



SmartFish  
Working Papers

No 021

# Health and Safety at Sea



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*European Union*



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## Health and Safety at Sea



## Health & Safety at Sea

### **Instruction on;**

- Introduction to basics of survival in the event of an accident or emergency
- Vessel safety and safety equipment and apparel safe working practices.
- Transfers at sea
- Maintaining health and being able to administer self-first-aid

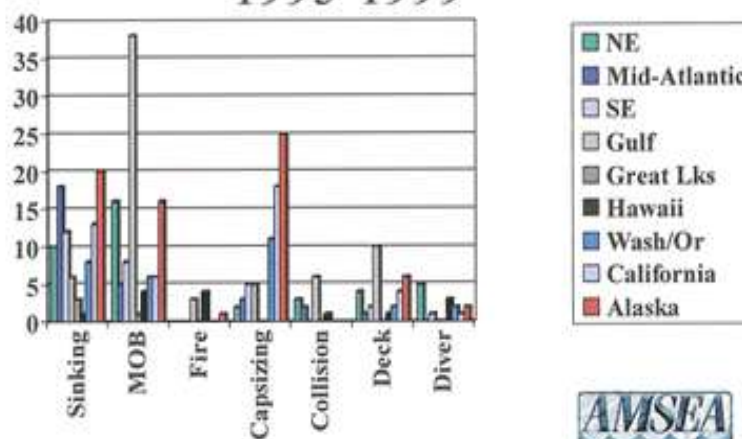
### **Trainees must have a good understanding of;**

- Their role and position in the event of an emergency on-board a vessel
- The safety gear that must be worn when working on deck
- Working knowledge of the safety equipment found on-board a vessel
- Understanding of safe working practices
- Understand basic health issues that may be experienced at sea and know how to deal with these

## Types of Accidents at Sea

- Capsizing
- Grounding
- Fire
- Collisions
- Foundering / Sinking
- Man Overboard (MOB)
- Personal Injury

## F/V Fatalities\* by Cause 1995-1999



\* Does not include deaths from natural causes, overdoses, suicides or unknown



Safety training includes:

- Survival at sea
- First aid
- Fire fighting



All these involve training in reactive actions to deal with the loss of a vessel, an injury or a fire onboard.

Equally important is training in *preventative actions* or *pro-active safety training* to prevent accidents from occurring in the first place.

- Safety training leads to a heightened awareness of safety issues
- Through this awareness many accidents and or disasters can be averted
- Need to cultivate an attitude and commitment to safe working practices
- Short cuts, neglect to wearing safety gear or leaving equipment unsecured put other peoples lives at risk as well as your own

- Overall safety onboard is Captain's responsibility
- All aspects involving safety onboard - Observer falls under the authority of the Captain
- Observers must familiarise themselves on the general & emergency alarms and the emergency procedures onboard

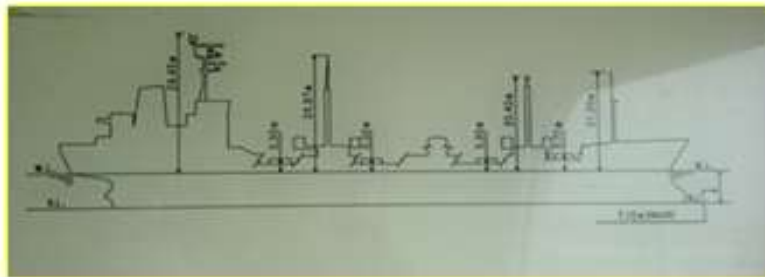


Observers will be issued with the following health & safety equipment:

- 1 x Personal Floatation Device;
- 1 x Hard hat (to European Standard EN397 "Industrial Safety Helmet");
- 1 x Pair of Safety Boots

## Familiarisation tour of the vessel:

- Conducted by senior officer shortly after boarding
- Remind the Captain of this requirement
- Be prepared to undertake their own tour to familiarise themselves with the vessel layout



## Responsibility of observer to be aware of location of the following in relation to their cabin and the vessel layout:

- their emergency muster station and life rafts
- fire extinguishers, breathing apparatus & water hoses
- ring buoys, tethering lines & strobes on upper deck
- first aid kits
- distress rockets/signalling devices
- EPIRB's
- life jackets and survival suits



## **Code of Safe Working Practices for Merchant Seamen**

**Safe practices when working in the vicinity of  
winches and derricks**

**Dangers when working near open hatches**

**Maintaining watertight integrity with respect to  
opening and closing hatches and bulkhead doors**

**Protective clothing, protective footwear and  
headgear**

**Dangers and safety procedures for entering  
enclosed or confined spaces**

## **Code of Safe Working Practices for Merchant Seamen (cont.)**

**Understanding of the refrigeration systems and  
dangers of leaking refrigeration gasses.**

**Dangers and safety procedures when working  
on the upper deck**

**Safety procedures for personnel transfers using  
small craft at sea**

## Health and Safety

### Working on the Upper-deck

Identify the Hazards (Ask the question)

- Is there a source of potential harm?
- What or who could cause the harm?
- How could it occur?

### Hazards on Deck

Class Exercise  
Identify Hazards



## What are the Objectives

- Observe the setting and hauling of fishing gear.
- Sampling catch in the factory

## Determine the Risk

- Where do you have to be to achieve your objectives
- What are the risks?
  - Being caught by moving equipment, derricks' or entangled by rope
  - Falling or being knocked into the open hatch

## Protective Gear

- Protective gear or equipment DOES NOT reduce the hazard
- It can only protect against harm or injury
- NOTE Protective gear can also increase the risk!!
  - Lanyards can get fouled or hook up in moving machinery.
  - Protective glasses can restrict vision.
  - Bulky suits or PFD can restrict movement

## Protective Gear

- Footwear – Safety Boots
  - Steel toecaps
  - Ankle protection
  - Good soles that will not easily slip on deck
  - Soles must be resistant to oil and chemicals
  - Comfortable – You will be standing for many hours

## Protective Gear

- Safety Harness and Safety Line
  - Safety harnesses should be worn and a safety line attached when working
  - close to open hatches or
  - against the ships railings where the danger exists of falling overboard or
  - there is a danger of a fall of more than two meters
  - *IT MUST ALWAYS BE KEPT IN MIND THAT THE SAFETY LINE CAN ALSO GET ENTANGLED WITH MOVING MACHINERY OR GEAR.*

## Protective Gear

- Protective Glasses
  - Working on the deck and looking up at the overhead slings there will always be a danger of falling objects.
  - Good glasses should be
    - Shatterproof
    - Protect against UV light
    - Comfortable
    - May need more than one pair for being able to work at night

## Protective Gear

### Hard Hat

- There will always be a danger of falling objects from overhead.
  - A hard hat must be worn at all times when working or moving around on the upperdeck

## Protective Gear

### Reflective Vest

- A brightly colored Jacket with reflective strips assists in maintaining a high visibility index.
  - Assists the machine operators in being able to visually keep track of your movements

# Protective Gear

## Personal Floatation Device

- A PFD must be worn whenever working on the upper-deck and there is a danger of falling overboard.
  - The Observer will have to assess this risk against the layout of the vessel, weather conditions and the area where they are working.

## Moving around on Deck

### *Ring bolt Kickers*



## Moving around on Deck

### **LOOK UP- LOOK DOWN-LOOK AROUND**

- Wear your safety boots.
- Wear your hard hat
- Don't swing on or jump over -
  - Stair rails
  - Guard rails
  - Pipes
  - Open hatches

## Hazards to note when moving around on deck

- Tripping over fittings, frames or pipes
- Be aware of open manholes and hatches
- Close hatches, manholes after passing through them
- Be careful of spillages of oil, grease or soapy water
- Be careful of wet decks from sea spray or rain.



## Hazards to note when moving around on deck



- In adverse weather there is always a danger of a sudden heavy roll or pitch
- Be careful of loose objects that have come loose or have not been lashed down
- Be aware of wires and ropes lying loose on the deck
- A sling lying on the deck that suddenly snatches up between your legs (ooo!!)

## Hazards to note when moving around on deck

- Avoid or be careful in areas where there is poor lighting
- Don't trust temporary guard rails around open hatches.

## Emergency Communication

### Emergency Communications

The chances are that in an emergency situation your knowledge of English may put you in the situation where you will be the most qualified to send off a distress signal or communicate with rescue vessels

These procedures have already been covered in your Survival Course.

### Emergency Communications



## Emergency Communications

- The Emergency frequencies are
  - VHF Channel 16
  - 2182.0 kHz SSB
  - 4125.0 kHz SSB
  - Inmarsat Terminal has a “single press” distress button (Need to hold it down for 7 seconds)

## Emergency Communications

### **Distress Call (remain calm speak clearly)**

- MAYDAY MAYDAY MAYDAY (x 3)
- Vessel Name (x3)
- Position (check GPS if possible)
- Nature of Emergency
- Number of Crew
- Description of the vessel
- Transmitting frequency
- (Repeat as often as possible allowing time interval for a reply and as long as your time allows)
- (In extreme emergency transmit only first 4)





## Transferring Between Vessels

### Transferring between Vessels

Transfers at sea may become necessary to return an Observer back to port or in special circumstances to place an observer onboard a vessel already at sea using a transfer vessel from port.

Methods of transfer can possibly be either by boat or by sling using a cargo net or basket.

## Transferring between Vessels



## Transferring between Vessels



## Transferring between Vessels

- Insist on advanced notice of transfer (twenty four hours minimum)
- Transfers must only take place in suitable weather and sea conditions.
- Transfers must take place during daylight and with at least three hours of daylight remaining

## Transferring between Vessels

- Don't be rushed
- Don't transfer unless you are happy that all the safety requirements are in place.



## Transferring between Vessels

### Transfer by boat

- Prepare a check list ahead of time to be sure that you do not forget anything
- Pack electronic gear and your clothes in a “Dry Bag” and secure in the transfer boat
- Wear your PFD, hard hat and suitable foot ware for climbing ladders
- Cold water conditions – wear your upperdeck work suit

## Transferring between Vessels

- The two vessels must be within a reasonable distance from each (few hundred meters NOT kilometres)
- Check the transfer boat for sea worthiness
- Check the propulsion. *(Often outboards are not tested ahead of time or regularly serviced and can easily break down during the transfer)*
- The transfer boat must be crewed by at least two competent seamen.

## Transferring between Vessels

When climbing off the vessel check ladders are secure.  
(Don't jump)

When boarding from the transfer boat first give the ladder a hard pull to check there is no slack and it is secure.



## Transferring between Vessels

- If being lowered with the transfer boat **HOLD ONTO YOUR LIFE LINE** until the boat is in the water.
- Similarly when being hoisted hold onto your life line until the boat is secured inboard.

## Transferring between Vessels

### Transfer by cargo net or basket

- Make sure a line is attached to both points for greater control and to reduce swinging
- Crouch down as low as possible to lower your centre of gravity
- Wear your hard hat and PFD.
- Keep your fingers and elbows inside the basket or net

## Transferring between Vessels

### Transfer by cargo net or basket

Correct position



## Transferring between Vessels

Transfer by cargo net or basket

Incorrect position



### Fisheries Observer Training

## Role of Observers / Fisheries Officers

Subject	Expected Outcomes	Training Sessions	Presentation Methods
<p>Role of Observers / Fisheries Officers</p> <p>Defining the role of Observers and Fisheries Officers in fisheries.</p>	<p>Understanding of;</p> <ul style="list-style-type: none"> <li>• Primary objectives of observers in an advisory, data collection and non-compliance role</li> <li>• Primary objective of Fisheries Observers in monitoring fisheries and recording of evidence for compliance.</li> <li>• Qualifications and training required for an observer</li> <li>• Observers Code of conduct</li> <li>• Protocols and Conduct on-board vessels</li> <li>• Cultural awareness</li> </ul>	<p>One session</p>	<p>Introductory lecture</p> <p>Power-Point</p>

## **Role of Observers / Fisheries Officers**

- Compliance Officers
- Fisheries (Scientific) Observers

## **Role of Observers / Fisheries Officers**

### **Compliance Officers**

- policing a fishery
- adheres to the management principles
- power to prosecute
- discourage illegal fishing practices
- information on other IUU vessels

## **Role of Observers / Fisheries Officers**

### Fisheries (Scientific) Observers

- Have wide-ranging objectives
  - Sea-Based Scientific Data Collectors
  - Land-Based Observers

## **Role of Observers / Fisheries Officers**

### Fisheries (Scientific) Observers

- Have wide-ranging objectives
  - Sea-Based Scientific Data Collectors
  - Land-Based Observers
- not employed in enforcement role
- overall function to collect accurate data for the efficient management of the resources

## **Role of Observers / Fisheries Officers**

Observers working at sea are in a unique position

- not affiliated with the vessel's personnell
- required to work alone
- for long periods
- without direct supervision or assistance

To be successful in this environment, they require

- high level of integrity
- personal self-motivation
- qualifications and training

## **Role of Observers / Fisheries Officers**

Qualifications and training required to be an observer

- proficiency in languages of the programme
- numeric competency
- mandatory certification
  - A "Certificate of Medical Fitness"
  - Certificate for Survival Techniques and Occupational Health and Safety at Sea

## **Role of Observers / Fisheries Officers**

Objectives of the Observer are to observe and record, accurate data

Operational Data includes

- trip details
- vessel's specifications
- fishing gear specifications
- electronic equipment
- composition of the catch
- oceanography & weather
- interactions with seabirds and marine mammals.
- waste management

## **Role of Observers / Fisheries Officers**

Biological data on the target and by-catch species include:

- Lengths and weight,
- sex and maturity,
- diet otoliths for age and growth data
- handling and processing of the catch
- Product conversion ratios



## **Role of Observers / Fisheries Officers**

Observer Code of Conduct and Protocols

Require that they do not participate in any activity, which would

- Question their impartiality or objectivity
- impair ability to perform duties
- Adversely affect the efficient accomplishment of the Program's mission

## **Role of Observers / Fisheries Officers**

Observer Code of Conduct and Protocols

- Observers may not solicit or accept, directly or indirectly, any gratuity, gift, favour, entertainment, loan or anything of monetary value from anyone who conducts activities that are regulated by the fishery, or who has interests that may be substantially affected by the performance or non-performance of the observers' official duties.

## **Role of Observers / Fisheries Officers**

### Observer Code of Conduct and Protocols

- may not serve as observers on any vessel or at any shore-side facility owned or operated by a person who previously employed the observer in any capacity.
- Observers may not solicit or accept employment as a crew member or an employee of the vessel or shore-side processor in any fishery while employed as an observer.
- Observers may not engage in an activity that may give rise to the appearance of a conflict of interest that may cause another individual to question the observer's impartiality, fairness or judgment.

## **Role of Observers / Fisheries Officers**

### Observer Code of Conduct and Protocols

- Observers must refrain from engaging in any illegal actions or any activities that would reflect negatively on their image, on other observers, or the Observer Program, as a whole. This includes, but is not limited to:
  - Engaging in drinking of alcoholic beverages while on duty
  - Engaging in the use or distribution of illegal substances
  - Becoming physically or emotionally involved with vessel personnel

## **Role of Observers / Fisheries Officers**

### Observer Code of Conduct and Protocols

- Observers shall treat as confidential all information with respect to the fishing operations of the vessel on which they are deployed.
- Observers shall comply with requirements established in the laws and regulations of the Flag State that exercises jurisdiction over the vessel to which the observer is assigned
- Observers shall respect the hierarchy and general rules of behaviour which apply to all vessel personnel,

## **Role of Observers / Fisheries Officers**

### Observer Code of Conduct and Protocols

- In all aspects involving the vessel's operation and safety at sea, the Observer will fall under the authority of the Captain
- Fisheries Observers will have no authority to advise or direct any of the vessel's operational activities or have any authority over any of the vessel's personnel
- Fisheries Observers should have access to all operational areas of the vessel necessary to complete their work
  - However, the observer should attempt to secure co-operation with the officers to ensure that their work does not interfere with the normal fishing and operational activities

## **Role of Observers / Fisheries Officers**

### Observer Code of Conduct and Protocols

Observers are afforded officer status and are expected to conduct themselves as such.

- Do not to wear working clothes in the accommodation or in the mess room.
- Mealtimes should be strictly adhered
- It is normal practice to change into acceptable attire before taking your meals.
- The observer's living and working areas must be kept clean and tidy. *Cleanliness and tidiness are also a safety factor.*
- The observers gear must be kept clean and secured

## **Role of Observers / Fisheries Officers**

### Observer Code of Conduct and Protocols

Observers must be aware and sensitive to the cultural practices of other members onboard. Cultural awareness includes;

- Manners of approach and address to officers and crew
- Awareness of eating customs
- Awareness and respect of religious practices
- Awareness of ablution and sanitary customs
  - A breach in this protocol can seriously offend the other parties. By not being aware or understanding these protocols you may not understand why or how this offence was caused

# **Role of Observers / Fisheries Officers**

## **Observer Training Requirements**

- Ship layout and terminology.
- Meteorology and Oceanography.
- Navigation and navigational aids.
- Fishing methods and related equipment.
- Onboard data collection procedures
- Catch and biological sampling methods.
- Identification of commercial and by-catch species
- Fish and crustacean biology.
- monitoring interactions with er marine fauna
- Marine mammal & Sea bird identification.
- Understanding of fisheries management and stock assessment.
- Quota allocations and permit conditions.

## Fisheries Law

### **Fisheries Law**

<b>Fisheries Law</b>  Provide an overview of the national legislation governing its fisheries and an introduction to UNCLOS.	Trainees need to have a basic understanding of the acts and specific regulations that will provide the legal basis for their work. Specifically they will need to know <ul style="list-style-type: none"><li>• Vessels licencing requirements</li><li>• Authorised fishing areas</li><li>• Authorised fishing gear</li><li>• Authorised and prohibited species</li></ul>	Class lectures Power-Point Class participation Practical tasks & feedback.
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### **Fisheries Law**

The main purpose of fisheries legislation is to provide a legal basis for management of a fishery, thus creating a legal framework governing exploitation.

"Fisheries law" comprises of

- legislation
- regulations
- administration
- international agreements

All of which can be shaped by a government into a set of instruments for implementing fisheries policy.

## **Fisheries Law**

The placement of observers in terms of national and/or international programs requires a

*legal mandate*

Embodied in the *Fisheries Law*

The mandate provides the legal obligation for the observer and outlines the conditions for their deployments.

## **Fisheries Law**

The mandate for observers prescribed through a number of organisations involving both national and international fisheries

- National Fisheries in *licence conditions*
- Regional Fisheries Management Organisations(RFMOs) in *Recommendations and Resolutions*
- Fisheries Scientists *seeking specific data*

# Fisheries Law

## Three Scenarios Exist

- *National flagged vessels operating within their Exclusive Economic Zone (EEZ).*
  - Conform to the licence conditions of flagged state
  - smaller vessels in the artisanal fishery & operate closer inshore & Short trips
- *National flagged vessels operating on the high seas & RFMO*
  - conform to licence conditions of flagged state & RFMO
  - Larger Vessels longer trips
- *Foreign flagged vessels with National permits for EEZ & High Seas*
  - vessels operate on both high seas and EEZ
  - Larger vessel and longer trips (up to several months)

# Fisheries Law

## **Organisations Mandate for Observer Deployment**

Regional Fisheries Organisations to influence the terms and conditions for observer deployment are:

- National Fishing Authority
- The Indian Ocean Tuna Commission (IOTC)
- South West Indian Ocean Fisheries Observer Program (SWIOFP)



## Vessels layout and Terminology

# Vessel Layout & Terminology

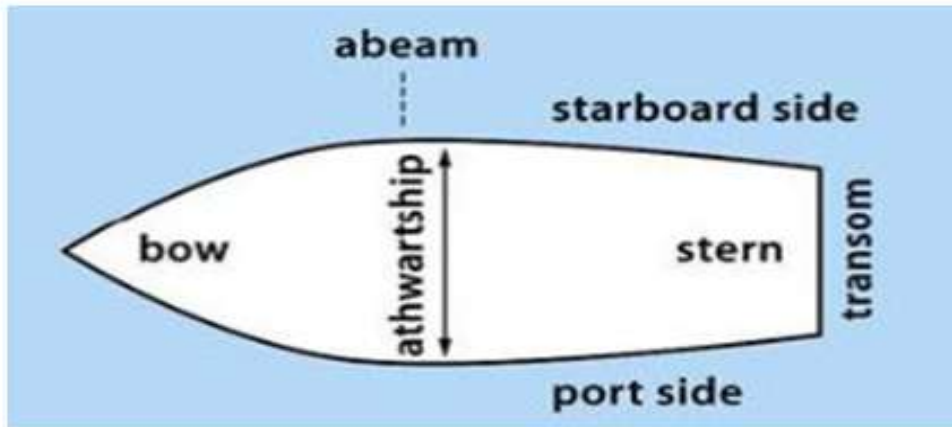
Subject	Expected Outcomes	Training Sessions	Presentation Methods
<b>Vessel Layout and Terminology</b>  Provide a basic guide to vessel terminology, equipment and the rank and role of the vessel personal.	Trainees need to achieve a basic working knowledge of; <ul style="list-style-type: none"><li>• Vessel layout</li><li>• Vessel Markings</li><li>• Nautical terminology</li><li>• Electronic equipment found on the bridge</li><li>• Rank and function of the key officers and crew.</li></ul>	One session	Introductory lecture  Power-Point

## Vessel Layout & Terminology

- Nautical terminology
- Observer need to relate nautical terms to their working environment

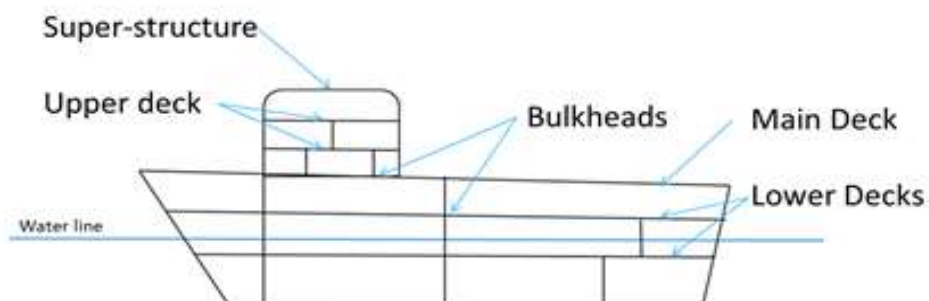


## Vessel Layout & Terminology



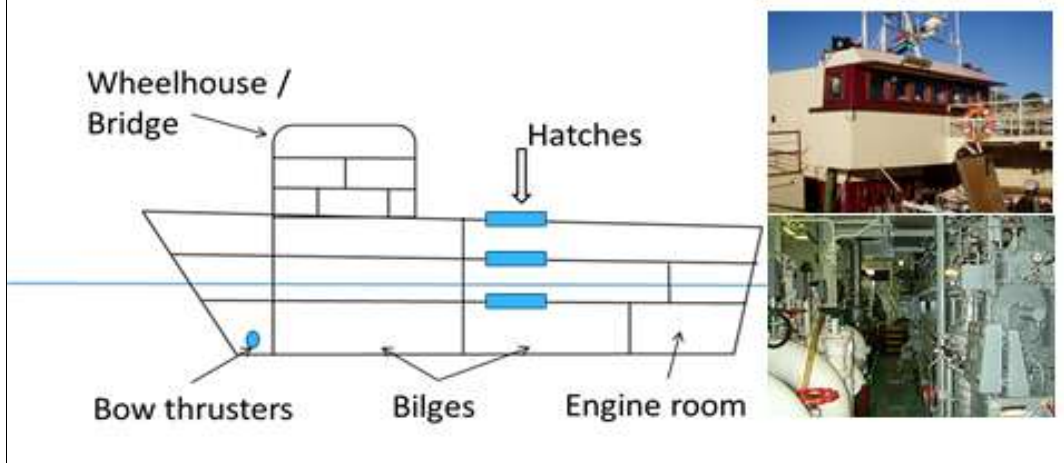
## Vessel Layout & Terminology

### Decks & Superstructure



# Vessel Layout & Terminology

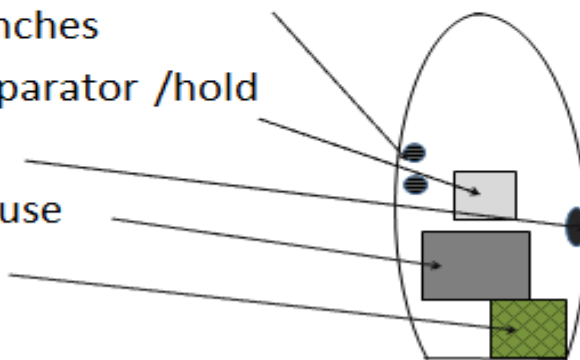
## Miscellaneous Nautical Terminology



# Ship Layout & Terminology

## Operational Areas On-board Purse-Seiner

- Purse winches
- Water separator /hold
- Triplex
- Wheelhouse
- Net Bin



## Vessel Layout & Terminology

### Miscellaneous Nautical Terminology

- Galley
- Mess hall
- Accommodation
- Bunks
- Fairleads
- Anchor
- Scuppers
- Bollards



## Ship Layout & Terminology

### Bridge electronic equipment

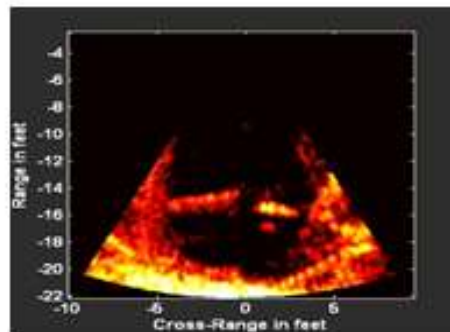
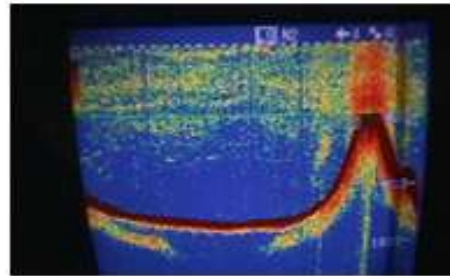
- Compasses
- Auto pilot
- GPS / Plotters
- Radar
- Radios



## Ship Layout & Terminology

Bridge electronic equipment

- Echosounder
- Sonar



## Ship Layout & Terminology

Vessel Markings

- Vessel name
- Port of registration
- Registration number
- Call sign



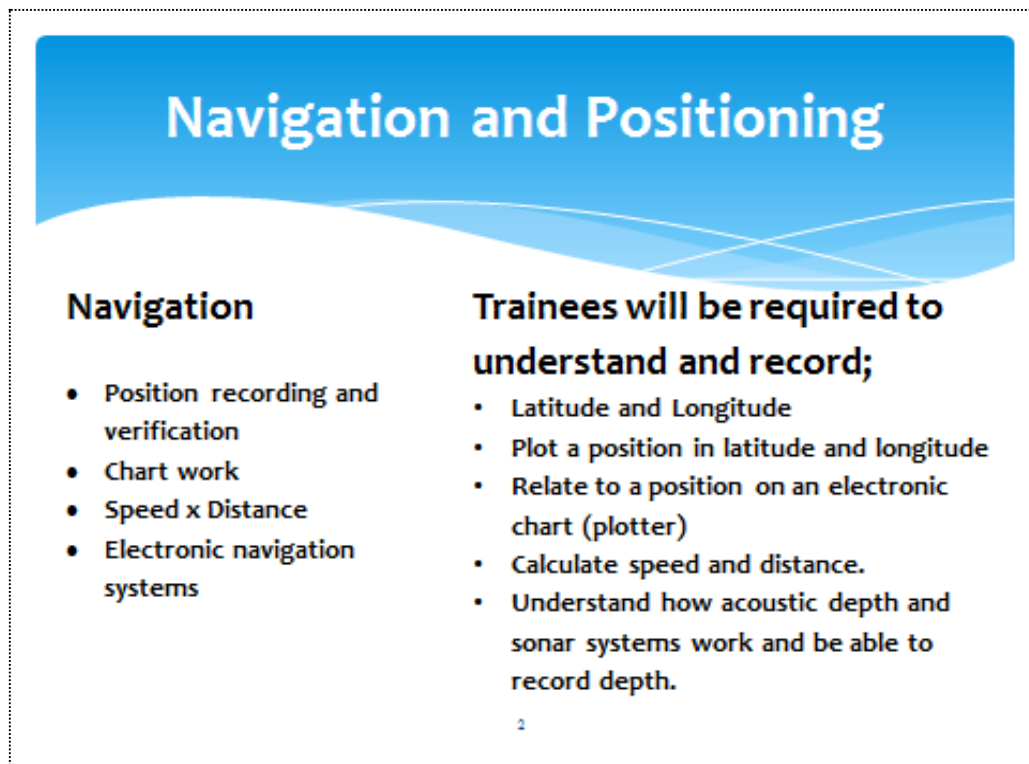
# Ship Layout & Terminology

## Vessel Personnel

- Captain
- Fishing Master
- Mate
- Factory manager
- Bosun
- Chief engineer
- Cook



## Observer Training Course – Navigation



The slide has a blue header with the title "Navigation and Positioning" in white. Below the header, there are two columns of text. The left column is titled "Navigation" and lists four bullet points. The right column is titled "Trainees will be required to understand and record;" and lists five bullet points. A small number "2" is centered at the bottom.

## Navigation and Positioning

### Navigation

- Position recording and verification
- Chart work
- Speed x Distance
- Electronic navigation systems

### Trainees will be required to understand and record;

- Latitude and Longitude
- Plot a position in latitude and longitude
- Relate to a position on an electronic chart (plotter)
- Calculate speed and distance.
- Understand how acoustic depth and sonar systems work and be able to record depth.

2

# Navigation and Positioning

## Task

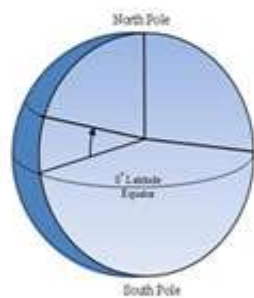
Your vessel is setting its line at 9 knots (*no line setter*)

Time between attaching droppers is 8 seconds

What is the spacing (*in meters*) between the droppers?

3

# Navigation and Positioning

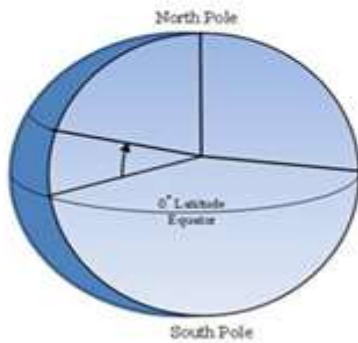


- \* The Equator ( $0^{\circ}$  latitude)
- \* Divides the earth into
  - \* Northern- and
  - \* Southern Hemispheres
- \* Lines running east-to-west parallel to the equator Latitude
- \* Measured in degrees North and South of the Equator

4



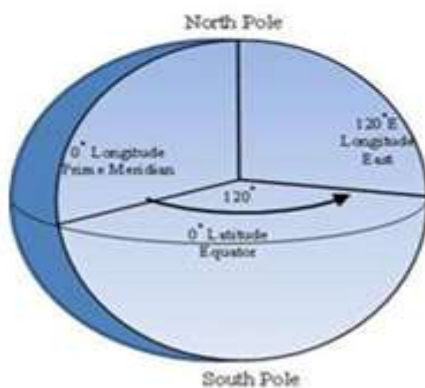
# Navigation and Positioning



- \* Latitude can NEVER exceed 90deg North or South
- \* Latitude North of the equator abbreviated symbol (N)
- \* Latitude south of the equator abbreviated symbol (S)

5

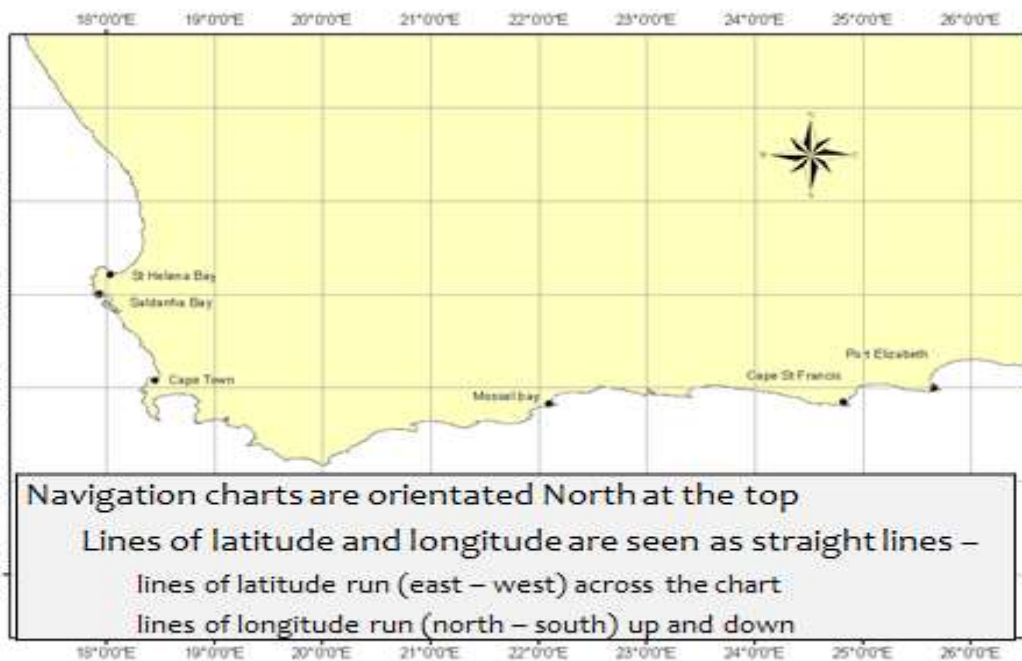
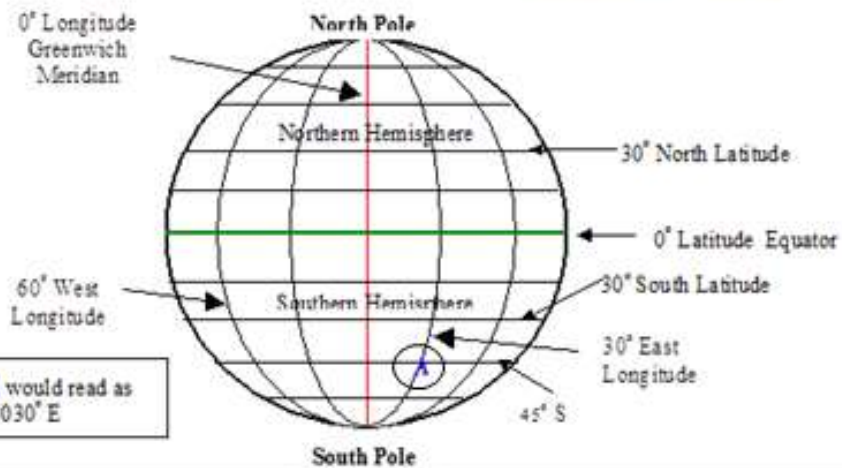
# Navigation and Positioning

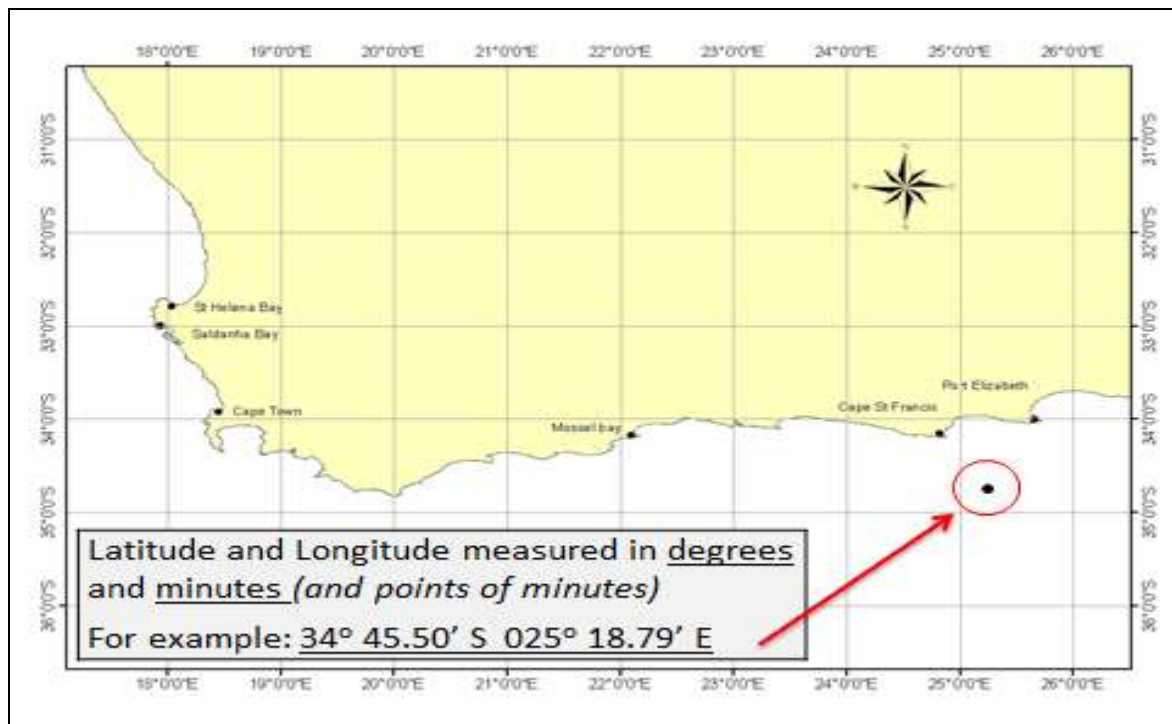
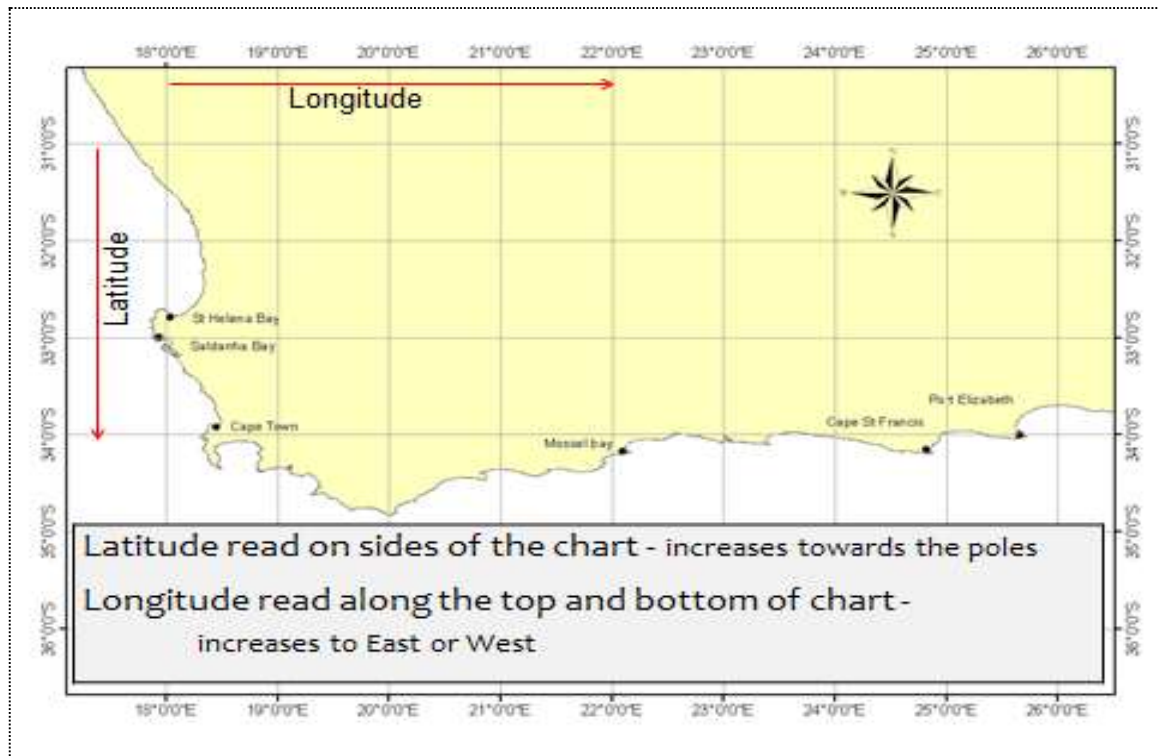


- \* Longitude are lines from the North to South Pole
- \* All lines of longitude converge and cross at the poles
- \* Measured East or West from the 0° Longitude or “prime meridian” (Greenwich Meridian)
- \* To a maximum of 180° East or West

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# Navigation and Positioning





# Navigation and Positioning

## Terms used in navigation

**Course**      A line between two positions  
The direction towards which vessel is steering is referenced in the three-figure notation from 000 to 360

11

# Navigation and Positioning

## Terms used in navigation

**Distance**      One (1) minute of Latitude = one (1) nautical mile  
Measured from the Latitude scale  
(Note; distance **CANNOT** be measured from the Longitude scale.)

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# Navigation and Positioning

## Terms used in navigation

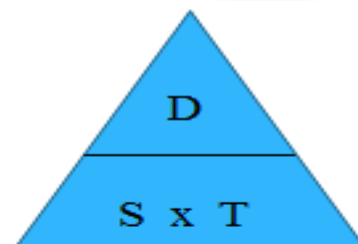
**Speed**            A vessels speed is measured in **KNOTS:**  
(Nautical Miles per Hour)  
(One nautical Mile equals 1.85 Kilometres)

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# Navigation and Positioning

## Terms used in navigation

**Speed**            **S**  
**Time**              **T**  
**Distance**        **D**



**Then**     **$S = D / T$**  nautical miles per hour **Knots**  
 **$T = D / S$**  Time in hours and /or/ minutes **hr:min**  
 **$D = S \times T$**  Nautical miles **Nm**

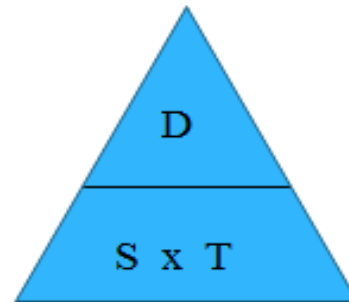
14

# Navigation and Positioning

## Example

It takes you 5 hours to travel 100 nm  
What was your speed?

$$\begin{aligned}\text{Speed} &= \text{Distance/Time} \\ &= 100 \text{ nm} / 5 \text{ hours} \\ &= 20 \text{ nm/hr (knots)}\end{aligned}$$



15

# Navigation and Positioning

## Electronic navigation equipment

### Auto pilot

- \* Used to steer the vessel on a specified course.
- \* electronically reads the compass and controls the rudder



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# Navigation and Positioning

## Electronic navigation equipment

### GPS

- \* Global Positioning System
- \* uses satellites to give the precise position of the vessel at all times



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# Navigation and Positioning

## Bridge electronic equipment

### Plotters

- \* electronic map showing land profile
- \* can show the track of the vessel
- \* a course can be set
- \* It can be connected to the GPS or operate independently using satellites and also will show the position of the vessel at all times



18

# Navigation and Positioning

## Bridge electronic equipment

### Radar

- \* Uses radio waves to reflect off objects within a specific range around a vessel
- \* Radar can show other boats or the coastline in times of darkness or poor visibility



19

# Navigation and Positioning

## Bridge electronic equipment

### Echo Sounder

- \* uses sound waves directed vertically down below the vessel to show the depth of the water and can also detect the position of fish below the vessel



20



## Navigation and Positioning

### Calculation Example 1

Start Position       $32^{\circ} 30'$  South     $017^{\circ} 52'$  East

End Position         $33^{\circ} 30'$  South     $017^{\circ} 52'$  East

***What is the distance between two positions in Nautical Miles ?***

21

## Navigation and Positioning

### Calculation Example 2

Start Position       $35^{\circ} 30'$  South     $022^{\circ} 40'$  East

End Position         $36^{\circ} 30'$  South     $022^{\circ} 40'$  East

***What is the distance between two positions in Nautical Miles ?***

22

## Navigation and Positioning

### Calculation Example 3

Start Position       $34^{\circ} 40.35'$  South     $018^{\circ} 40.45'$  East

End Position         $33^{\circ} 50.89'$  South     $018^{\circ} 40.45'$  East

***What is the distance between two positions in Nautical Miles ?***

23

## Navigation and Positioning

### Calculation Example 3

***You are steaming on a course 180 degrees at 10 knots***

Your Start Position is       $32^{\circ} 10'$  South     $017^{\circ} 45'$  East

***After three (3) hours what is your position ?***

24

# Navigation and Positioning

## Calculation Example 4

Your Start Position is  $33^{\circ} 30'$  South  $018^{\circ} 10'$  East

Your End Position is  $34^{\circ} 50'$  South  $018^{\circ} 10'$  East

*Your start time is 15:00 and the vessel is steaming at 8 knots*

**What time will you arrive at the end position ?**

25

Biological sampling Reproduction

**BIOLOGICAL SAMPLING**  
**2. Reproduction**

SWIOFP Fisheries Observer  
Training Course

Oceanographic Research Institute, Durban  
23 & 30 August 2010

1

**Weighing**



2



## Gonad staging

### Male

#### I Inactive/virgin

Testis small and thin, transparent to greyish-white

#### II Developing

Testis show lateral thickening, increase in size, whitish colour, sperm visible if squeezed

#### III Ripe

Testis large, grey-white with sperm in tissue and sperm duct, becomes pinkish during active spawning

#### IV Spent

Testis decreased in size, reddish-grey in colour, no sperm present in tissue but still present in main sperm duct

### Female

#### I Inactive/virgin

Ovaries long and thin, pink in colour, no eggs visible

#### II Developing

Ovary increases in length and thickness, orange in colour, eggs visible to naked eye

#### III Ripe

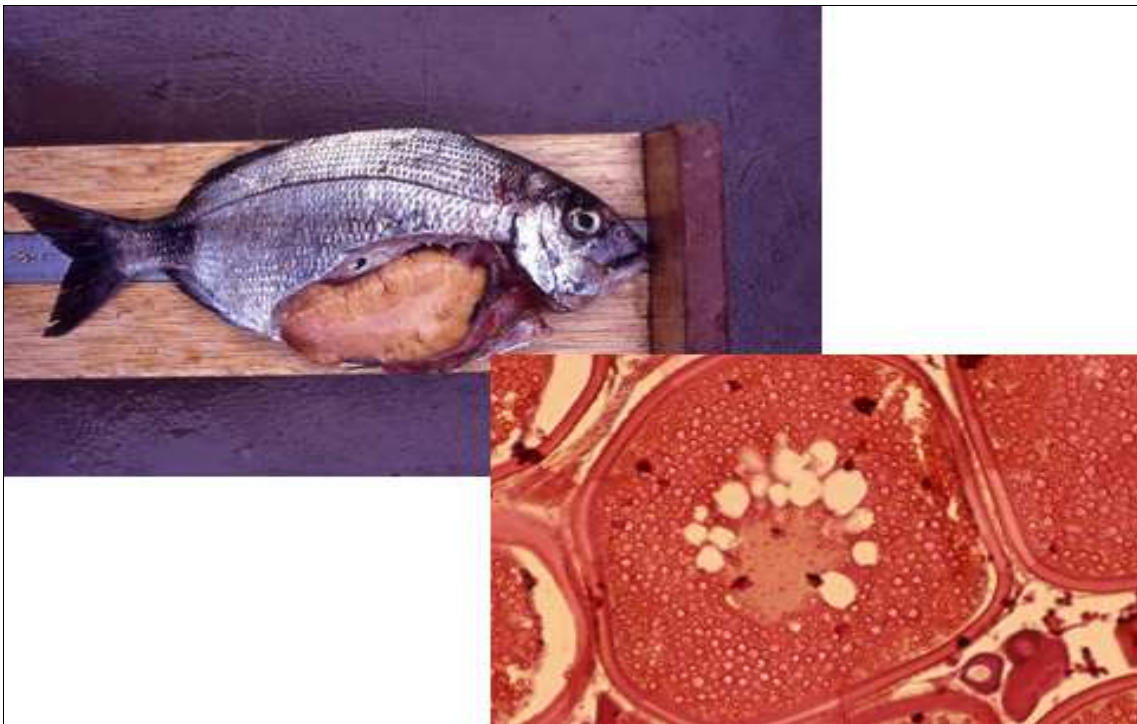
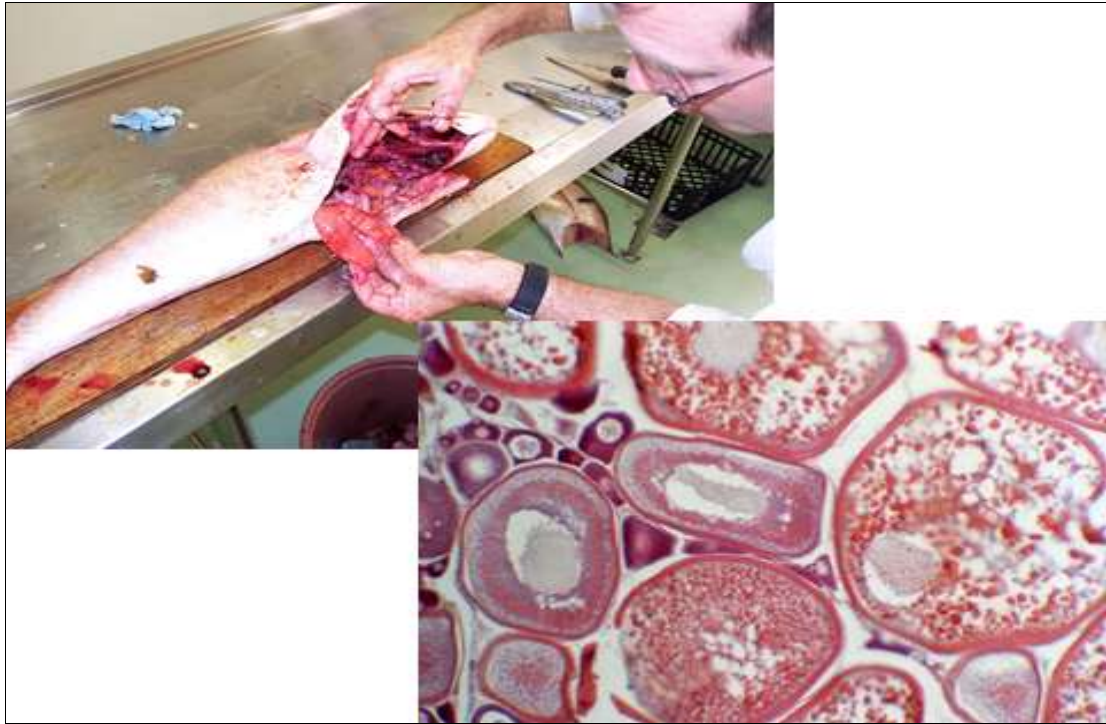
Ovary is swollen yellow-orange in colour, translucent eggs visible in the tissue and lumen

#### IV Spent

Ovary decreased in size considerably, flaccid with large empty lumen, bloodshot reddish-orange in colour

3

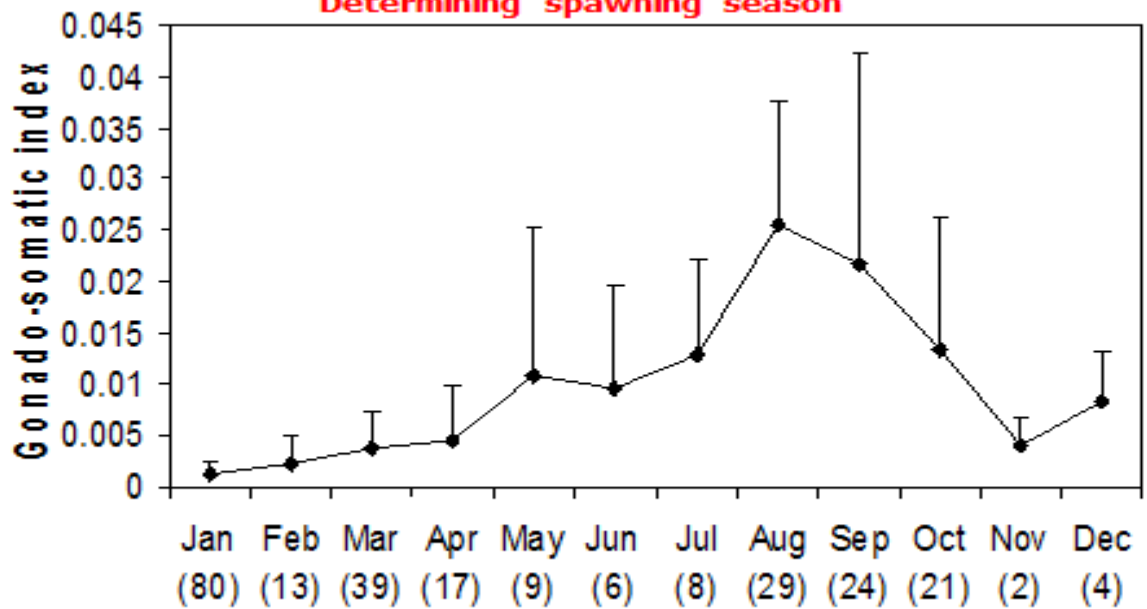




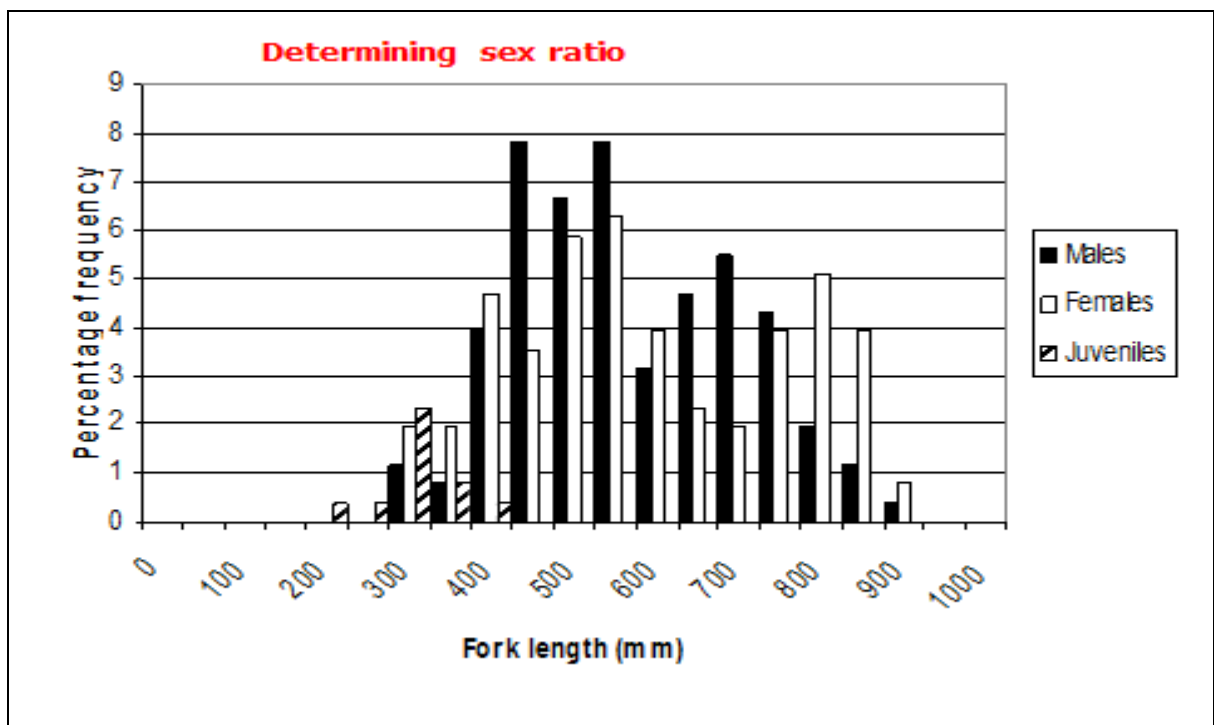
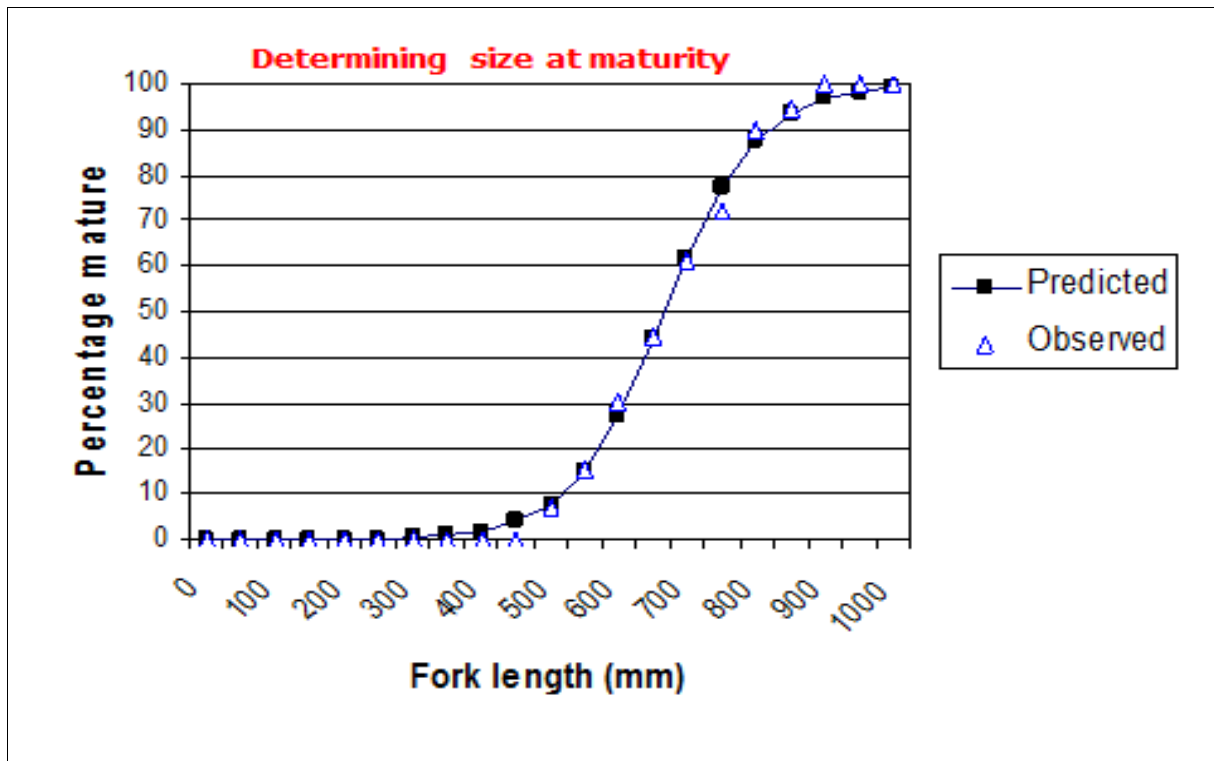
## Weighing gonads



## Determining spawning season







Determine fecundity



Histology



## On-board sampling Method



### On-board Data Collection

#### Catch Estimation Trainees must be able to;

Estimating the total catch of the target and by-catch species landed from a single fishing event.

- Understand and apply various statistical means to estimate total catch weight from a single fishing event that includes;
  - Calculating the weight of a trawl bag (codend) using volumetric, rectangular, cylindrical and oval formulas.
  - Calculating volumes of holding bins.
  - Calculating fish density from a sample volume.
- On hook and line or gill net vessels, raise catch estimates from sub-sampled fish weights and or numbers to total catch.

## On-board Data Collection

### Catch Sampling Techniques and Requirements

Sampling of total catch to determine catch composition of retained and the discarded components of the catch.

### Trainees must be able to;

- Taking sub-samples of a single catch event from each of the main fishing methods used in their region.
- Competent in sampling and determining the composition of a catch being landed ashore.
- Statistically raise the sampled catch composition to total catch weights or numbers.

## On-board Data Collection

### Aim of Fisheries Biologists and Managers

- Study the Biology of the Species
- Determine the Biomass
- Calculate the Sustainable Yield

## On-board Data Collection

### Means to this information

- ❖ Research trips scientific research vessels
- ❖ Vessels log book data
- ❖ Land based observer monitoring
- ❖ Fisheries observers on-board fishing vessels

## On-board Data Collection

### Data Categories

- ❖ Operational
- ❖ Biological
- ❖ Environmental



## On-board Data Collection

### Operational

- ❖ Vessel & Gear
  - Vessel size
  - Electronic aids
- ❖ Catch & Effort
  - Transit
  - Searching
  - Fishing
  - Catch Composition (*By-catch*)
- \* Production
  - Products
  - Conversion factors
  - Monitor fish quality

## On-board Data Collection

### Biological

- ❖ Length frequencies
- ❖ Length & Weight ratio
- ❖ Sex & Maturity
- ❖ Age & Growth
- ❖ Diet
- ❖ Genetic profiles



## On-board Data Collection

### Environmental

- ❖ Seabird interactions
- ❖ Interactions with Protected Endangered and Threatened species (PET)
- ❖ Monitoring effectiveness of By-catch reduction devices (BRD) & (TED)
- ❖ Vulnerable Marine Ecosystems (VME)
- ❖ Waste management

## On-board Data Collection

**By-catch** species are the all species that include fish, sharks and invertebrates as well as seabirds, turtles and marine mammals caught with the target species

**Discards** are the portions of the by-catch that are returned to the sea



# On-board Data Collection

## Data Forms

- ❖ Generic
  - ❖ Vessel and Trip Data for all fisheries
  - ❖ Biological Data Collection
  - ❖ Environmental Monitoring
- ❖ Fisheries Specific
  - ❖ Gear
  - ❖ Catch and effort

# On-board Data Collection

## Total Catch Estimation

Shape	Formula
Rectangle	Volume = $L \times W \times H$
Cylinder	Volume = $\pi r^2 \times L$
Oval	Volume = $\pi \times (\text{short } r) \times (\text{long } r) \times L$
Wedge	Volume = $\frac{1}{2} \times (L \times W \times H)$

W = Width L = Length H = Height r = radius  $\pi$  = pi (constant ~3.14)



## On-board Data Collection

### Total Catch Estimation

**Calculate  
Codend  
Weight**

Chocker spacing 1.5 m

Bag width 2.5 m

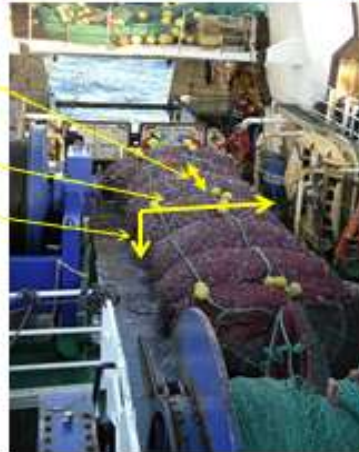
Bag height 1.2 m

*Fish density = 900kg/m<sup>3</sup>*

*Long radius = 1.2 m*

*Short radius = 0.6 m*

$\pi = 3.14$



## On-board Data Collection

### Catch Sampling

- ❖ Whole catch is sampled
- ❖ Representative random Sub-sampling (%) of total catch
- ❖ Correct random sampling protocols remove subjectivity



## On-board Data Collection

### Catch Sampling

- ❖ Catch composition
- ❖ Separate fish into species.
- ❖ Count and weigh each species



## On-board Data Collection

### Catch Sampling

Calculate % per species

- 1 First we divided individual species weight by total sample weight. *Note that the result of this division will be always inferior to 1 (<1)*
- 2 To obtain percentage you will need to multiply this result by “100”

## On-board Data Collection

### Catch Sampling

Species	Sample Weights	Step 1	Step 2 -(x 100) for %
	(kg)	Calculation	
Hake <i>M. capensis</i>	56	<b>Prac ex 1</b>  <b>(calculate % per species)</b>	
Hake <i>M. paradoxus</i>	134		
Kingklip	12		
Jacopever	8		
Rat-tail	3		
<b>Total Weight</b>	<b>213</b>		

## On-board Data Collection

### Catch Sampling

Species	Sample Weights	Step 1	Step 2 -(x 100) for %
	(kg)	Calculation	
Hake <i>M. capensis</i>	56	0.2629	26.29%
Hake <i>M. paradoxus</i>	134	0.6291	62.91%
Kingklip	12	0.0563	5.63%
Jacopever	8	0.0376	3.76%
Rat-tail	3	0.0141	1.41%
<b>Total Weight</b>	<b>213</b>	<b>1</b>	<b>100.00%</b>

## On-board Data Collection

### Catch Sampling

#### Prac ex. 2 -

Marbles / calculate %  
per species

Green	Blue	White	Large
No	No	No	No
%	%	%	%

## On-board Data Collection

### Longline Catch Sampling

*Longlines extend over a wide geographical area and are hauled for many hours*

- ❖ Catch composition recorded as % on observed hooks.
- ❖ Separate fish into species
- ❖ Count and weigh each species

# On-board Data Collection

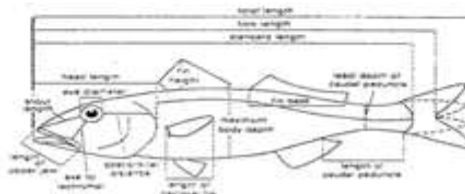
## BIOLOGICAL SAMPLING Length/weight and size composition



## Measuring Length Frequencies

- Length frequencies are recorded for the target species or for species specified by research scientists from MCM.
- Fish can be measured in three (3) main ways and it is very important to note which measurement is required and has been recorded.

- |   |                          |    |
|---|--------------------------|----|
| 1 | Total Length             | TL |
| 2 | Fork Length              | FL |
| 3 | Standard (caudal) Length | SL |



## Measurement units

- \* Fineness of measurement depends on the size of the fish (mm, cm, m)
- \* Goal is measurement precise to 0.5% of the overall length



23

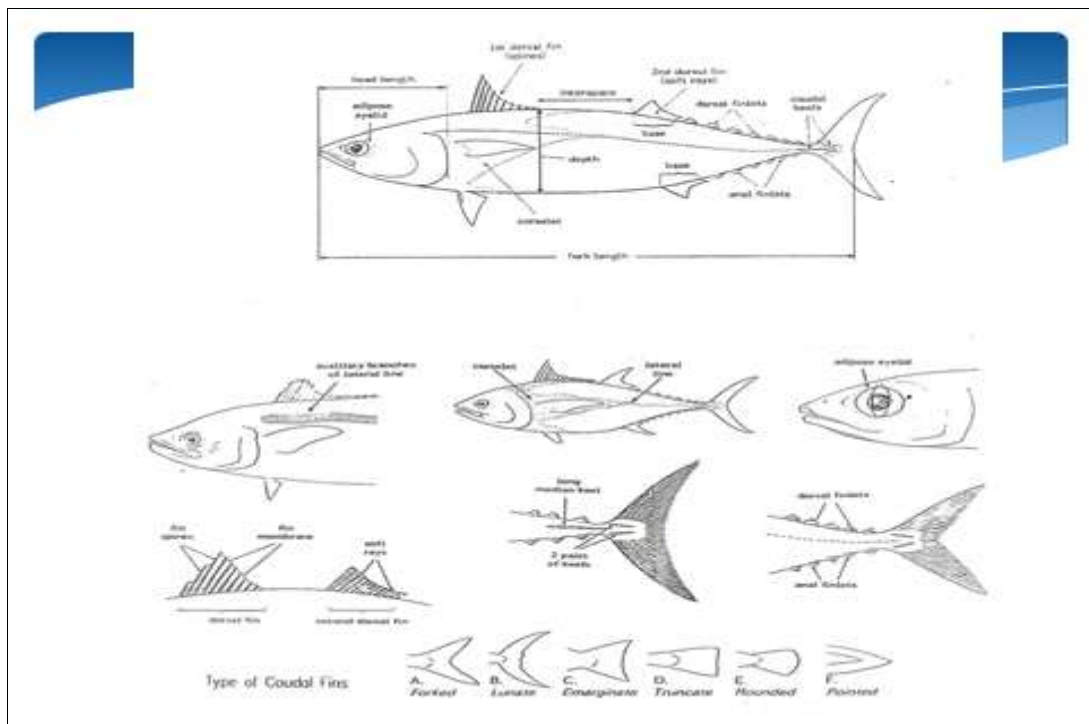
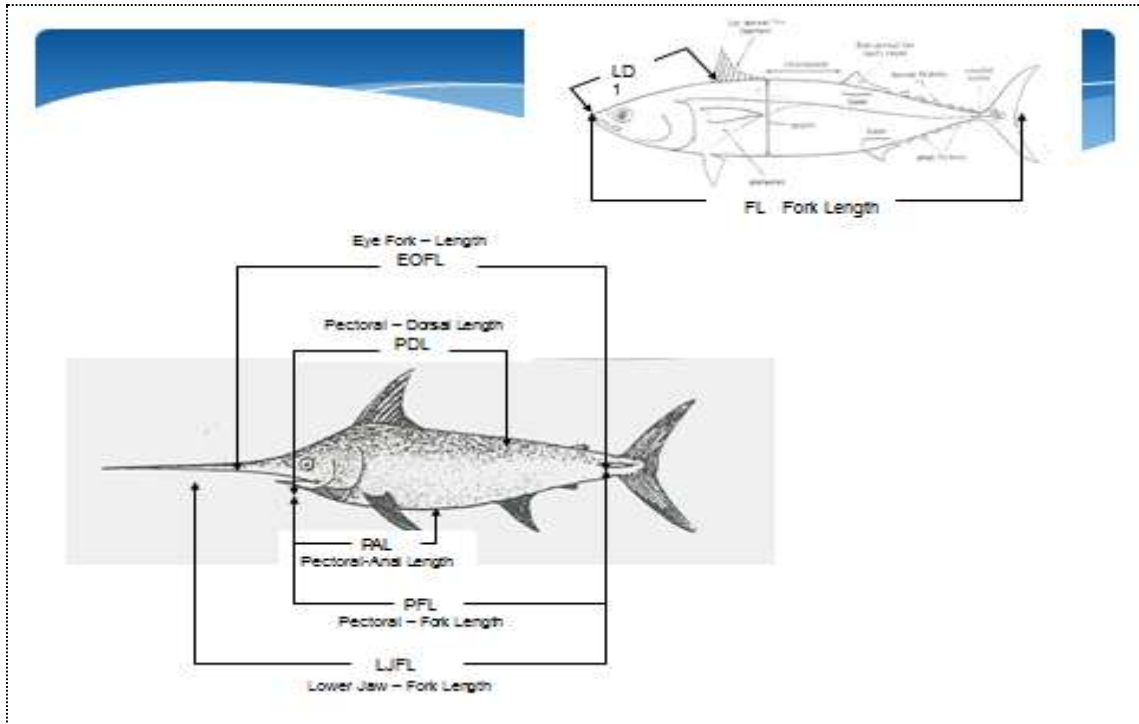
Measurements for length are generally taken to the nearest centimetre below or half centimetre for pelagic fish.

*For Example: Both fish that are 42.2 cm and 42.7 cm long will be recorded as 42cm.*

- 34.1 = 34
- 47.9 = 47
- 56.5 = 56

Pelagic fish are measured to the lowest half centimetre.

- 11.2 = 11
- 13.6 = 13.5
- 13.4 = 13
- 17.8 = 17.5



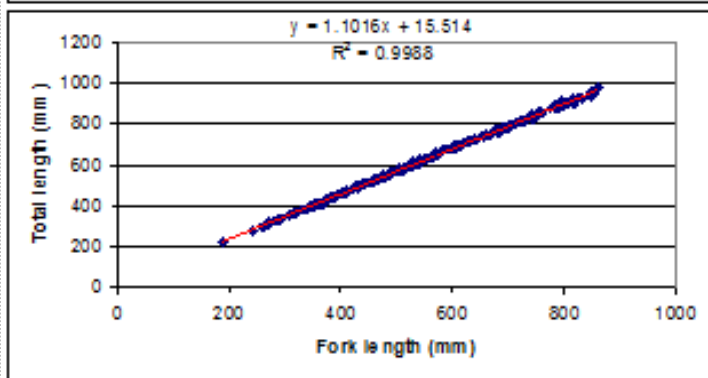
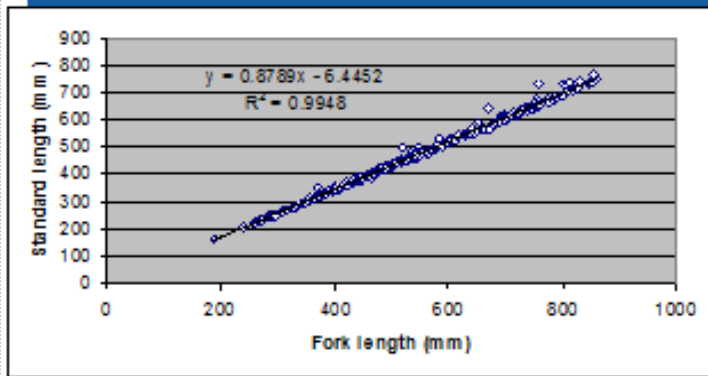


**Total weight  
(in the round)**

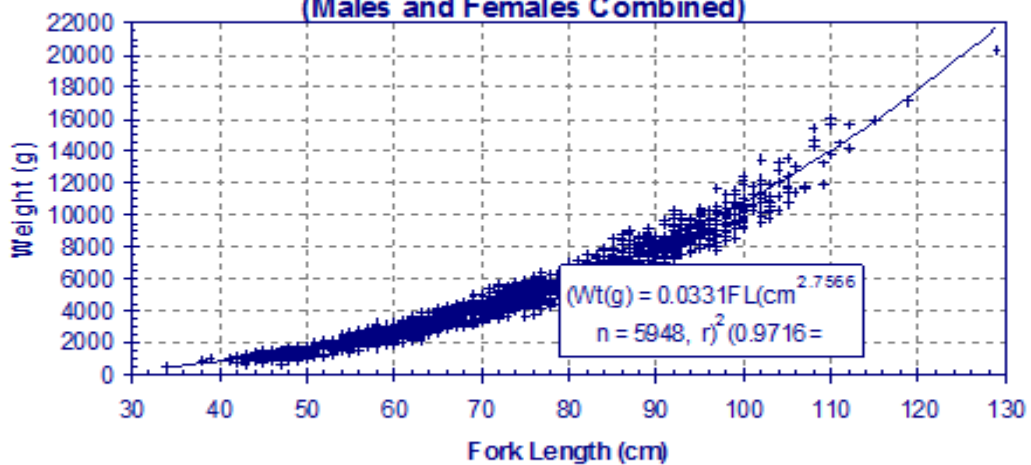
**Gutted weight**

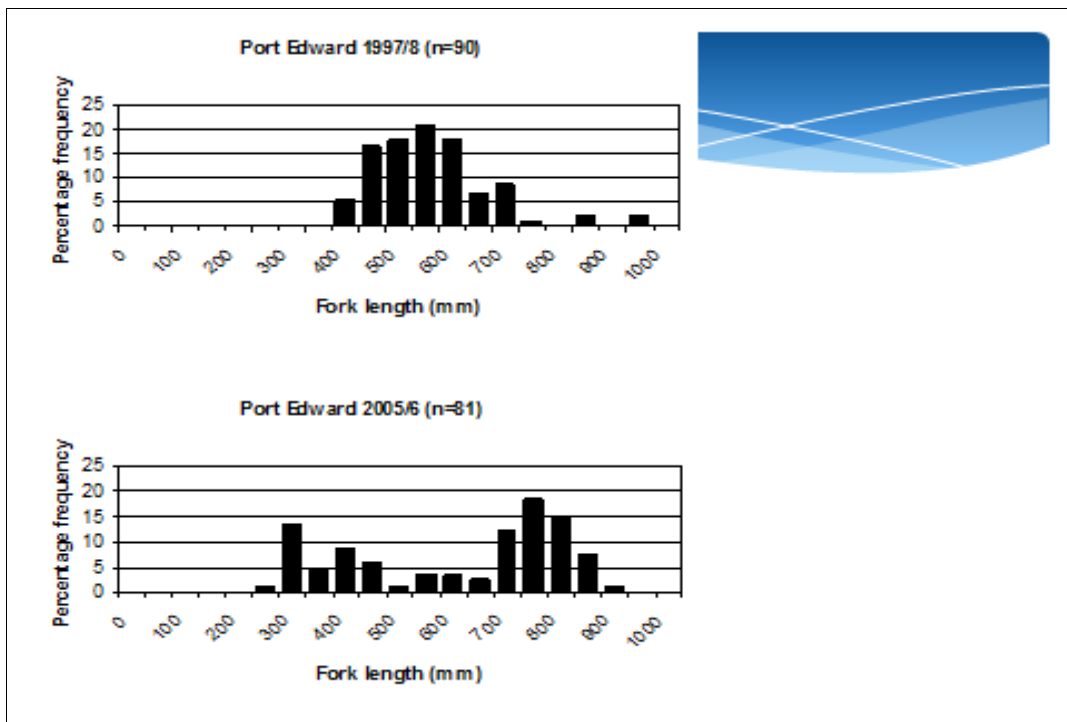
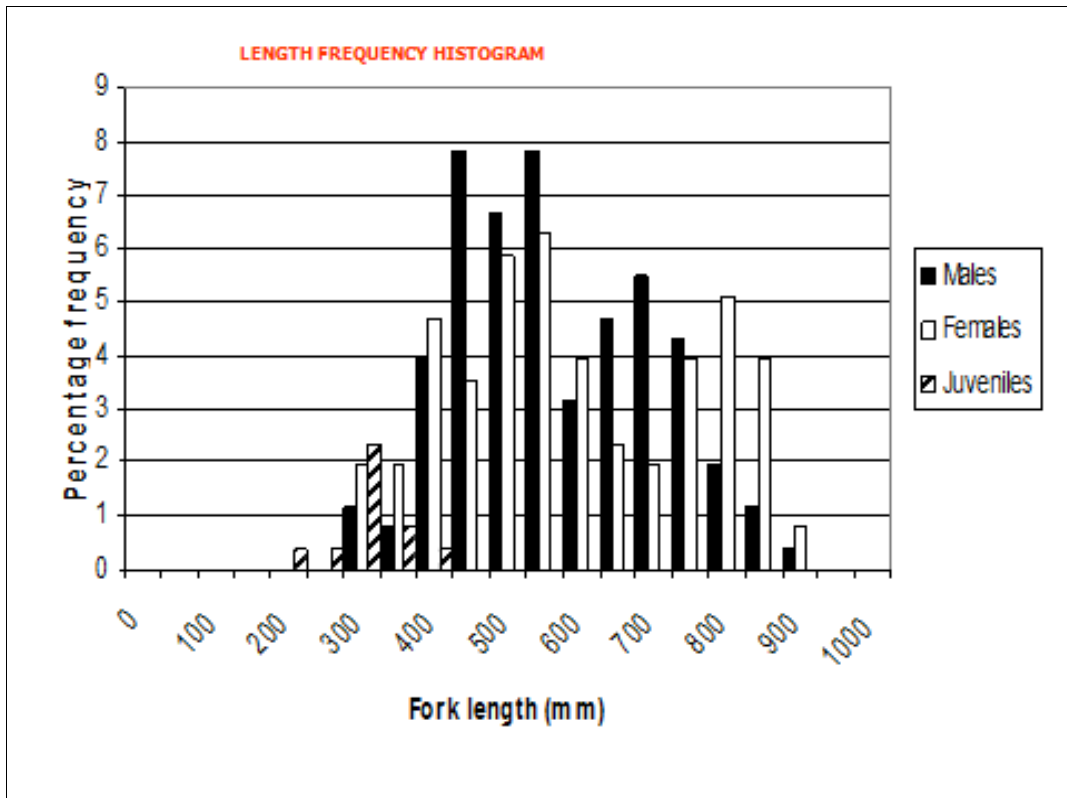


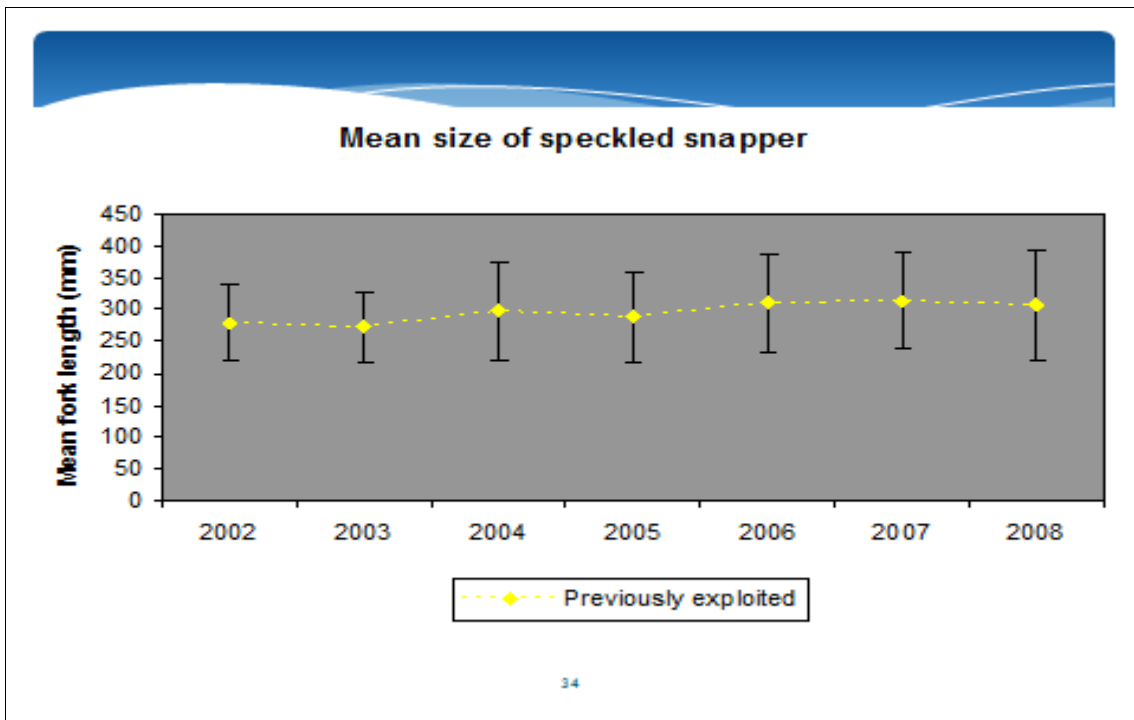
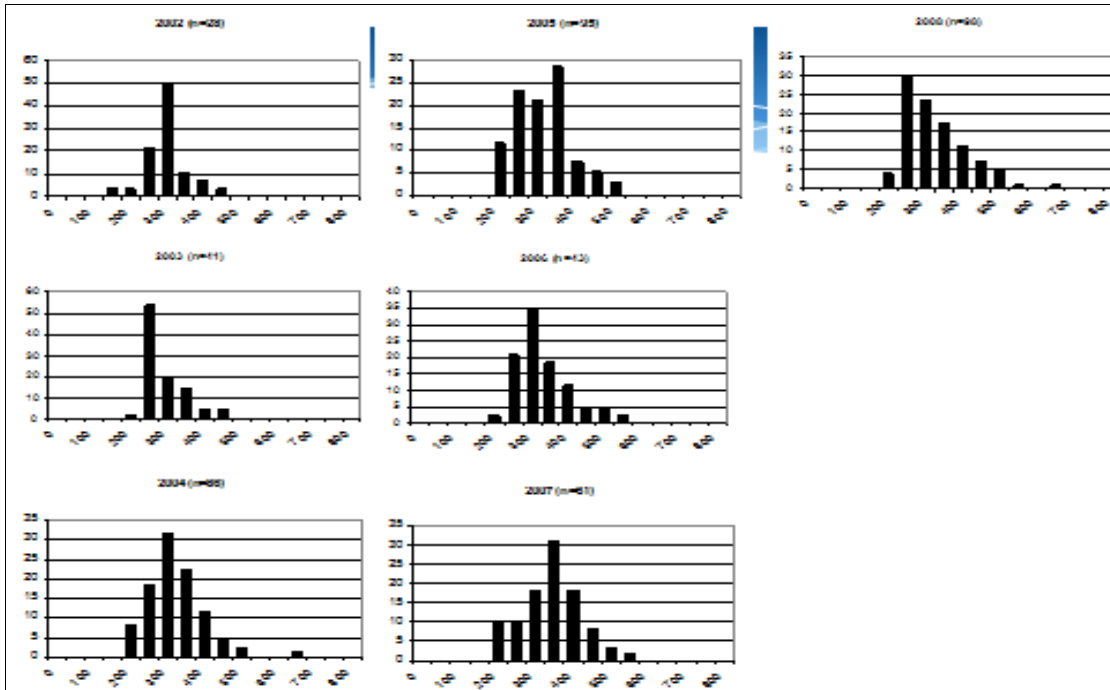
### Length regressions



### Yellowtail Fork Length : Weight Regression (Males and Females Combined)







La bonne gouvernance et de la gestion des pêches et de l'aquaculture permettent d'améliorer la contribution du secteur à la sécurité alimentaire, au développement social, à la croissance économique et au commerce régional ; ceci en assurant par ailleurs une protection renforcée des ressources halieutiques et de leurs écosystèmes.

La Commission de l'Océan Indien (COI) ainsi que la COMESA (Common Market for Eastern and Southern Africa), l'EAC (East African Community) et l'IGAD (Inter-Governmental Authority on Development) ont développé des stratégies à cette fin et se sont engagés à promouvoir la pêche et l'aquaculture responsable.

SmartFish supporte la mise en œuvre de ces stratégies régionales en mettant l'accent sur le renforcement des capacités et des interventions connexes visant à :

- la mise en œuvre d'un développement et d'une gestion durables des pêcheries ;
- le lancement d'un cadre de gouvernance pour les pêcheries durables dans la région;
- le développement d'un suivi-contrôle-surveillance efficace pour les ressources halieutiques transfrontalières ;
- le développement de stratégies commerciales regionales et la mise en œuvre d'initiatives commerciales;
- l'amélioration de la sécurité alimentaire à travers la réduction des pertes post-capture et la diversification.

SmartFish est financé par l'Union Européenne dans le cadre du 10ème Fond Européen de Développement.

SmartFish est mis en œuvre par la COI en partenariat avec la COMESA, l'EAC et l'IGAD et en collaboration avec la SADC. Une collaboration étroite a également été développée avec les organisations régionales de pêche de la région. L'assistance technique est fournie par la FAO et le consortium Agrotec SpA.

By improving the governance and management of our fisheries and aquaculture development, we can also improve food security, social benefits, regional trade and increase economic growth, while also ensuring that we protect our fisheries resources and their ecosystems.

The Indian Ocean Commission (IOC), the Common Market for Eastern and Southern Africa (COMESA), the East African Community (EAC) and the Inter-Governmental Authority on Development (IGAD) have developed strategies to that effect and committed to regional approaches to the promotion of responsible fisheries and aquaculture.

SmartFish is supporting the implementation of these regional fisheries strategies, through capacity building and related interventions aimed specifically at:

- implementing sustainable regional fisheries management and development;
- initiating a governance framework for sustainable regional fisheries;
- developing effective monitoring, control and surveillance for trans boundary fisheries resources;
- developing regional trade strategies and implementing regional trade initiatives;
- contributing to food security through the reduction of post-harvest losses and diversification.

SmartFish is financed by the European Union under the 10th European Development Fund.

SmartFish is implemented by the IOC in partnership with the COMESA, EAC, and IGAD and in collaboration with SADC. An effective collaboration with all relevant regional fisheries organisations has also been established. Technical support is provided by Food and Agriculture Organization (FAO) and the Agrotec SpA consortium.

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