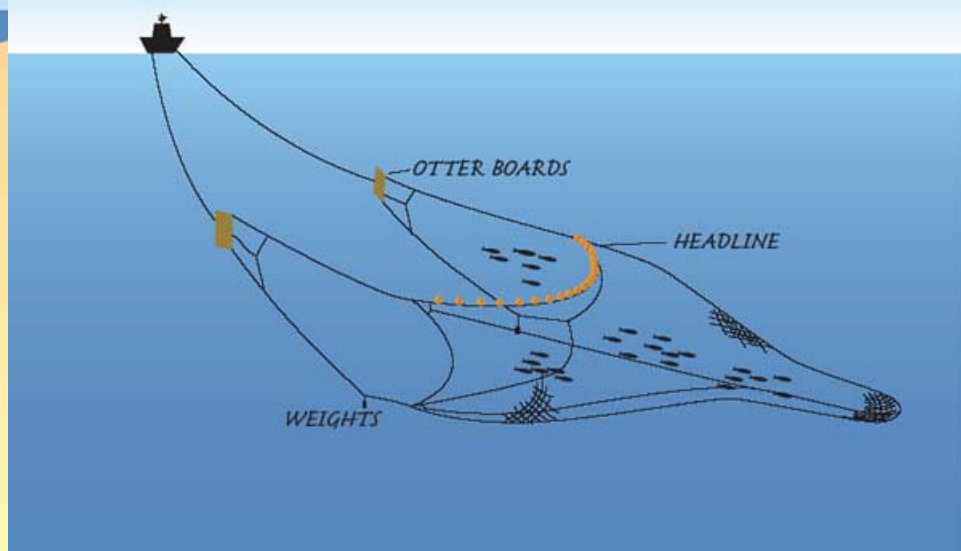
Joël Prado - FAO/FIIT



DEMERSAL TRAWL



MIDWATER TRAWL



Introduction

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

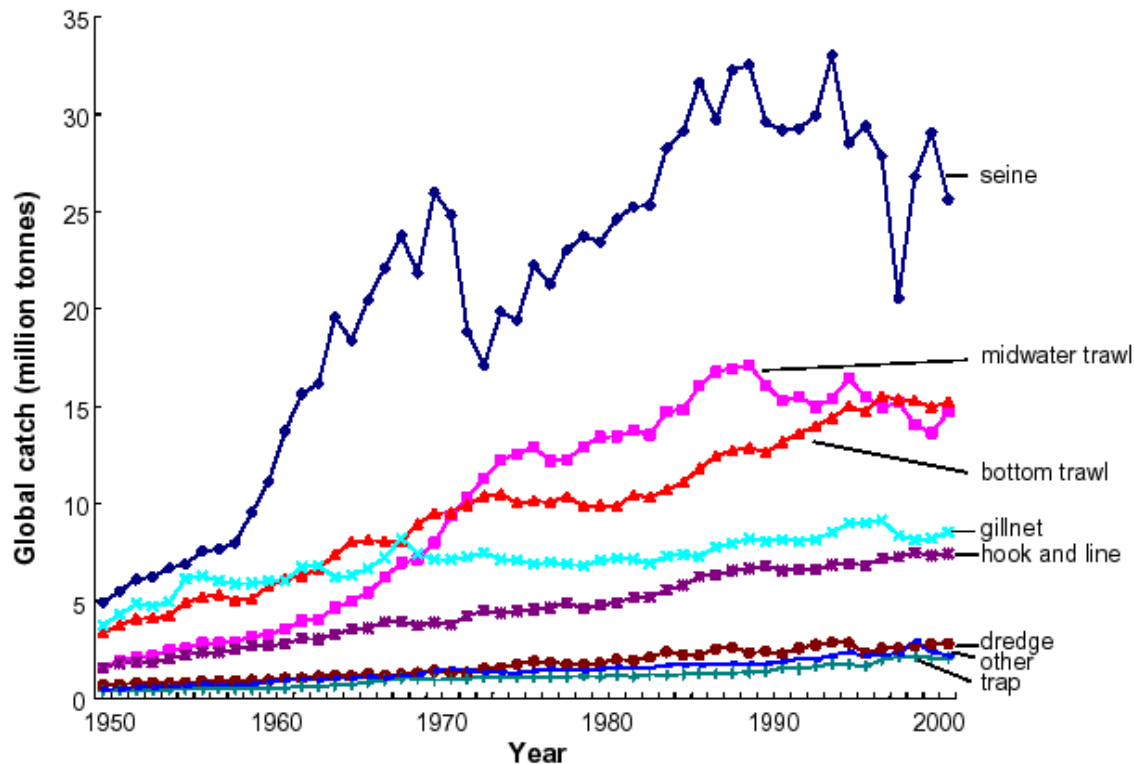


Figure 1. Annual global catch (million tonnes) taken by general fishing gear types

Watson et al. 2004

Introduction

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



<http://www.montereybayaquarium.org>

Introduction

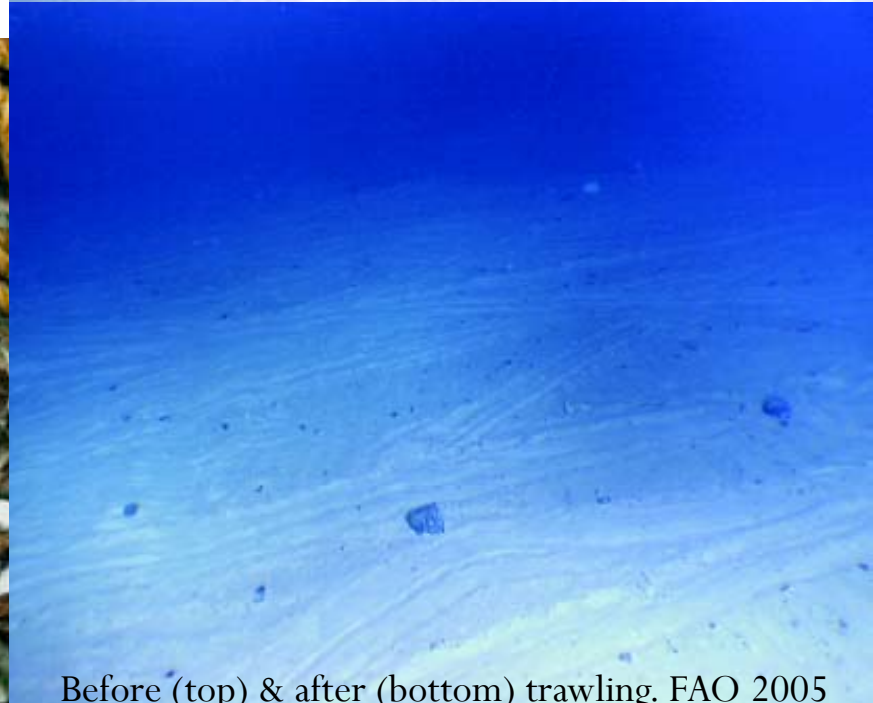
- Fish & invertebrates
- Bottom (demersal) and midwater (pelagic)
- 50% global catch
- Active using cone-shaped net
- Small & large vessels



Introduction - Impacts

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

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



Before (top) & after (bottom) trawling. FAO 2005

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 trawl

Trawl configurations

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



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



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



Griffiths:

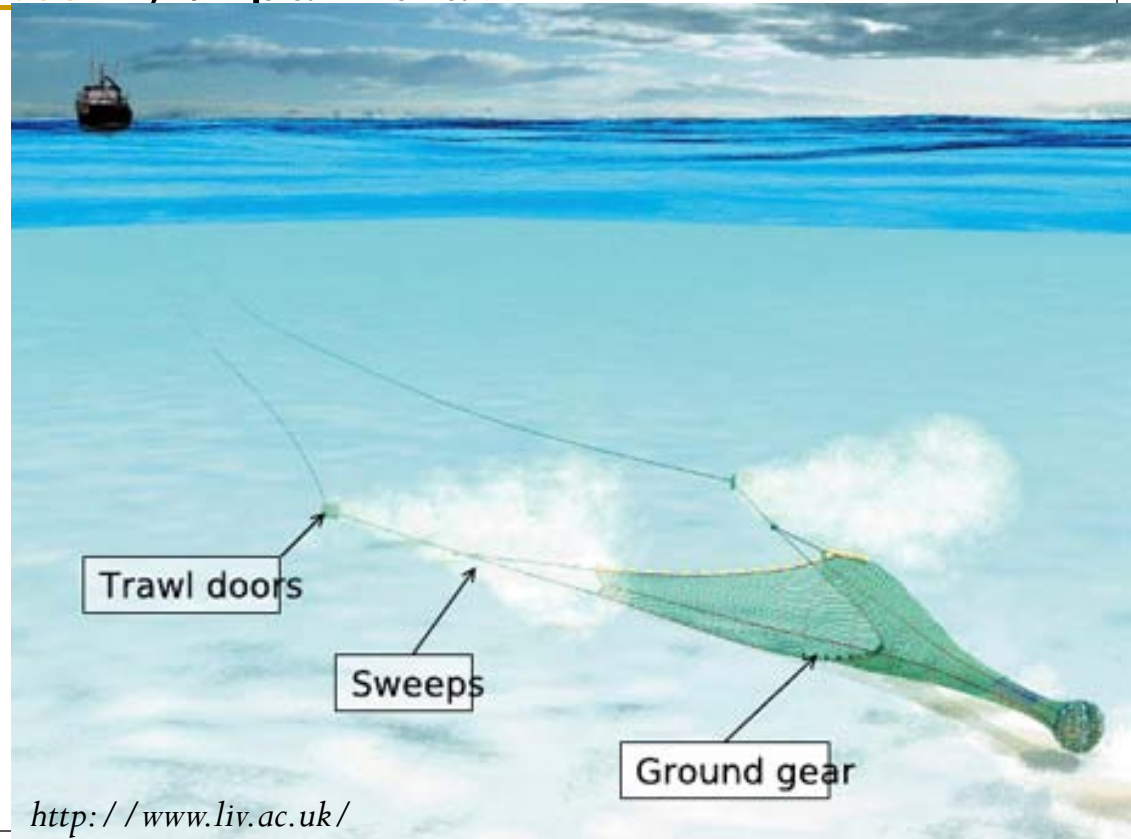
<http://www.sanctuarysimon.org/>

Trawl configurations

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



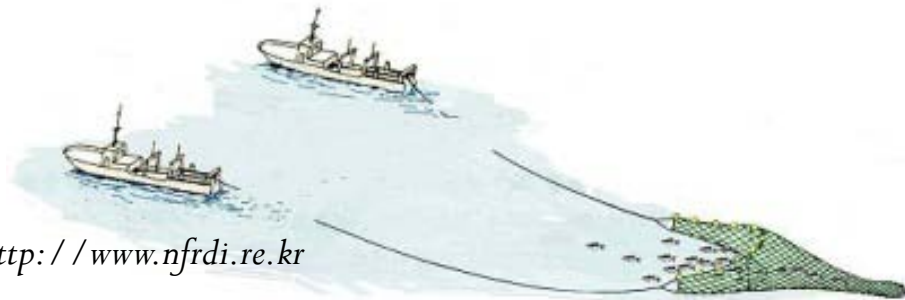
<http://www.crimond.com/bison.htm>



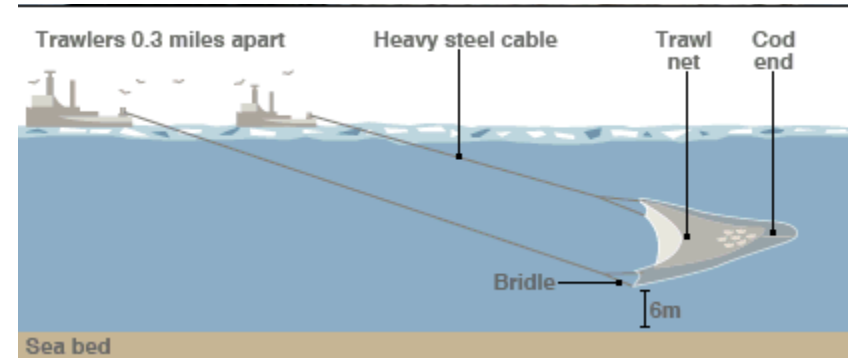
<http://www.liv.ac.uk/>

Trawl configurations

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



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

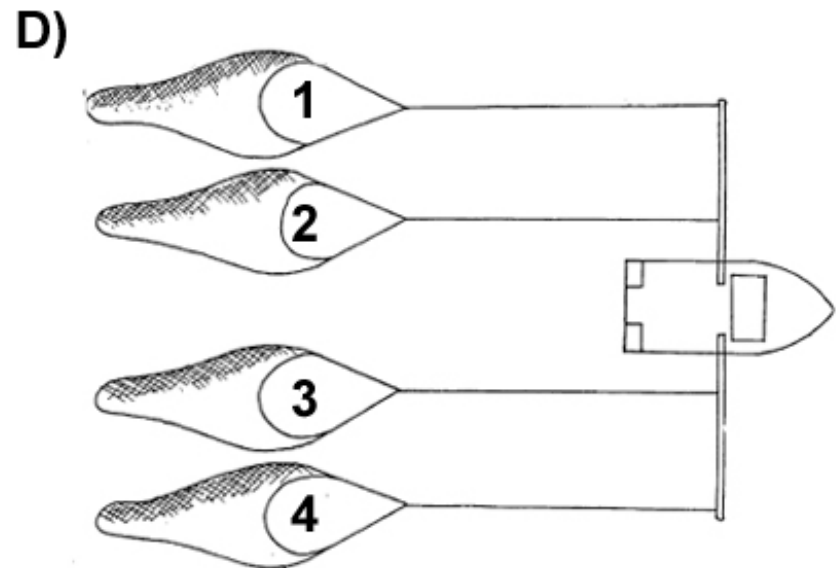
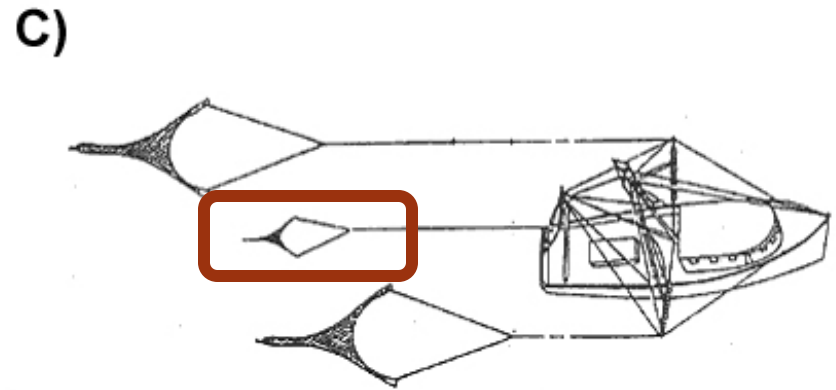
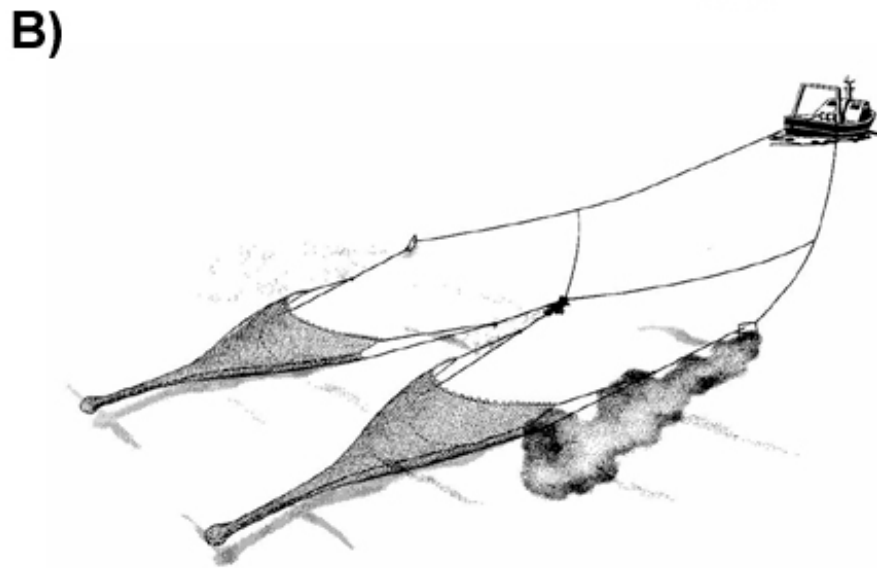
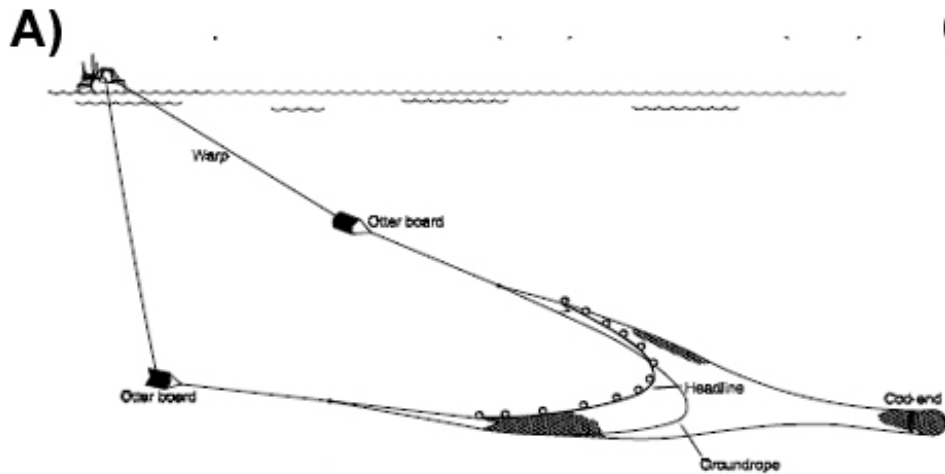


<http://news.bbc.co.uk>



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

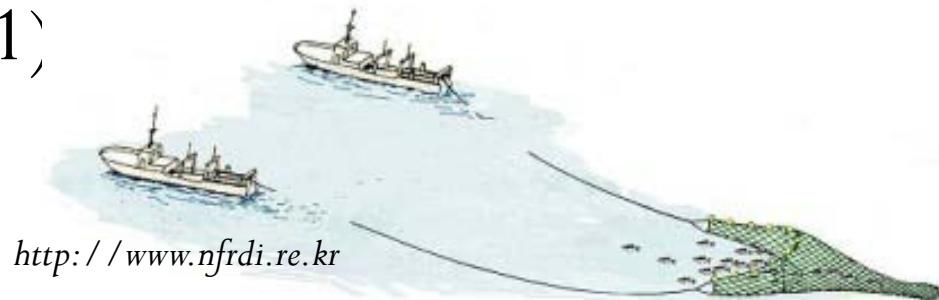
Trawl configurations



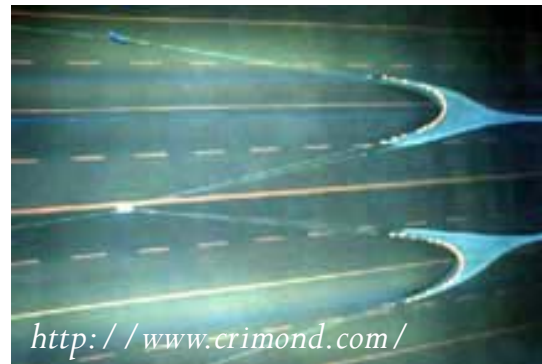
Trawl configurations

- Confusing terminology (#1)

- Pair trawl – 2 vessels

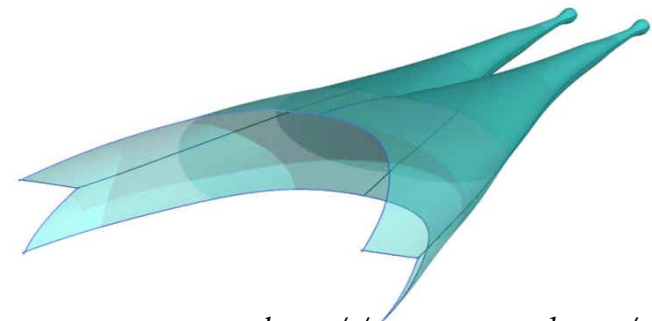


- Twin trawl – 2 nets



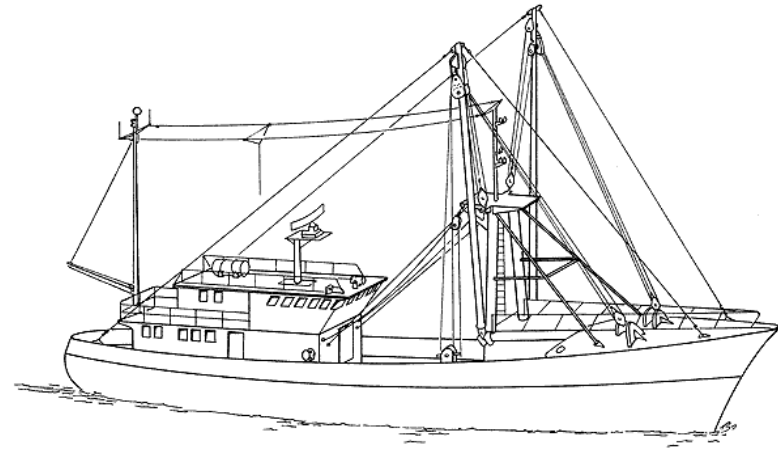
DUPLEX SHRIMP TRAWL
perspective view

- Duplex (separator) trawl –
2 codends



Trawl configurations

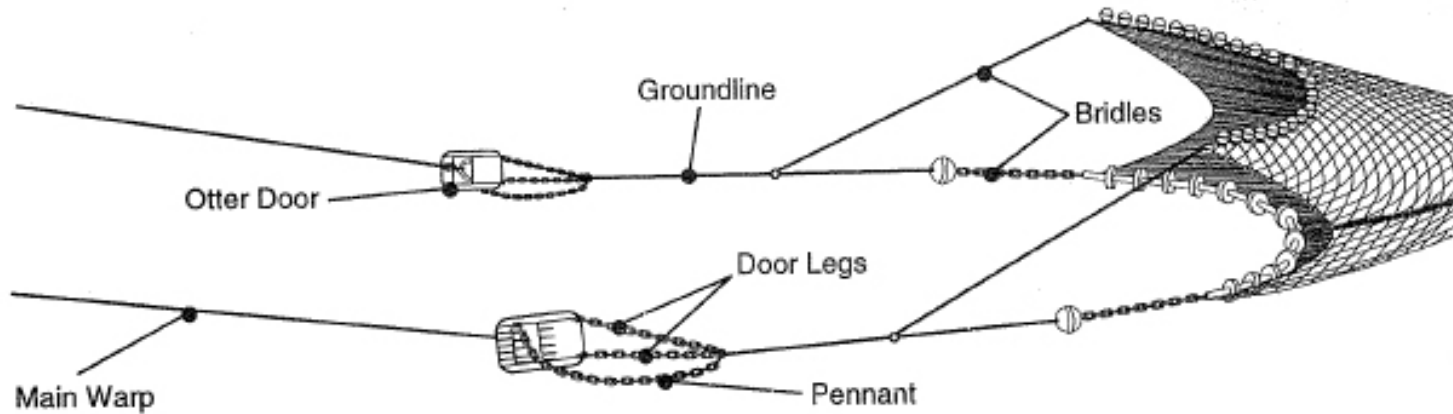
- Confusing terminology (#2)
- Beam trawler – vessels which deploy nets from abeam; also outrigger trawler or winch boat
- Beam trawl – type of net



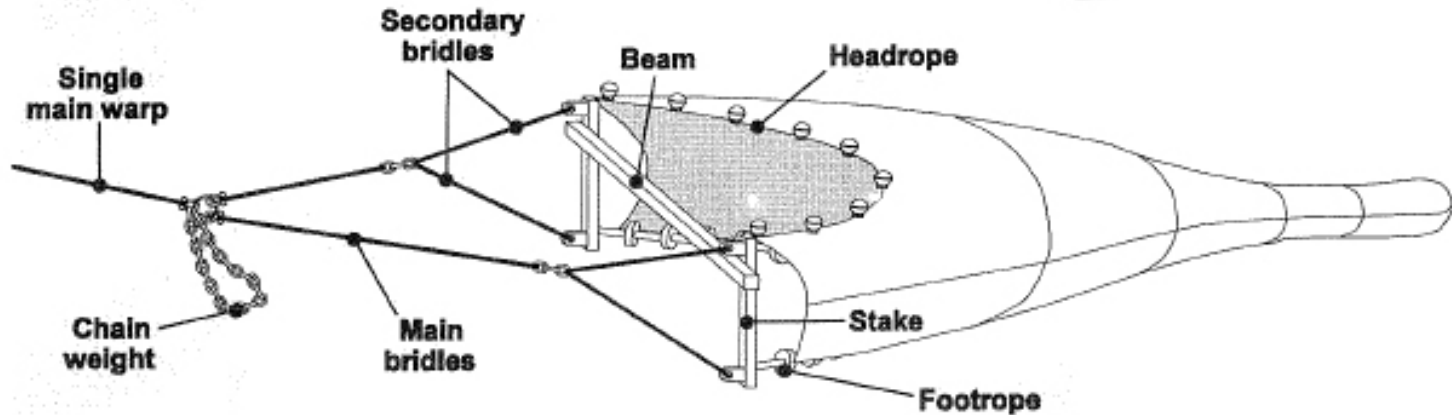
Beam trawler with beam trawls;
<http://www.ilvo.vlaanderen.be>

Net components (Manual Fig.6-2)

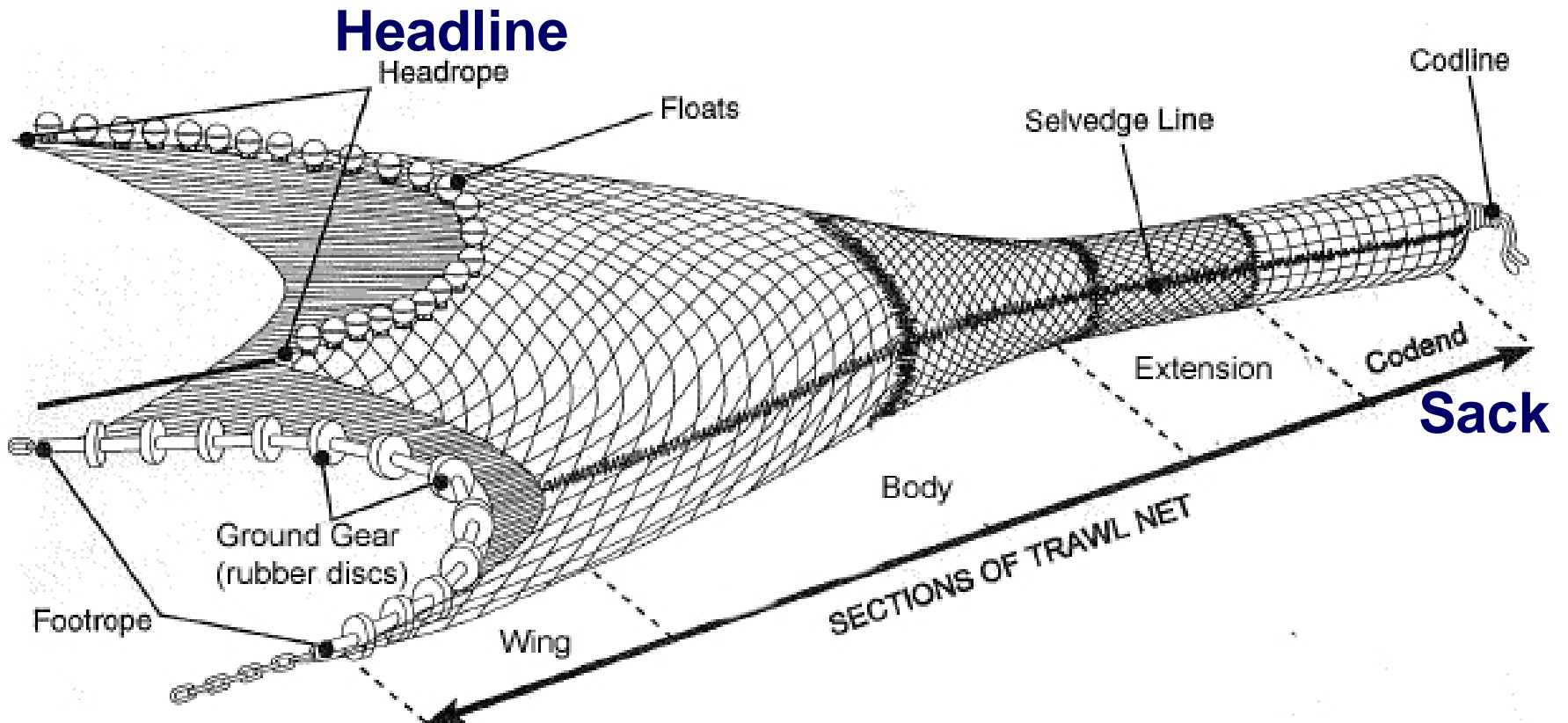
A) Otter Trawl

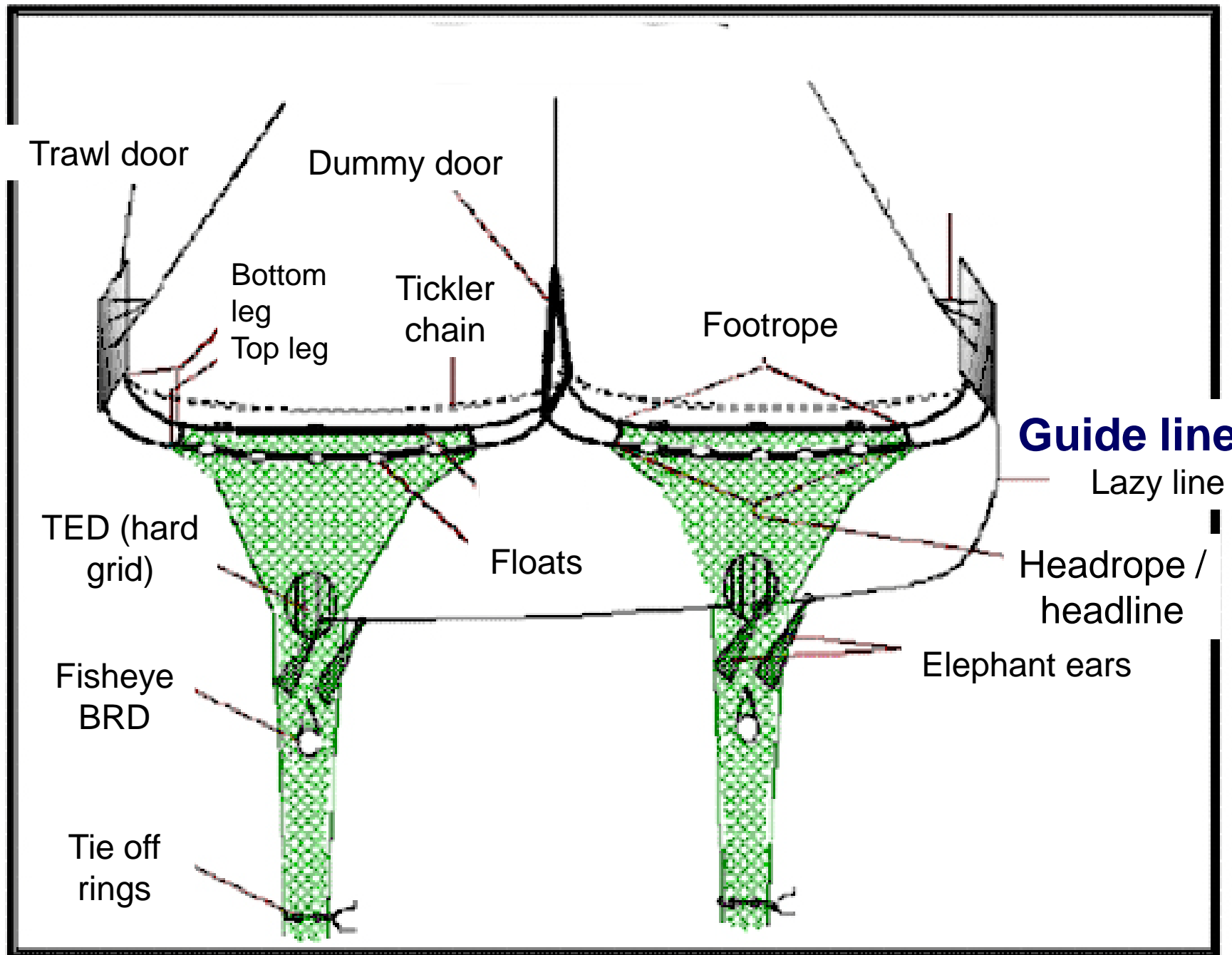


B) Beam Trawl



Net components (Manual Fig.6-3)





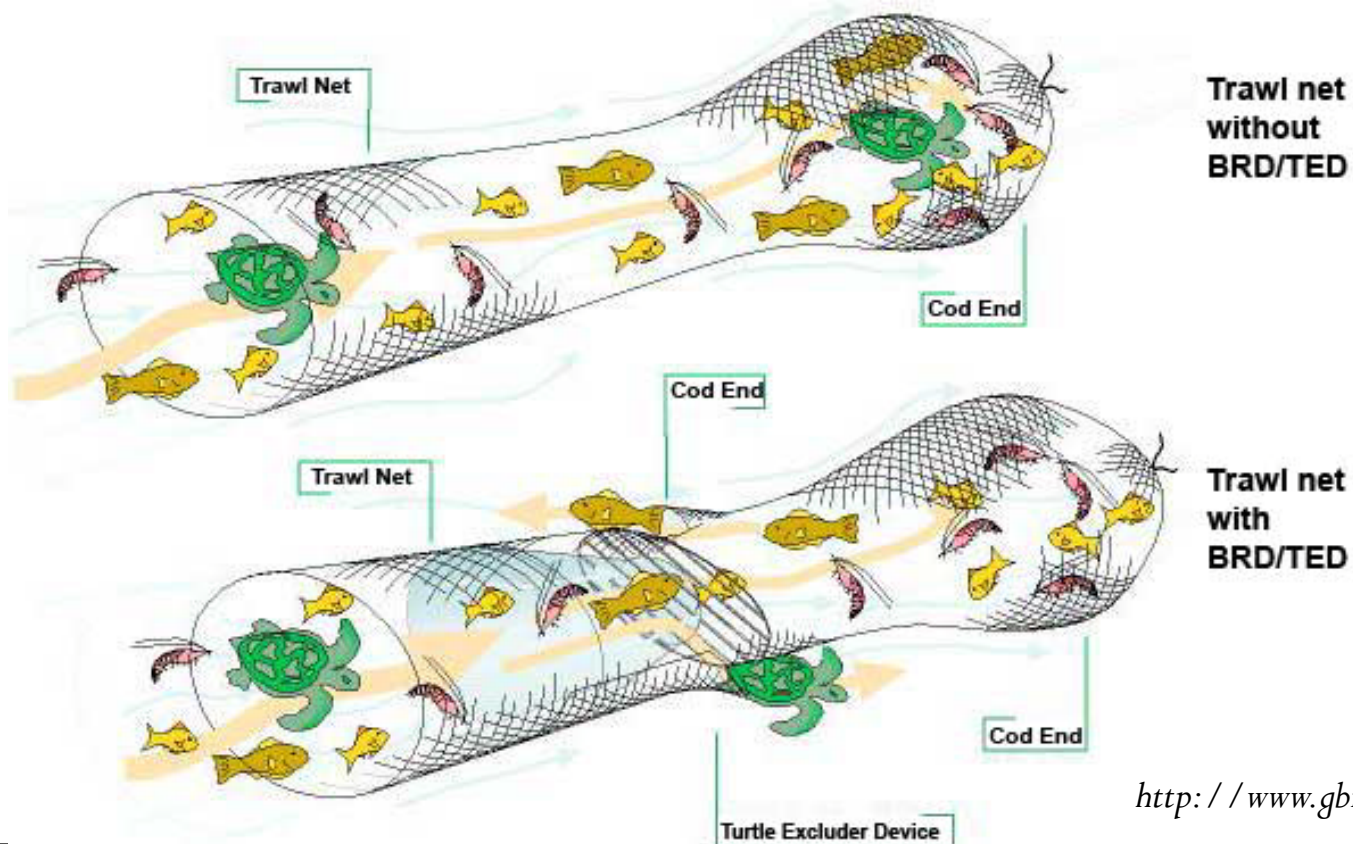
Gear Deployment & Retrieval

- Video - [retrieving](#)



Bycatch reduction

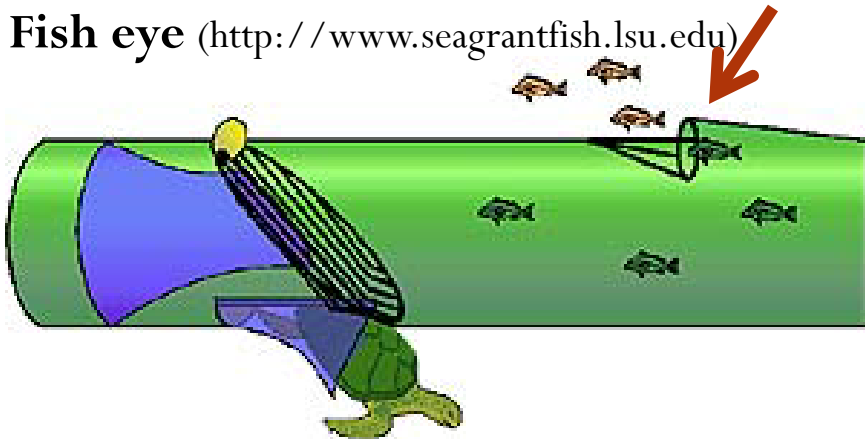
- Bycatch reduction device (BRD)
 - Junk fish excluder (JTED)
 - Turtle excluder device (TED)



Bycatch reduction

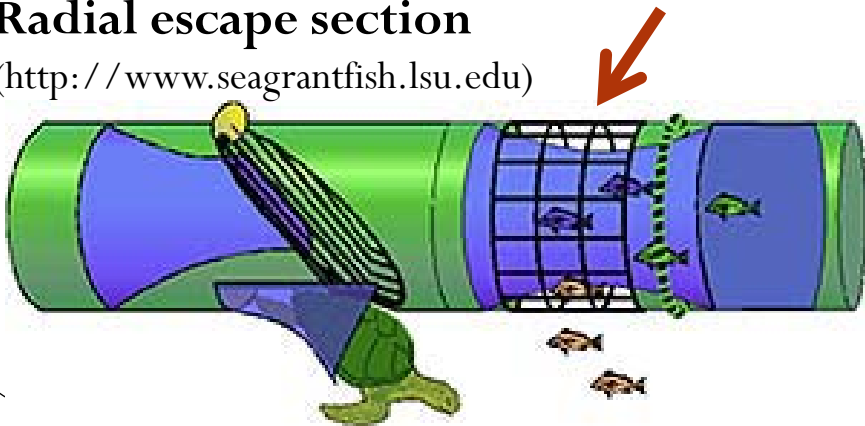
- Bycatch reduction device (BRD)
- Junk fish excluder (JTED)

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

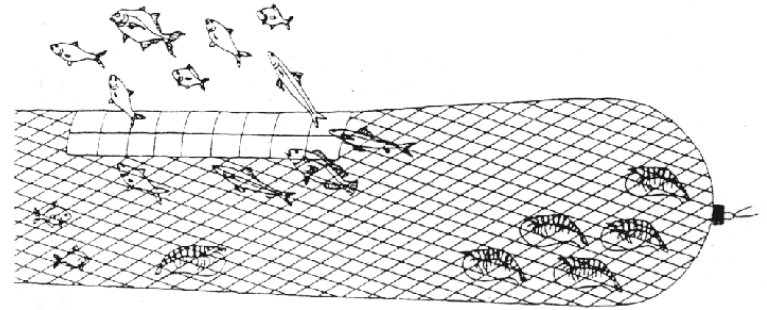


Radial escape section

(<http://www.seagrantfish.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](#))

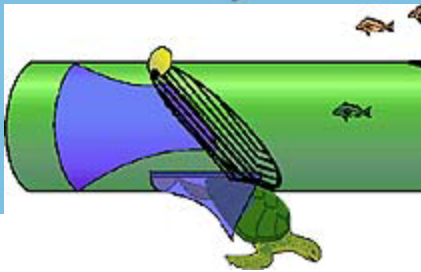
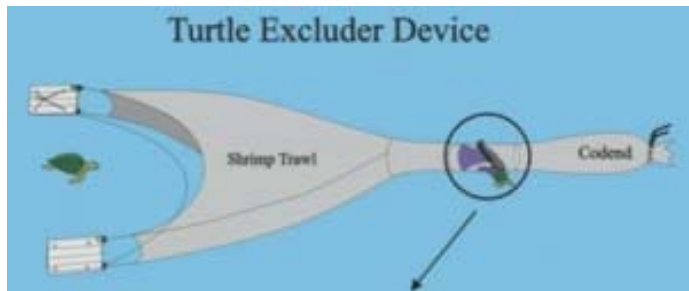
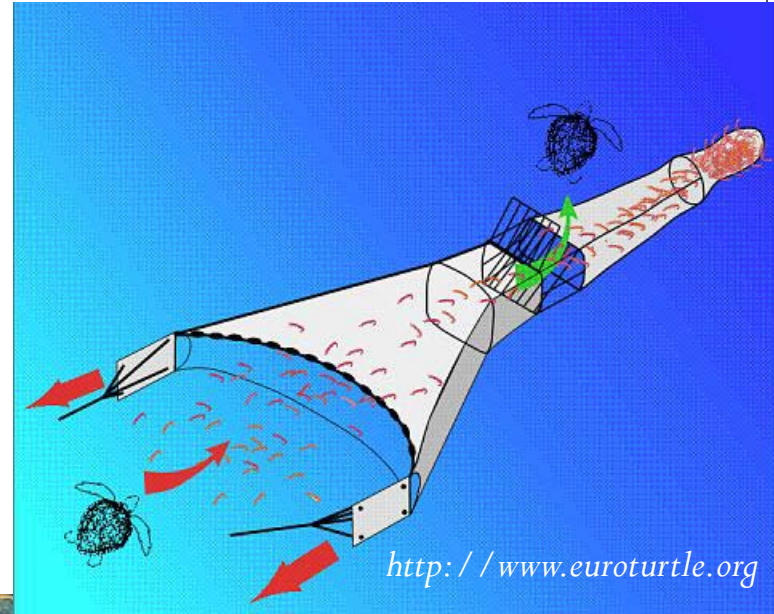
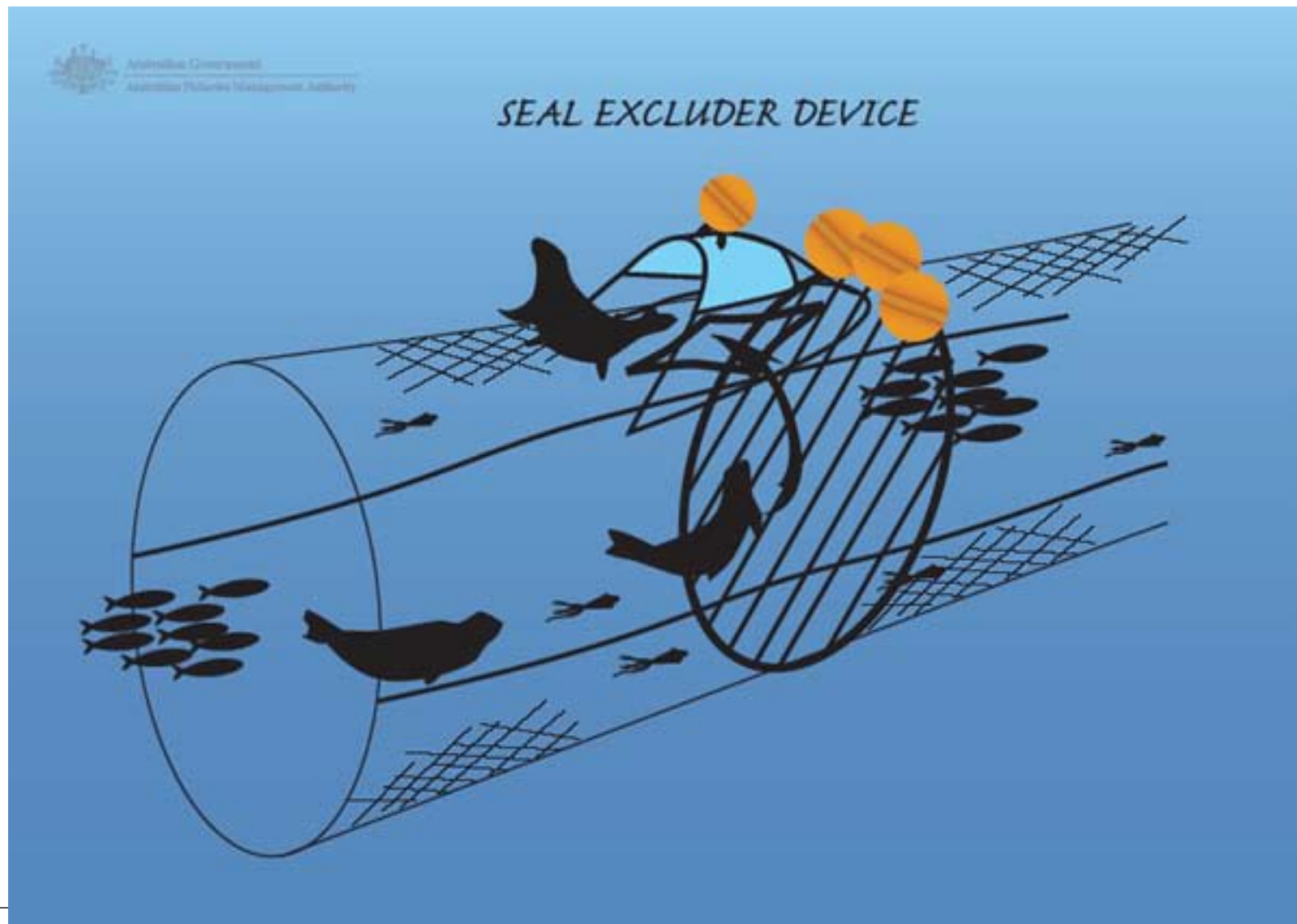


Photo: Mike Gerner, AFMA



Bycatch reduction



CATCH SENSOR

Indicates when the cod-end is full. Ensures that the trawl is fishing and tells exactly when to haul.

GRID SENSOR

Indicates the angle of the sorting grid. Instantly know when the grid is blocked or incorrectly rigged.

HEADLINE HEIGHT

Indicates the distance from the headline to the ocean floor and footgear clearance (when a slave is added).

DEPTH/TEMPERATURE SENSORS

Indicates the depth of the trawl below the surface and temperature at the trawl.

DOOR SENSORS (Single)

Provide spread between the and distance from the vessel door. Distances indicate if the marks are out and display when doors are not in line.

DOOR AND CLUMP SENSORS (Twin Trawl)

Provide spread on EACH trawl and the distances from the vessel to EACH door and clump. A middle wire adjustment indicates warp to pay out or take in to ensure doors and clump are in line.

<http://www.notus.ca/>

Trawlmaster provides the most important parameters of the trawl which allows you to fish more efficiently.

Gear Description - Finfish Trawl

Observer code	Vessel code	Trip ID
Net type (check one): <input type="checkbox"/> Midwater <input type="checkbox"/> Bottom		Net #: 1
Configuration (check one): <input type="checkbox"/> Otter trawl <input type="checkbox"/> Beam trawl <input type="checkbox"/> Other _____		
Net deployment position: <input type="checkbox"/> Stern <input type="checkbox"/> Port <input type="checkbox"/> 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)		Length (m)		Height (m)	
Weight (kg)		Type	Square / Oval / V / Other	Weight (kg)		Type	Square / Oval / V / Other
		Length (m)	Diameter (mm)			Other	
Door legs - top							
Door legs - bottom							
Penant							
Groundline							
Bridle (top leg)							
Bridle (bottom leg)							

Gear Description - Finfish

Gear Description - Finfish Trawl

Page ____ of ____

Observer code	Vessel code	Trip ID
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Net type (check one): Midwater Bottom Net #:

Configuration (check one): Otter trawl Beam trawl Other _____

Net deployment position: 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)		Length (m)		Height (m)	
Weight (kg)		Type	Square / Oval / V / Other	Weight (kg)		Type	Square / Oval / V / Other

	Length (m)	Diameter (mm)	Material	Other
Door legs - top				
Door legs - bottom				
Penant				
Groundline				
Bridle (top leg)				

<http://www.net-sys.com/>



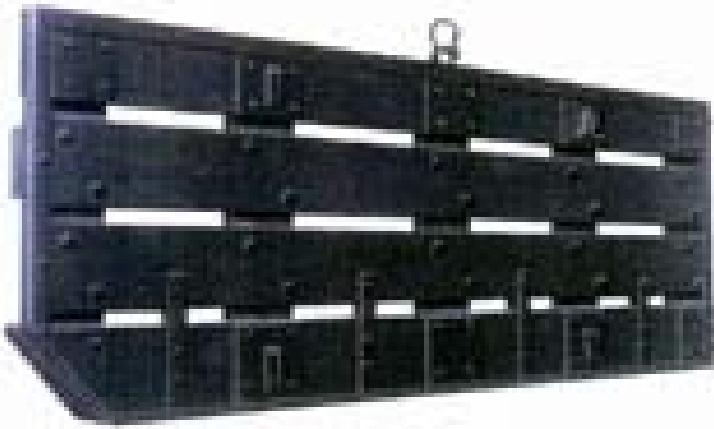
<http://www.crimond.com/>



<http://dnr.louisiana.gov/>



www.morgere.fr/



Observer code	Vessel code	Trip ID
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Net type (check one): Midwater Bottom Net #:

Configuration (check one): Otter trawl Beam trawl Other _____

Net deployment position: 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)		Length (m)		Height (m)	
Weight (kg)		Type	Square / Oval / V / Other	Weight (kg)		Type	Square / Oval / V / Other

	Length (m)	Diameter (mm)	Material	Other
Door legs - top				
Door legs - bottom				
Penant				
Groundline				
Bridle (top leg)				
Bridle (bottom leg)				

Beam Trawl

	Length (m)	Weight (kg)	Material	Other
Beam				

Beam Trawl

	Length (m)	Weight (kg)	Material	Other
Beam				
Stake				

Diameter

	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 / main wire				
3rd wire				
Headline 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 Trawl

	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 / sack			.				◇ / □
Other							
Other							

Other rigging present? Check all that apply

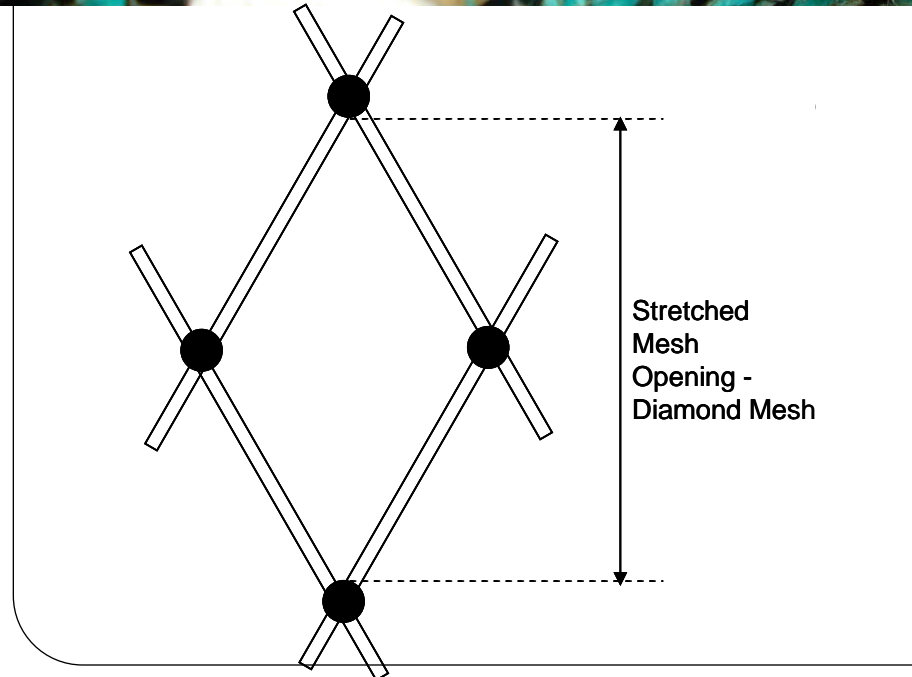
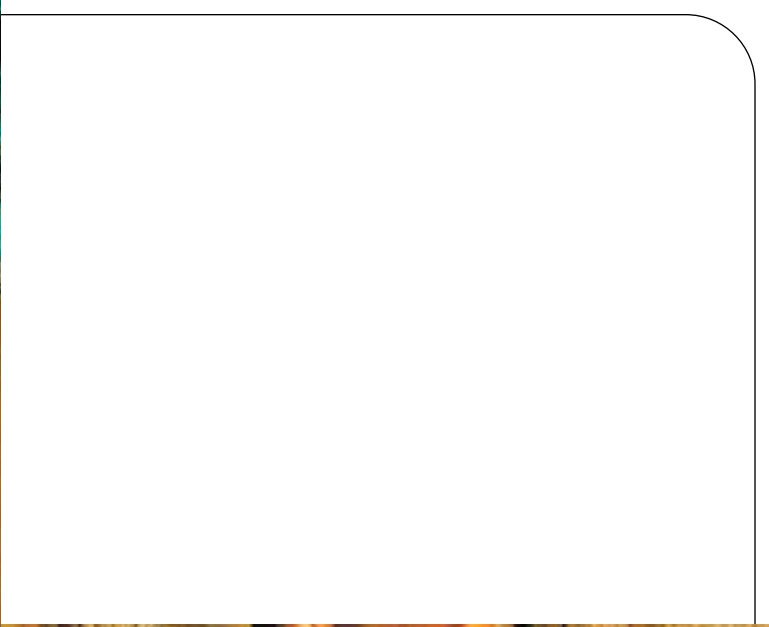
- | | | | |
|--|---|------------------------------------|---------------------------------|
| <input type="checkbox"/> Chaffing gear | <input type="checkbox"/> Vert.Streng.Strap | <input type="checkbox"/> Lazy line | <input type="checkbox"/> Other: |
| <input type="checkbox"/> Elephant ears | <input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

Photos? Y / N

Bycatch Reduction Device (BRD)

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

Courtesy of S. Sei, Sierra Leone)

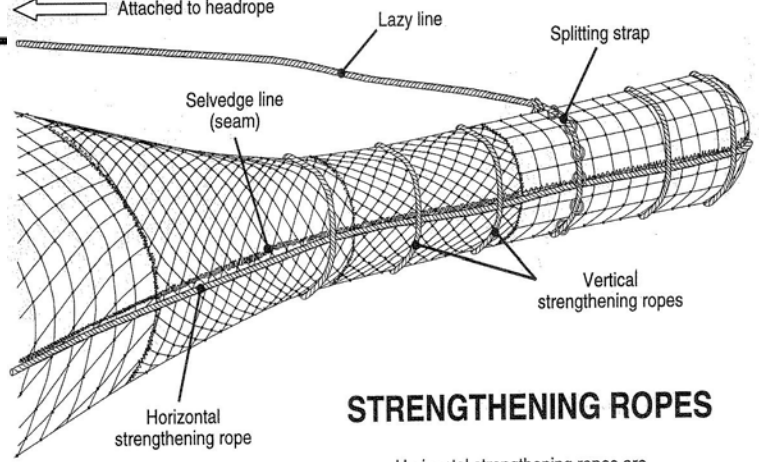
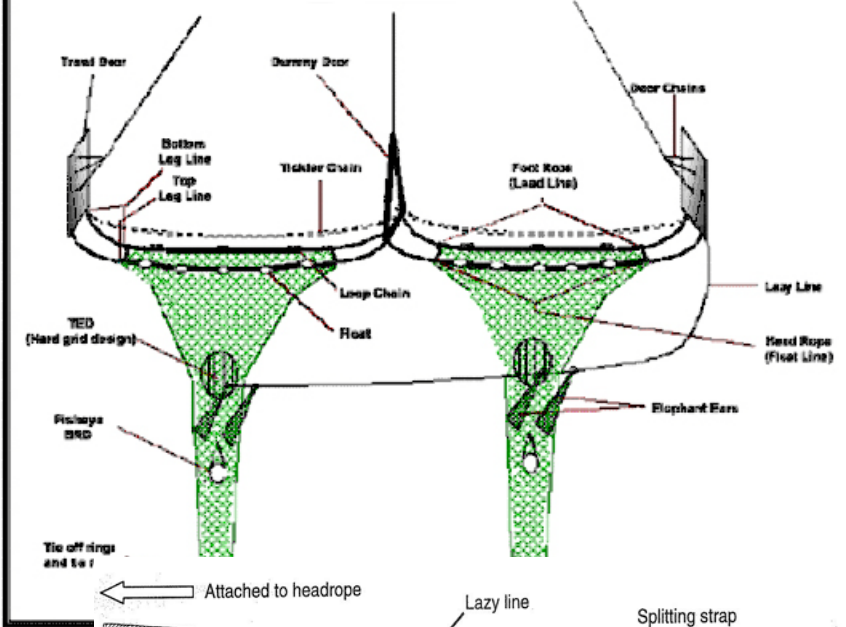


<http://www.fao.org/>

on - Finfish

otion - Finfish Trawl

Page ____ of ____



STRENGTHENING ROPES

Horizontal strengthening ropes are also referred to as *lastridge* ropes.



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"/> Other:
	<input type="checkbox"/> Splitting Strap		

Photos? Y / N

Gear Description - Finfish

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	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

Fisheye		Offset	<input type="text"/>	Radial escape section	
Opening (cm)	Width	Height	<input type="text"/>	Opening (cm)	Width
Shape			Height	Length	<input type="text"/>
<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				
<input type="checkbox"/> Other:					
			Square-mesh window		
			Opening (cm)	Width	Height

BRD notes/drawing

Comments:

Gear Description - Finfi

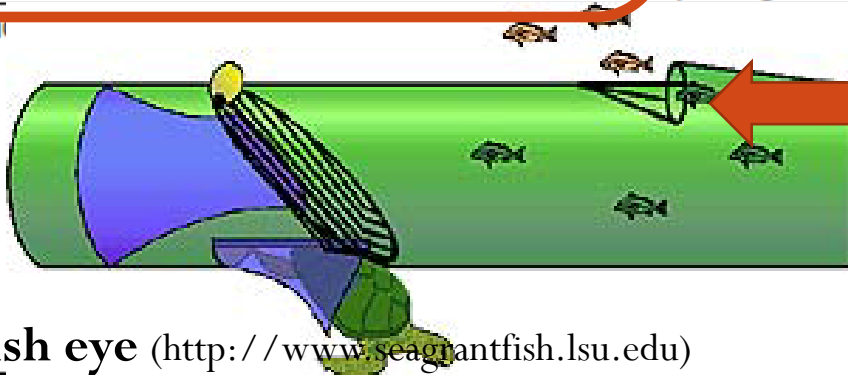
Bycatch Reduction Device (BRD)

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

Funnel Yes Distance of escape opening from head of funnel
 No Distance of escape opening from tie-off

Fisheye		Offset		Radial escape section	
Opening (cm)	Width	Width	Height	Opening (cm)	Width
Shape				Length	
<input type="checkbox"/> Oval	<input type="checkbox"/> Diamond			If not all the way around	
<input type="checkbox"/> Square	<input type="checkbox"/> Halfmoon				
<input type="checkbox"/> Rectangle	<input type="checkbox"/> Triangle				
<input type="checkbox"/> Other: _____					

Square-mesh window
Opening (cm) Width



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

Comments:

Images from Eayrs (2007)

Gear Description - Finfish



Bycatch Reduction Device (BRD)

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



f escape opening from headrope:

f escape opening from tie off rings:

m

Radial escape section

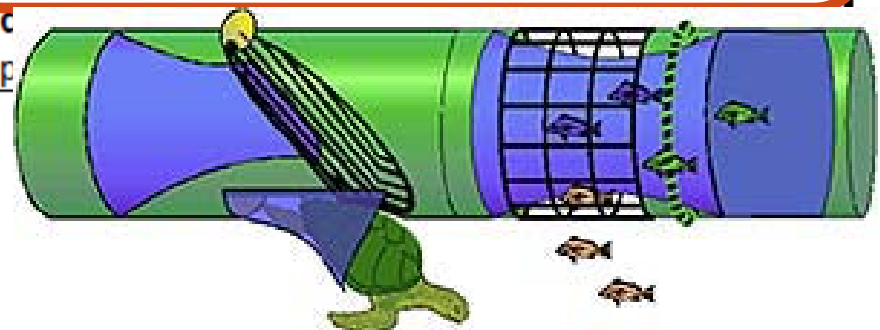
Opening (cm) Width Height

Length

If not all the way around, #openings

St

Op



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

Images from Eayrs (2007)

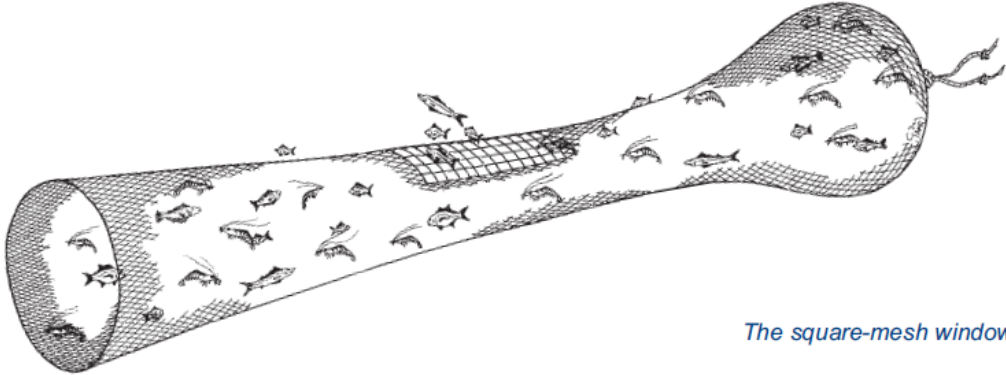
Comments:

Gear Description - Finfish

Bycatch Reduction Device			
Type:		<input checked="" type="checkbox"/> Square-mesh window	
<input type="checkbox"/> Fisheye	<input type="checkbox"/> Square-mesh codend		
<input type="checkbox"/> Radial escape section			
Funnel	<input type="checkbox"/> Yes	Distance of escape opening from	
	<input type="checkbox"/> No	Distance of escape opening from	
Fisheye	Offset		Radial escape
Opening (cm)	Width	Height	Opening (cm)
Shape		If not all the	
<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:			
BRD notes/drawing			



Square-mesh window			
Opening (cm)	Width	Height	



The square-mesh window

Comments:

Gear Description - Shrimp Trawl

Observer code	Vessel code	Trip ID
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Total # nets:

Vessel configuration: Outrigger Stern trawler

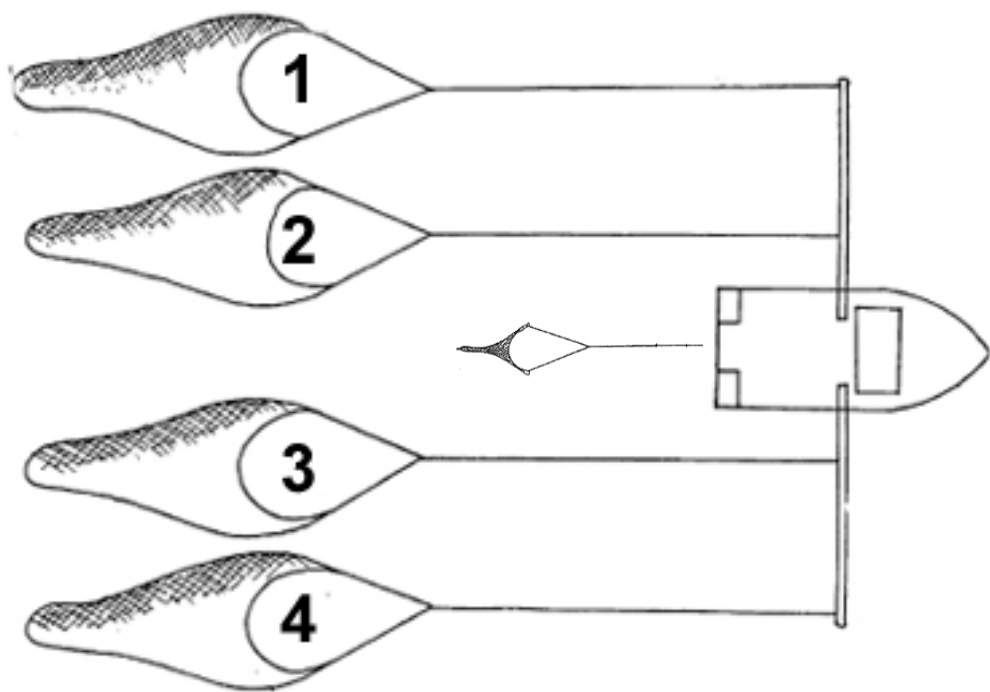
Net # / position (check one or more if nets are identical; see manual for position diagram)

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

Net Manufacturer / design name:

Material:	<input style="width: 95%;" type="text"/>
Length (m)	<input style="width: 95%;" type="text"/>
Weight (kg)	<input style="width: 95%;" type="text"/>
Bridle (m)	<input style="width: 95%;" type="text"/>
Bottom leg (m)	<input style="width: 95%;" type="text"/>
Top leg (m)	<input style="width: 95%;" type="text"/>
Bottom leg line (m)	<input style="width: 95%;" type="text"/>
Warp (m)	<input style="width: 95%;" type="text"/>
Foot rope (m)	<input style="width: 95%;" type="text"/>

D)



my	<input style="width: 95%;" type="text"/>
Steel / Wood /	<input style="width: 95%;" type="text"/>
(m)	<input style="width: 95%;" type="text"/>
e	<input style="width: 95%;" type="text"/> Square / Oval / V / Other
Other	<input style="width: 95%;" type="text"/>
	<input style="width: 95%;" type="text"/>
	<input style="width: 95%;" type="text"/>
	<input style="width: 95%;" type="text"/>
	<input style="width: 95%;" type="text"/>
ts:	<input style="width: 95%;" type="text"/>

Observer code	Vessel code	Trip ID
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Total # nets:

Vessel configuration: Outrigger Stern trawler

Net # / position (check one or more if nets are identical; see manual for position diagram)

Port - outside (1) Stbd - inside (3) Try net (5)

Port - inside (2) Stbd - outside (4) Location: _____

Net Manufacturer / design name: _____

Doors - Main				Doors - Dummy			
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

	Length (m)	Diameter (mm)	Material	Other
Bridle (door chain)				
Top leg line				
Bottom leg line				
Top leg line-dummy				
Bottom leg line - dummy				
Warp / Main wire				
Head rope				# floats:
Foot rope				
Tickler chain				Weight:
Loop chain				

Bottom leg line - dummy				
Warp / Main wire				
Head rope				# floats:
Foot rope				
Tickler chain				Weight:
Loop chain				

Net Characteristics

Total length (m):		Mouth width:			Mouth height:		
	Material	Diameter (mm)	Mesh open (cm)	W / D	# meshes horiz	# meshes vert	Other
Wing			.				
Trawl body			.				
Extension			.				
Codend / sack			.				◇ / □
Other							
Other							

Other rigging present? Check all that apply.

- Elephant ears
 Choke rings
 Lazy line
 Other:
- Chafing gear
 Other:

Comments:

Gear Description - Shrimp Trawl

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		Distance of escape opening from headrope:	<input style="width: 100px; height: 20px;" type="text"/> m
<input type="checkbox"/> Yes		Distance of escape opening from tie off rings:	<input style="width: 100px; height: 20px;" type="text"/> m
<input type="checkbox"/> No			
Fisheye	Offset	<input style="width: 50px; height: 20px;" type="text"/>	<input style="width: 50px; height: 20px;" type="text"/>
Opening (cm)	Width	Height	<input style="width: 50px; height: 20px;" type="text"/>
Shape		Radial escape section	
<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:		Opening (cm)	Width
		Length	Height
		If not all the way around, #openings	
		<input style="width: 50px; height: 20px;" type="text"/>	
		Square-mesh window	
		Opening (cm)	Width
		Height	<input style="width: 50px; height: 20px;" type="text"/>
BRD notes/drawing			

Turtle Excluder Device (TED)	
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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: _____

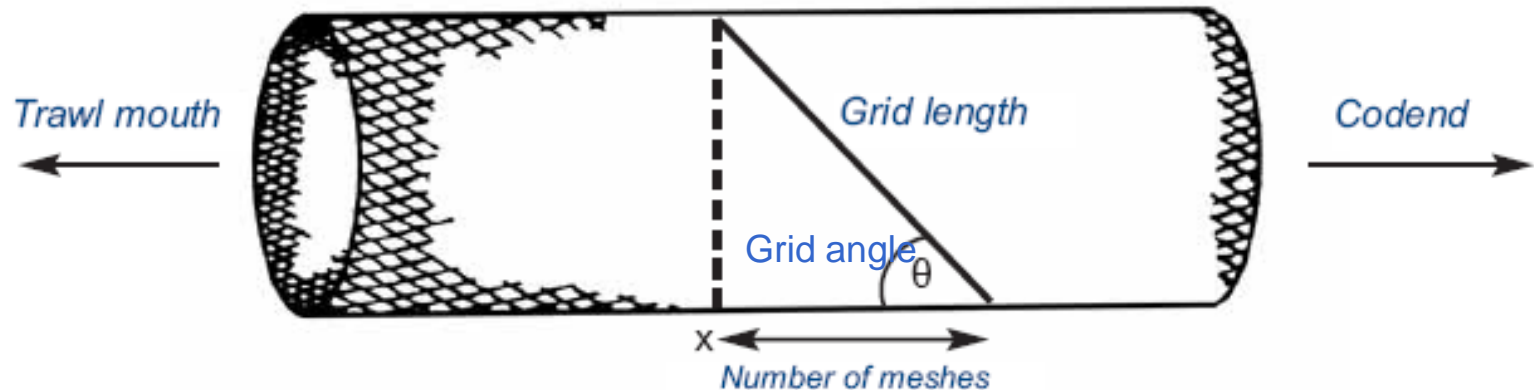
Dimensions _____ Distance of TED from headrope: _____ m

Length: cm **# TED Floats:** _____

Width: cm **Float material** Sponge / Foam / Plastic / Other: _____

Bar Spacing: cm **Float shape** Round / Cylinder / Bullet / Ellipsoid

TED notes/drawing



Photos? Yes / No

Activity

- Handout
- Groups of 2 or 3
- 20 minutes
- *use mini net in front of room for your codend mesh size.
Record your measurements and average mesh size calculation.

Gear Description - Finfish Trawl

Observer code FS345	Vessel code LIB 9997	Trip ID 7
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Net type (check one): Midwater Bottom Net #: **1**

Configuration (check one): Otter trawl Beam trawl Other _____

Net deployment position: Stem Port Stbd

Net Manufacturer / design name: *Crimond nova demersal*

Otter Trawl							
Doors - Main				Doors - Dummy			
Material:	Aluminum / Steel / Wood / Other			Material:	Aluminum / Steel / Wood / Other		
Length (m)	2.4	Height (m)	2.0	Length (m)		Height (m)	
Weight (kg)	1000	Type	Square / Oval / V / Other	Weight (kg)		Type	Square / Oval / V / Other
	Length (m)	Diameter (mm)	Material	Other			
Door legs - top	4.03	1.2	<i>chain</i>				
Door legs - bottom	3.5	1.2	<i>chain</i>				
Penant	4.2	1.2	<i>chain</i>				
Groundline	6	20	<i>wire cable</i>				
Bridle (top leg)	7.2	15	<i>wire cable</i>				
Bridle (bottom leg)	6	15	<i>wire cable</i>				

Height = 2 m



Length = 2.4 m

Groundline				
Bridle (top leg)				
Bridle (bottom leg)				

Beam Trawl				
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	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:

Otter and Beam Trawl				
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	Length (m)	Diam (mm)	Material	Other
Warp / main wire	400	25	steel cable	
3rd wire				
Head rope	52	20	nylon	# floats: 18
Foot rope	60	22	weighted synthetic	
Selvedge line	11	60	Dyneema	
Tickler chain	65	10	chain (steel)	Weight: 100kg
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	8	25	rubber	How many? 15
Rubber spacer	15	10	rubber	How many? 32
Other				

Net Characteristics							
Total length (m):		Mouth width:			Mouth height:		
	Material	Diam. (mm)	Mesh open (cm)	W / D	# meshes long	# meshes around	Other
Wing	Polyethelene	3.5	15.0		25	100	
Trawl body	Polyethelene	3.5	12.0		30	65	
Extension			.				
Codend / sack	Polyethelene	3.5	8.25	W	110	76	 / □
Other							
Other							

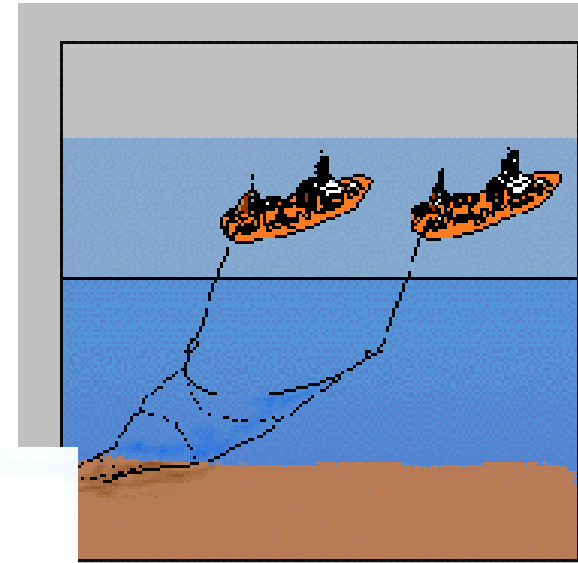
Other rigging present? Check all that apply.

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

Photos? Y / N

Summary

- Can you name the trawl configurations below



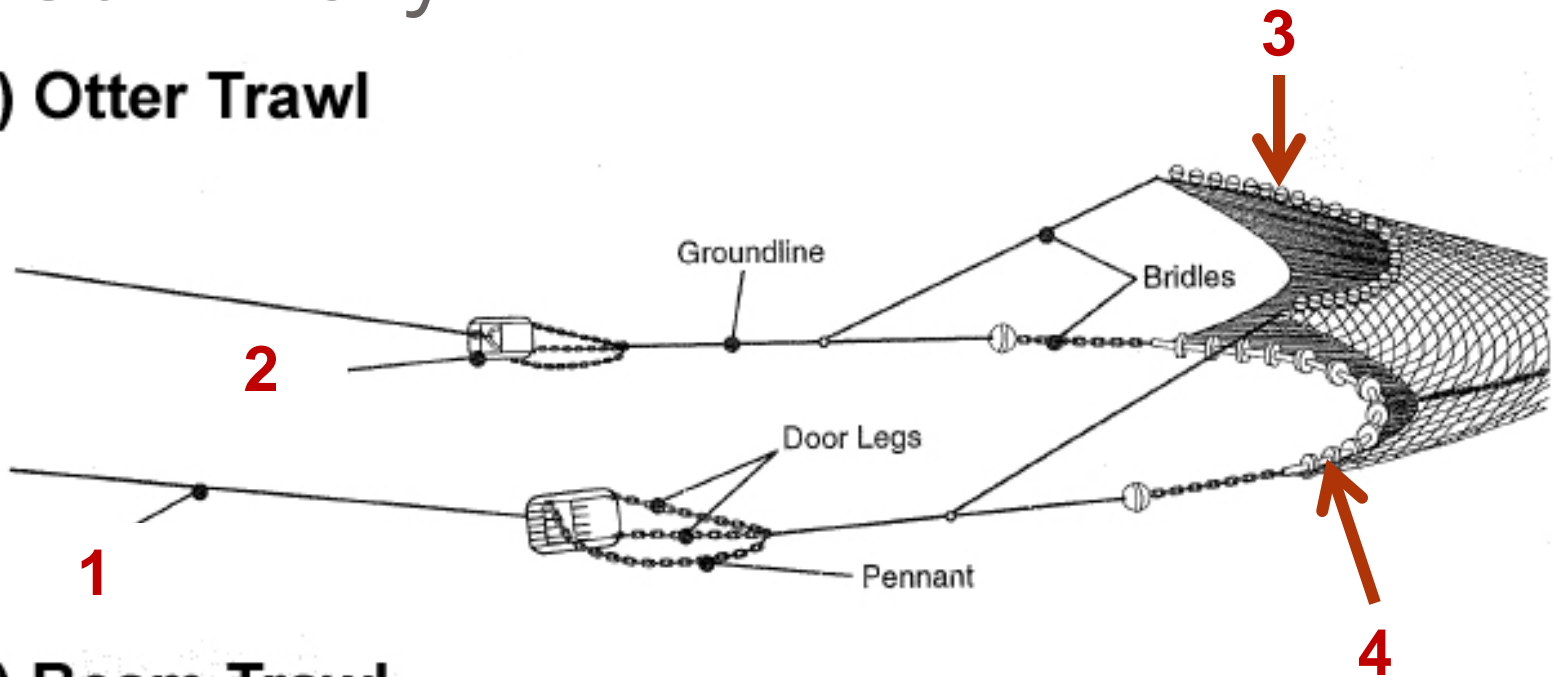
• Beam trawl /

otter trawl /

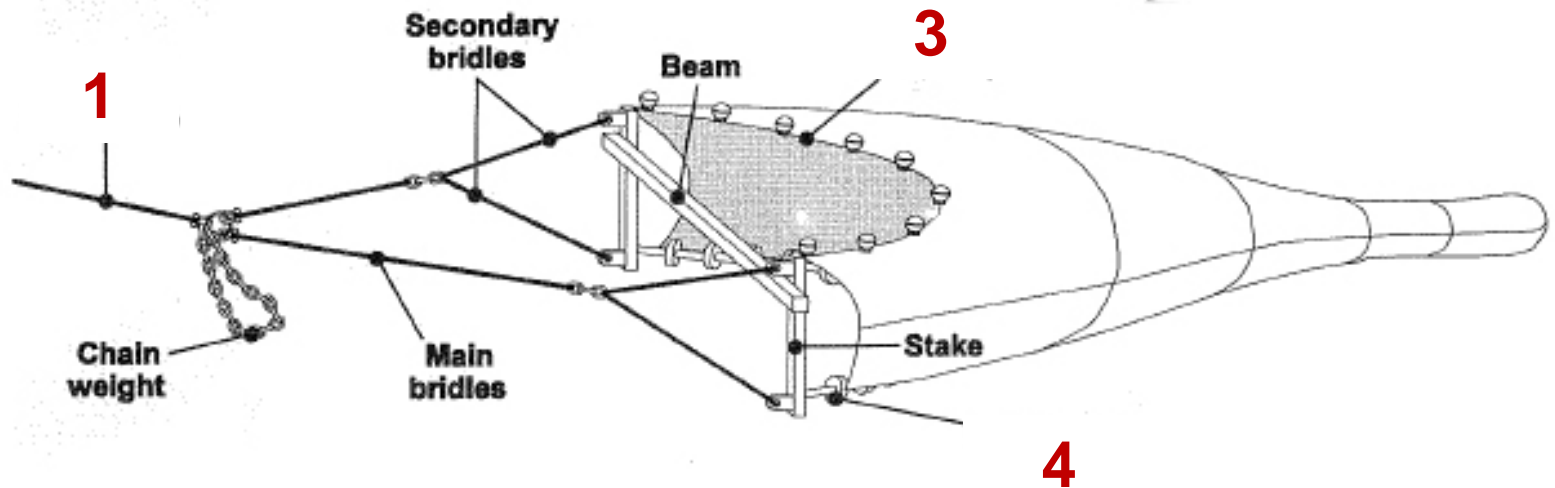
pair trawl

Summary

A) Otter Trawl



B) Beam Trawl



Summary

- Describe how trawl gear works

References

- Eayrs, S. 2007. A Guide to Bycatch Reduction in Tropical Shrimp-Trawl Fisheries. Revised edition. Rome, FAO. 108 p.
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- 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**.