Philippine Association of Crab Processors, Inc.
An Association for Sustainable Crab Fisheries

Life of the Blue Swimming Crab *Portunus pelagicus*

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Topics

01
Role of BSC
How important the BSC fishery in your life

02
Introduction
Socio-economic background and biological characteristic

03
Life Cycle of BSC
Biological Stages

04
Stock Assessment
Introduction, methodology, Hands-on activity

01

Role of BSC

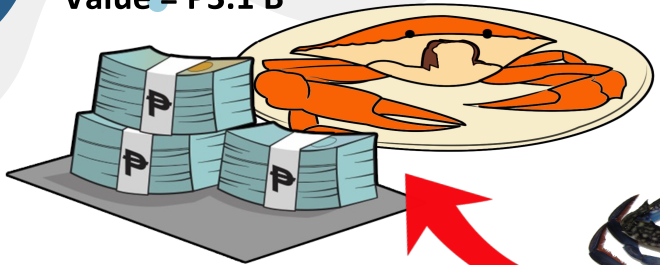
How important the BSC fishery in your life?

Unsa ko para nimo?

Produksyon / Pagkain

Crab Production = 27, 253MT

Value = P3.1 B



Panghanapbuhay

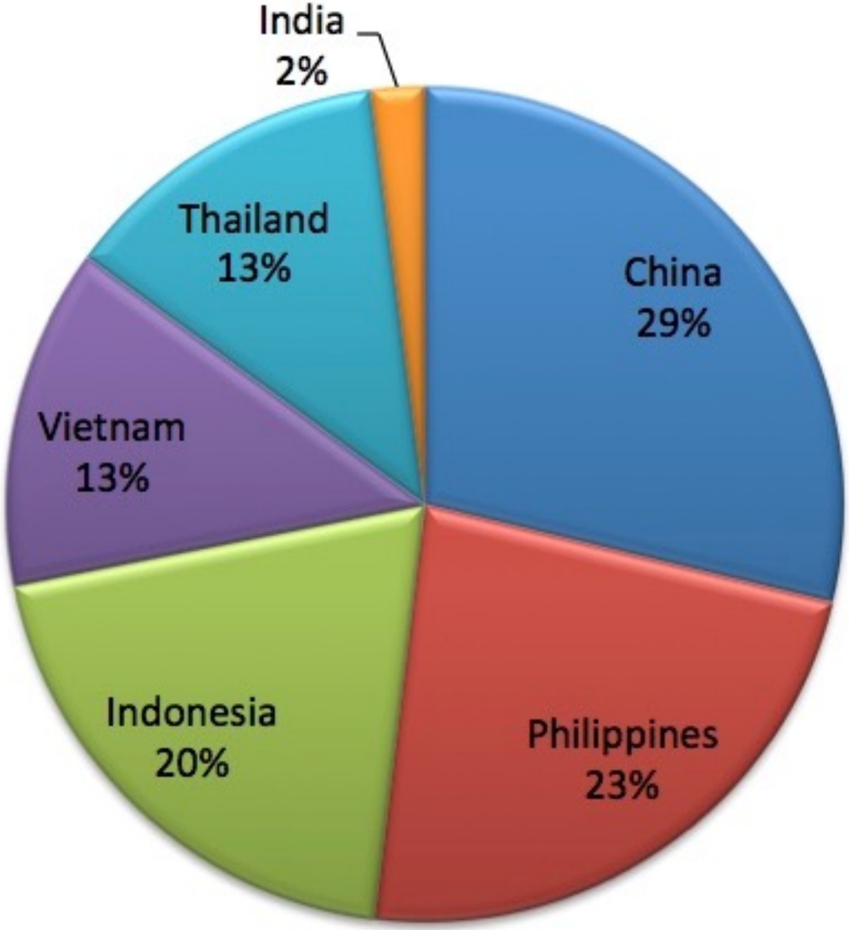
Pang-Eksportasyon / Kalakalan

Export = 5,372MT

Value = $80.5M

P3.5B

SUPPL
OF THE BLU
IN THE



Major sources of swimmer crab into the United States in 2011. Data from {NMFS 20 12}

02

Introduction

Socio-economic background and
biological characteristic

Key Numbers

Top 5th

On the marine fishery produced/commodities in the Philippines in 2021

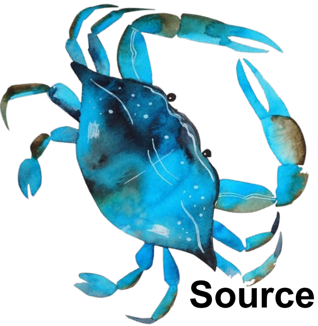
P5.7B

Economic value in 2021

Source: Fisheries Statistics of the Philippines, 2017-2019; PSA, 2021

Background

- Phylum Arthropoda – segmented bodies
  - Ex: lobsters, shrimp, crabs
- Found in sandy or muddy substrate, commonly in seagrass and coral reef habitat
- Usually burrowed in the substrate and comes out during the dusk to feed

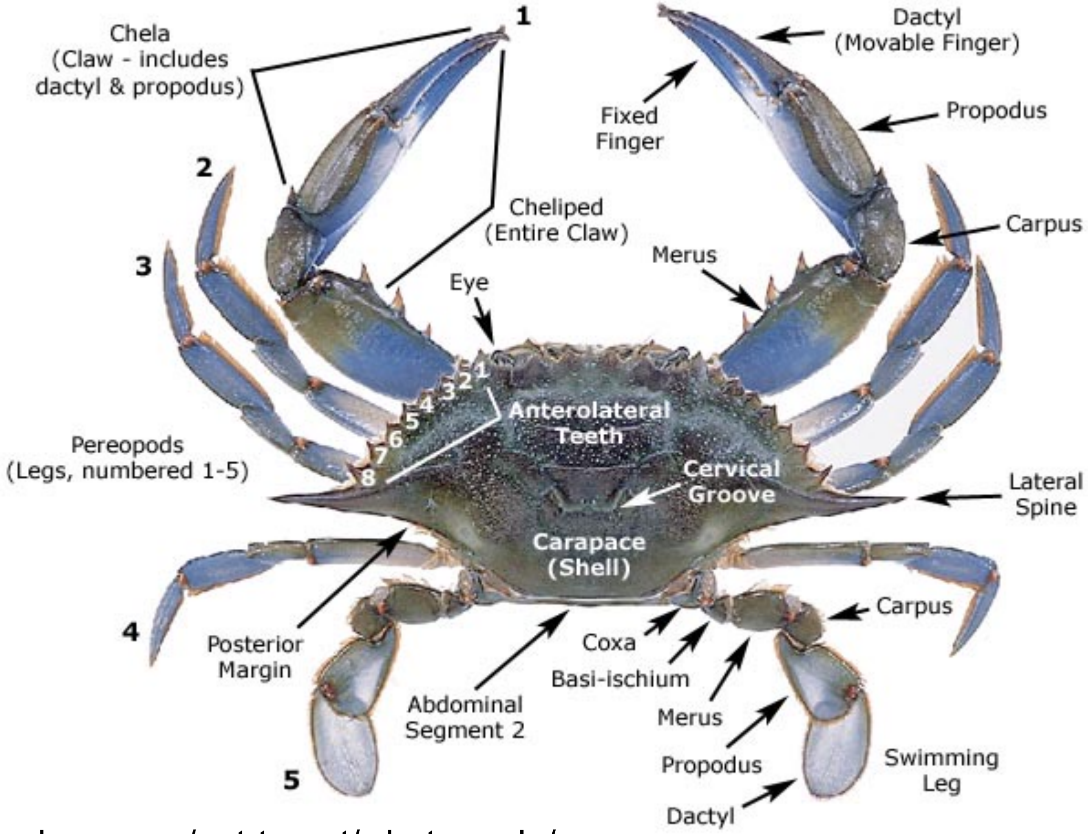


Source: Ho Kit Ian, 2020

Background

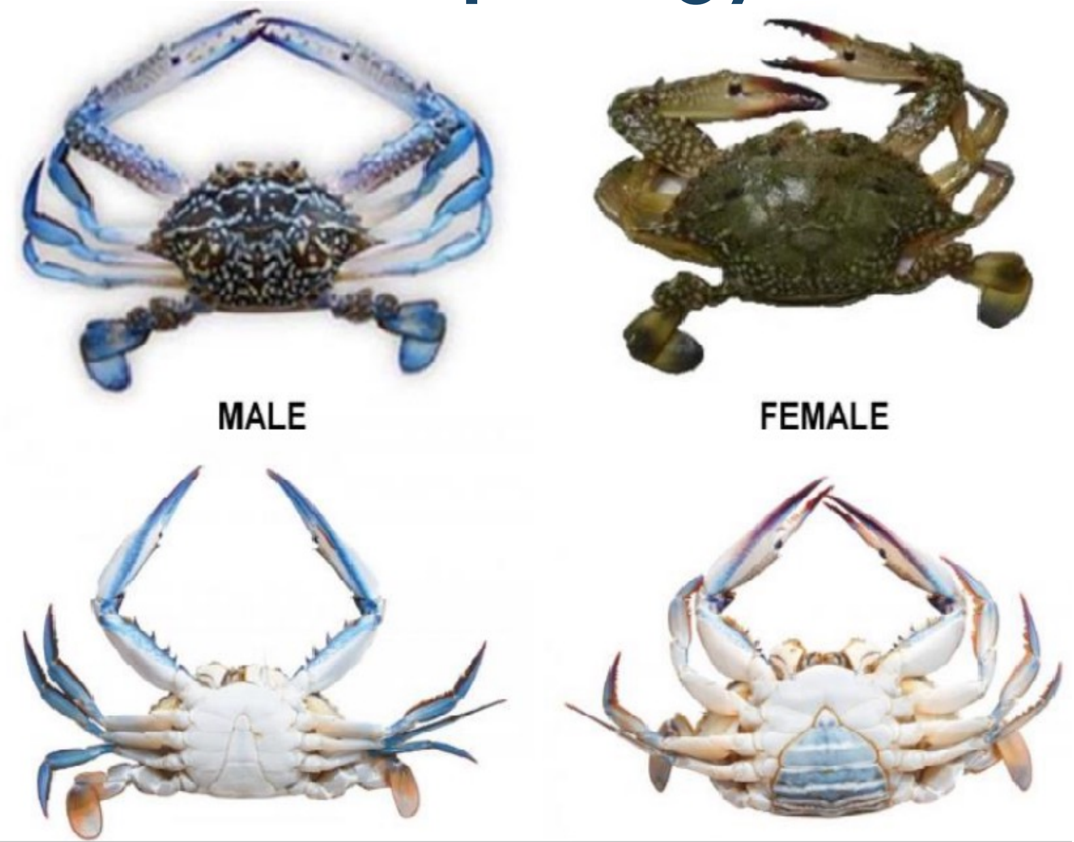
- Opportunistic predator – diet depends on available food source but prefers to prey on other organisms
  - Ex: gastropods, bivalves, hermit crabs, small fishes, and other organic matter

Morphology



Source: https://twogulfscrab.com.au/pot-to-pot/what-we-do/

Morphology



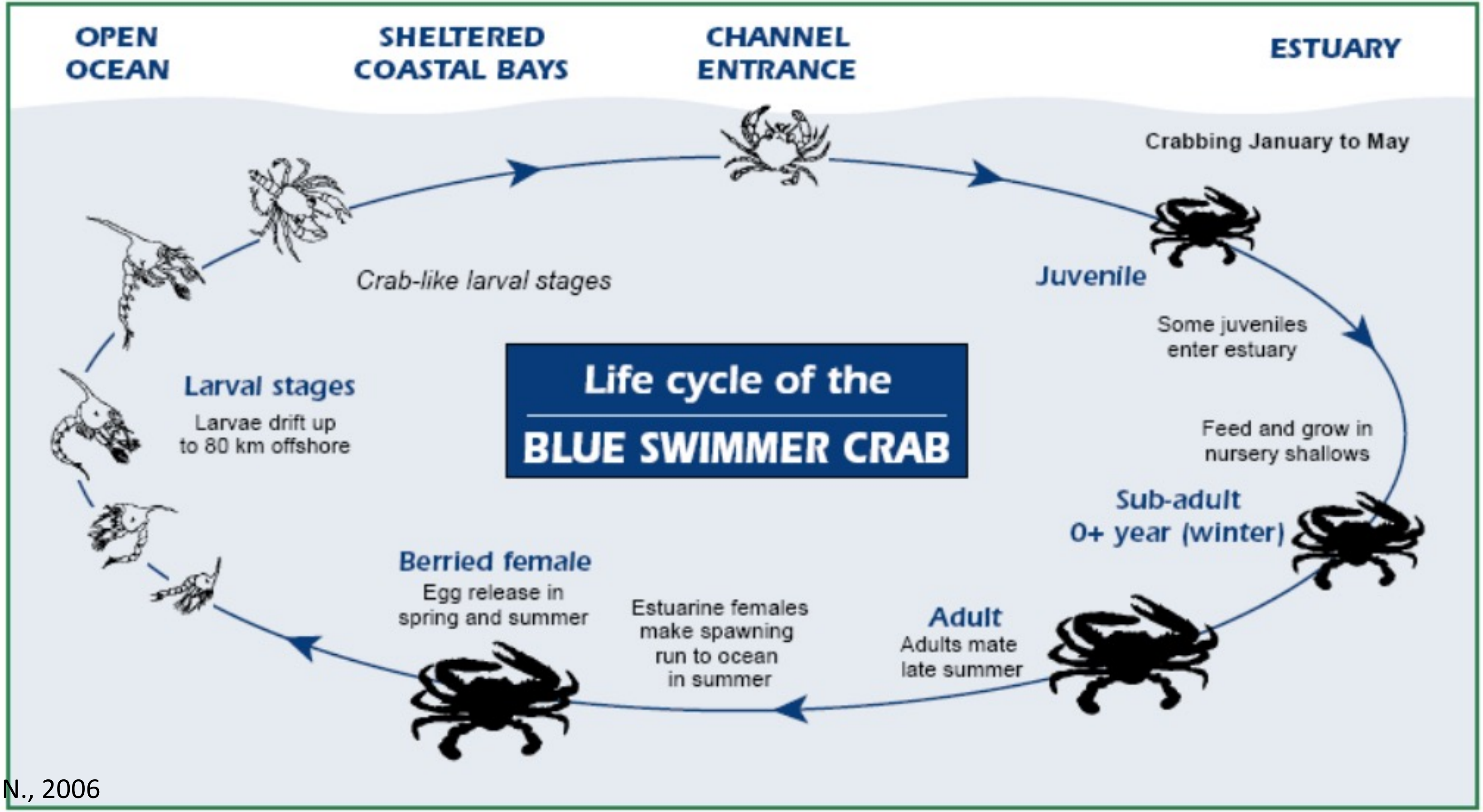
ource: Meso, 2019; museum.wa.gov.au

03

Life Cycle of BSC

Biological Stages

Life Cycle

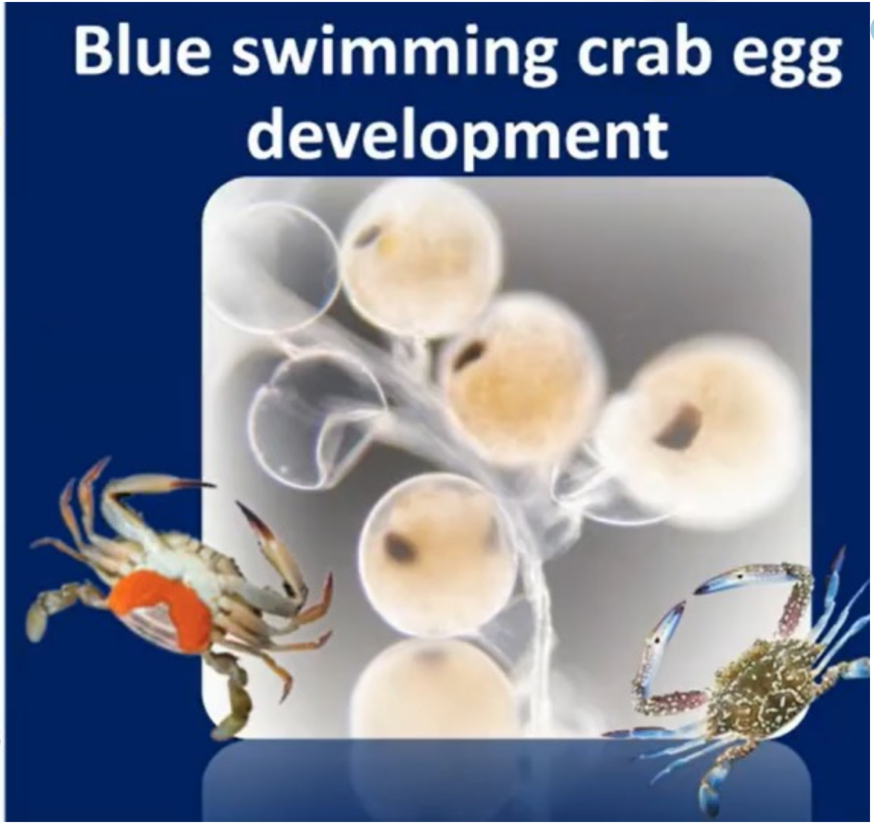


Sources: N., 2006

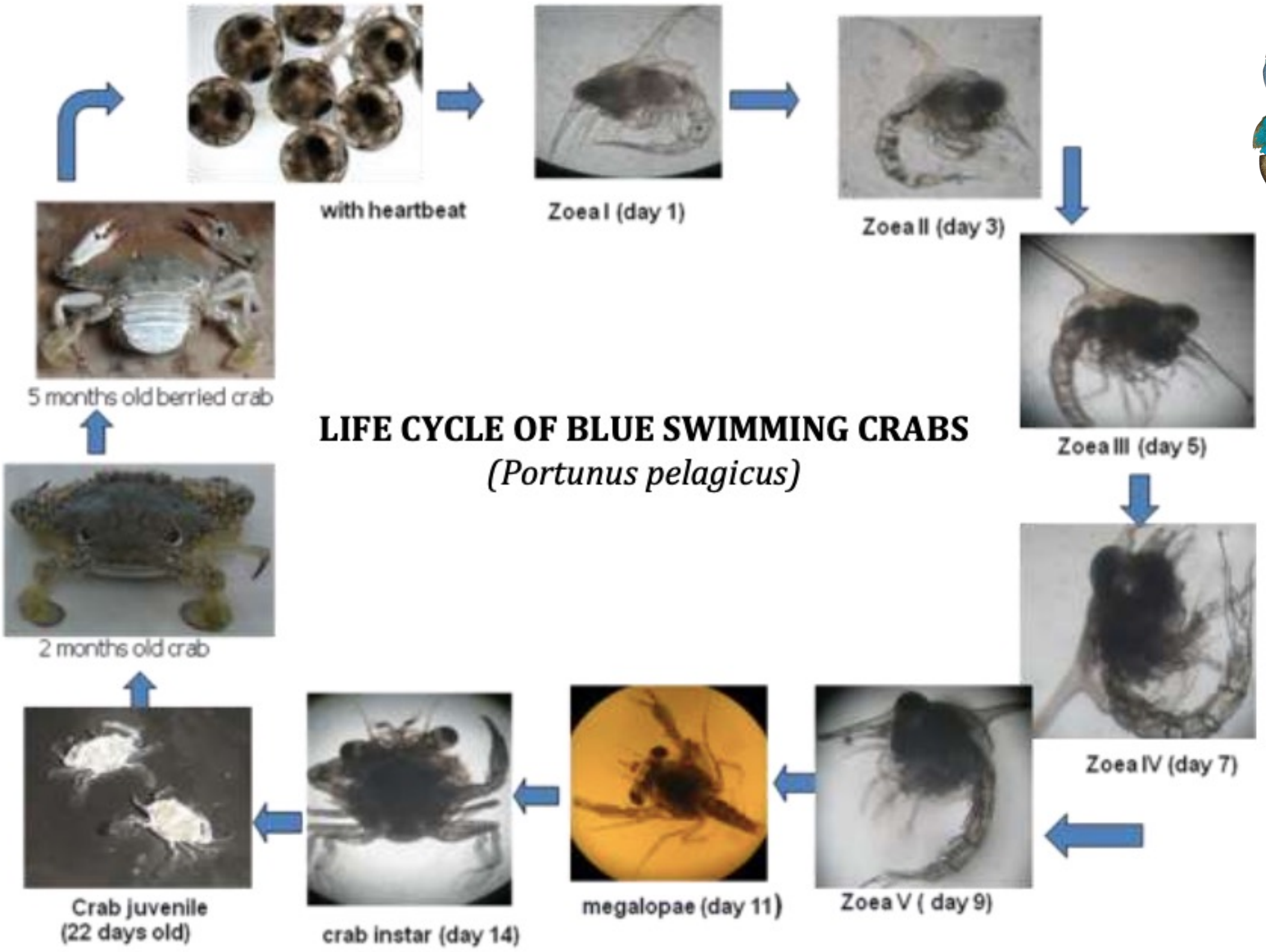
Molting to Mating

Reproductive process of BSC

Egg Development



Source: Manajit, n.a



Source: Guiuan Marine Fisheries Development Center, Guiuan, Eastern Samar

Actual Images of the Larval Development

Fertilized Egg

Zoea

Megalopa

Instar

Instar -> Adult

04

Stock Assessment

Introduction, methodology, and
hands-on activity

Purpose of Stock Assessment

01 Collect

Gather data on stock abundance

Analyze 02

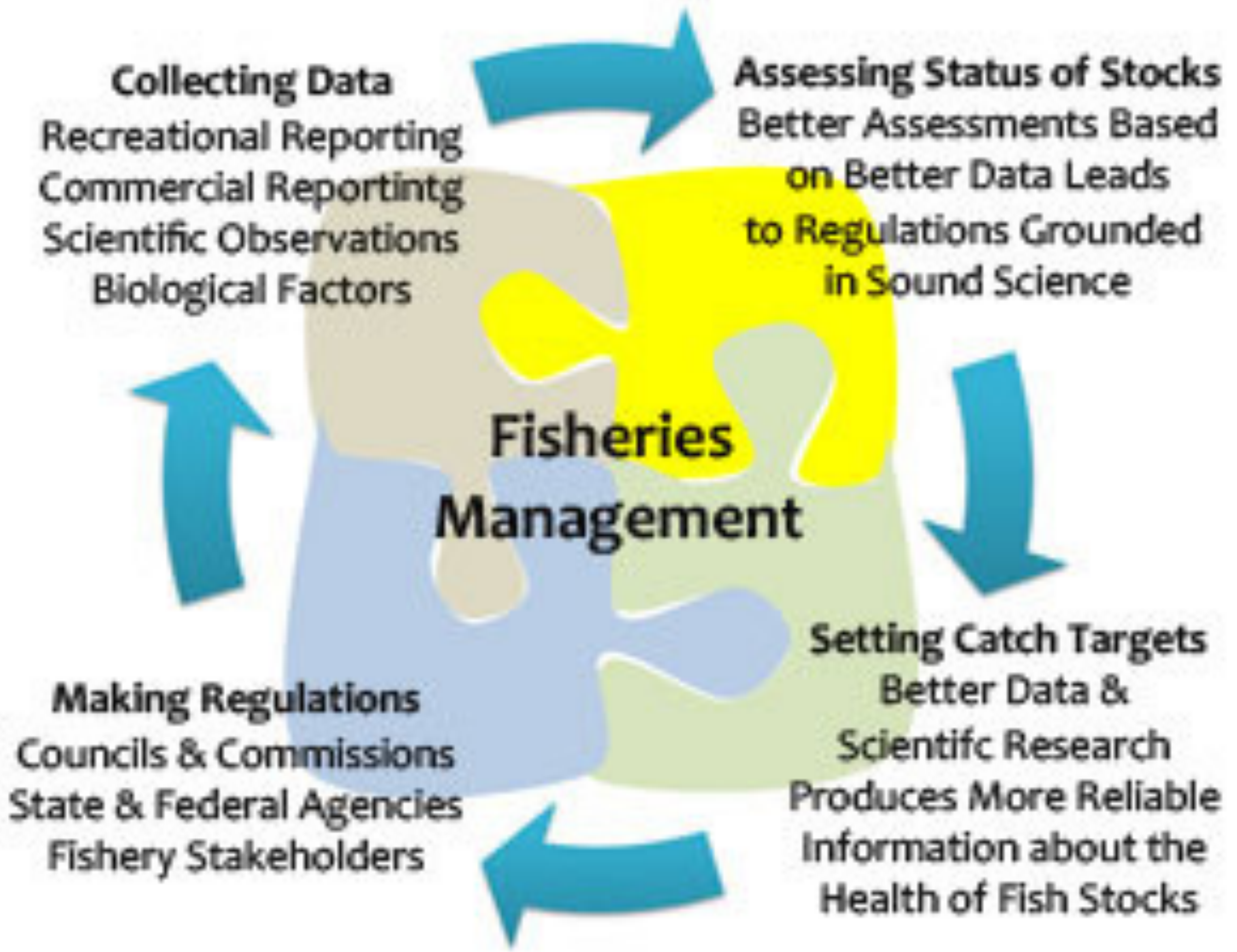
Determine status of stocks in response to fishing

03 Trends

Predict future trends

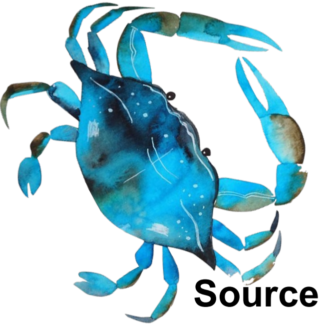
Strategize 04

Determine scientific management approach


Collecting Data
Recreational Reporting
Commercial Reportintg
Scientific Observations
Biological Factors
Assessing Status of Stocks
Better Assessments Based
on Better Data Leads
to Regulations Grounded
in Sound Science
Fisheries
Management
Setting Catch Targets
Better Data &
Scientifc Research
Produces More Reliable
Information about the
Health of Fish Stocks
Making Regulations
Councils & Commissions
State & Federal Agencies
Fishery Stakeholders

Information from Stock Assessment

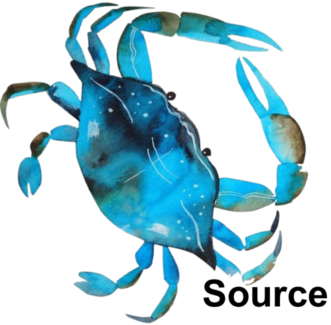
- Catch per Unit Effort (CPUE) - kg/gear/hr
- Seasonality – low and peak season
- Sex Ratio and Size Composition
- Spawning Season - release of eggs
- Gonadosomatic Index (GSI) – proportion of gonad mass to total body mass



Source: Ho Kit Ian, 2020

Information from Stock Assessment

- Fecundity Estimates – egg laying capacity per ind.
- Size at first Maturity
- Exploitation Ratio
- Spawning Potential Ratio (SPR) – proportion of the unfished reproductive potential left at any given level of fishing pressure

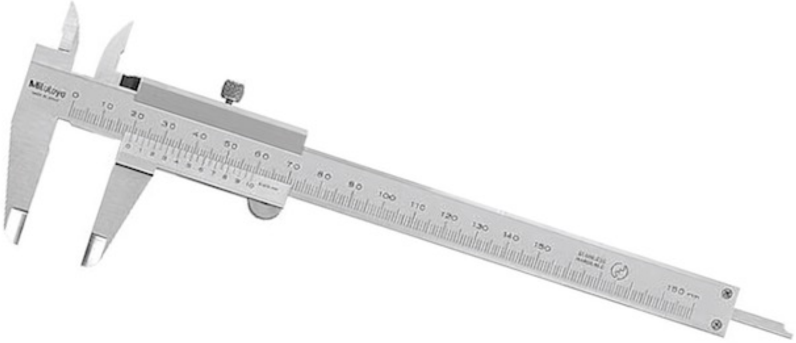


Source: Ho Kit Ian, 2020

Methods

Materials

Digital
Weighing Scale
(0.00g)



Vernier Caliper

Materials

Gonadal Stages Guide

Data Collection

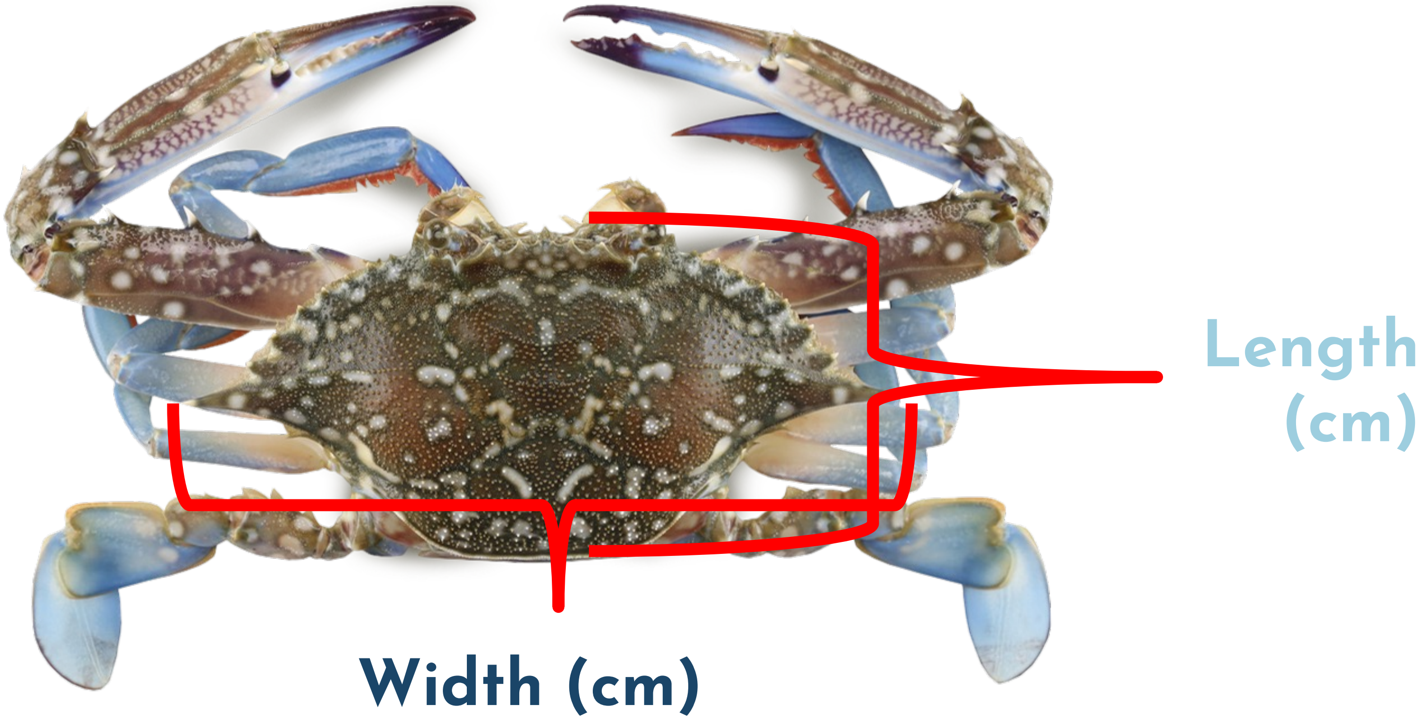
1. Determine the GEAR TYPE and DURATION OF FISHING (hr) of the fisher

Crab Net/Gill Net

Crab Pot

Data Collection

2. Measure Carapace Length and Width



Materials

3. Record Weight (g)

4. Identify Gonadal Stage

ACTIVITY

Instructions

4 Groups

Stakeholders and
3 PO's

→

1 Enumerator/ Group

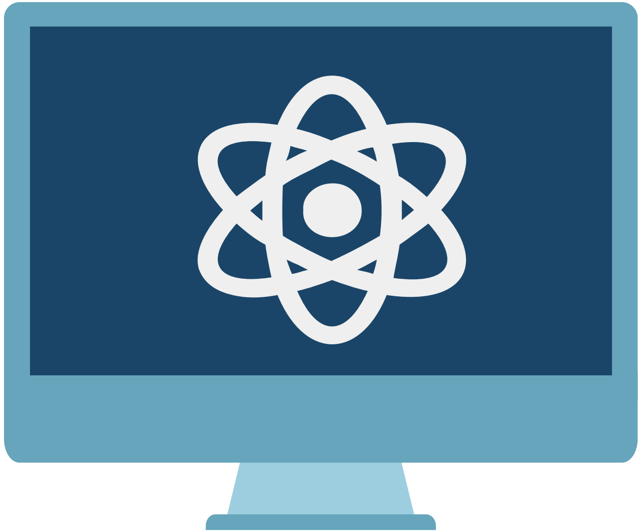
→

Individual

Each will perform
the data collection

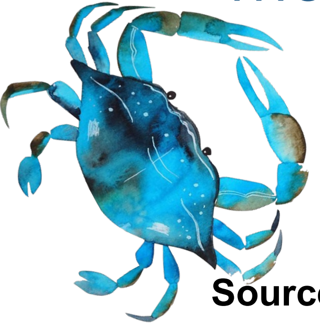
Sample Output

Bantayan SPR Report 2017



Highlights

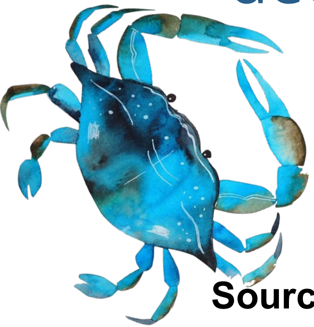
- Hand fishing or “*salom*” is the most destructive fishing method for BSC due to juvenile exploitation. “Salom” fishers indiscriminately catches > 70% immature crabs. Gill net remains the most efficient gear in terms of sustainable catch size.
- Fishing mortality is 1.83 times than natural mortality, indicating moderate fishing pressure.



Source: Technical Report, 2017

Highlights

- SPR is 26% which means the fishery is at risk of overexploitation.
- Generally, Bantayan is harvesting crabs past maturity. But frequent juvenile landings (accounting to ~30% of the total female crabs) caused SPR to decline drastically.



Source: Technical Report, 2017

ESTABLISHMENT and MANAGEMENT of the THAI-STYLE HATCHERY

OBJECTIVE:

1. Increase the natural population

2. Measure the effectiveness of the hatchery in increasing abundance

3. Know the marine ecological impact of crab hatching tanks

4. Capacitate the coastal community in operating and managing the hatchery

What is Thai -Style Hatchery?

Thai-Style hatchery mitigate the effects of overharvesting of the Blue Swimming Crab through allowing gravid female crabs to release their larvae before processing the crab.

The BSC Thai-Style Hatchery which was established at BFAR-MSH on August 2019 has total dispersed of 552,104,254 pcs. of zoea until December 15,2021 before super typhoon Odette striken and destroyed the facility.

BSC Thai- Style Hatchery Set-up at Brgy. Kiambakeke,Guiwanon, Bantayan,

Set-up of the Thai-Style Hatchery

Thai-Style Hatchery is compose of five (5) blue drums of 175L capacity and a funnel-shaped container.The set-up is configured such that seawater circulates through the containers connected by pipes with a flow rate of 49 seconds per liter, while eggs are kept afloat by aeration in each container. The eggs move with the circulating water, and zoeas are isolated in the funnel-shaped container.

The light stimulates the swimming activity of zoea, concentrating them at the upper water layer. The outflowing water then drifts the zoeas out from the system, through a pipe, toward the collecting net. The cycle continues until all eggs hatch into zoeas.

METHODOLOGY:

Site Selection:

1. Near a PACPI member company's picking station;
2. Should be adjacent to a cove, semi-cove, or a sheltered bay;
3. Area should be biologically rich primarily inhabited by seagrass, aquatic plants and/or seaweeds;
4. The site should harbor ideal conditions for the protection and settling down of zoea;
5. It should be productive enough to support the growth of zoea to megalopa to

Operation of the Thai-Style Hatchery:

The following are the step-by-step procedure in operating the thai-style hatchery:

1.Segregate and collect stage 4 live

en th

g s

2. Keep the crabs alive by placing them in seawater with aeration.

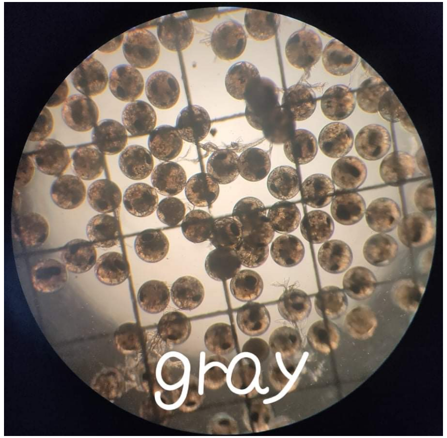
3. Remove the eggs by brushing using a medium-size nail brush. Ensure that crabs are steadily submerged in aerated seawater in the process.

4. Collect the eggs using a fine mesh net (approximately 80 microns), rinse partly with seawater and distribute equally into the containers. If the eggs' source is far from the set-up, transfer the eggs to a container with seawater for transport.

5. Run the set-up until eggs hatched into zoea. Ensure that the set-up does not run out of filtered seawater.

6. Collect the zoeas daily, at nightfall, and release them to the dispersal site.

1,633,333 zoea was dispersed at Baod Sanctuary

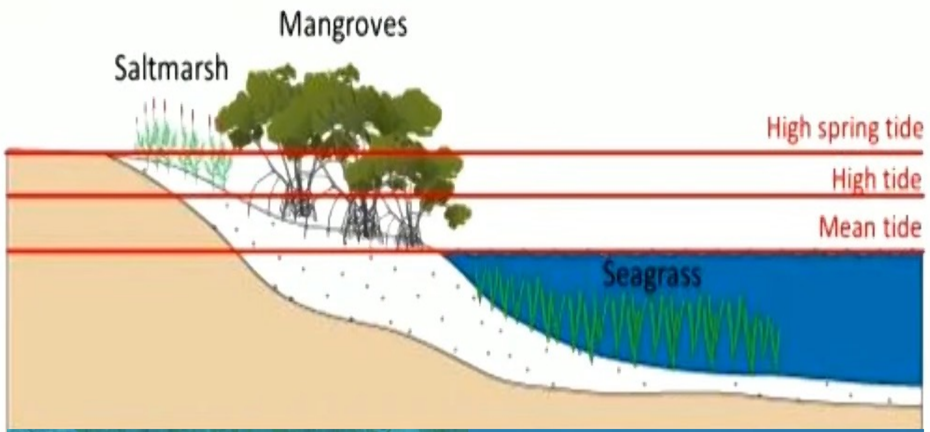


Seagrass Ecosystem and Monitoring

What are seagrasses?

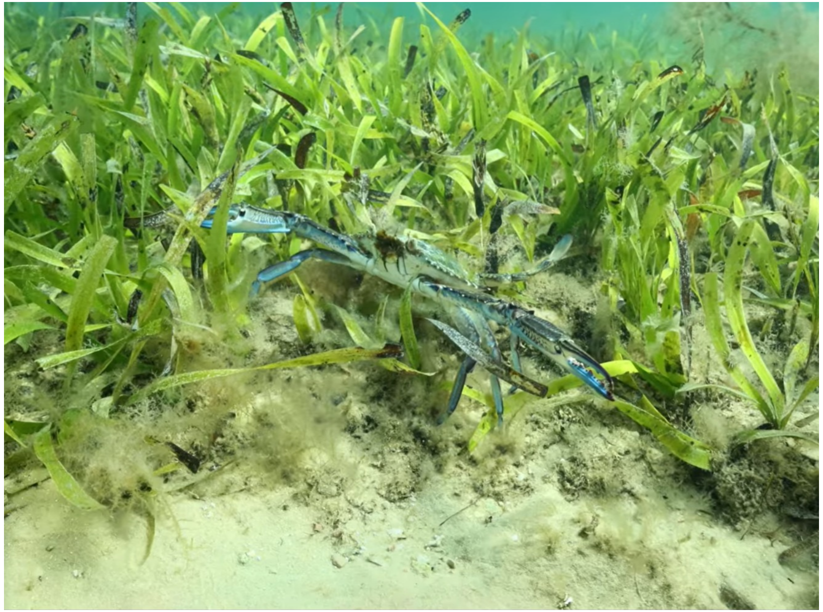
- They occur in the mean tide to the subtidal

- unlike mangroves, they are Herbasceous (not woody)



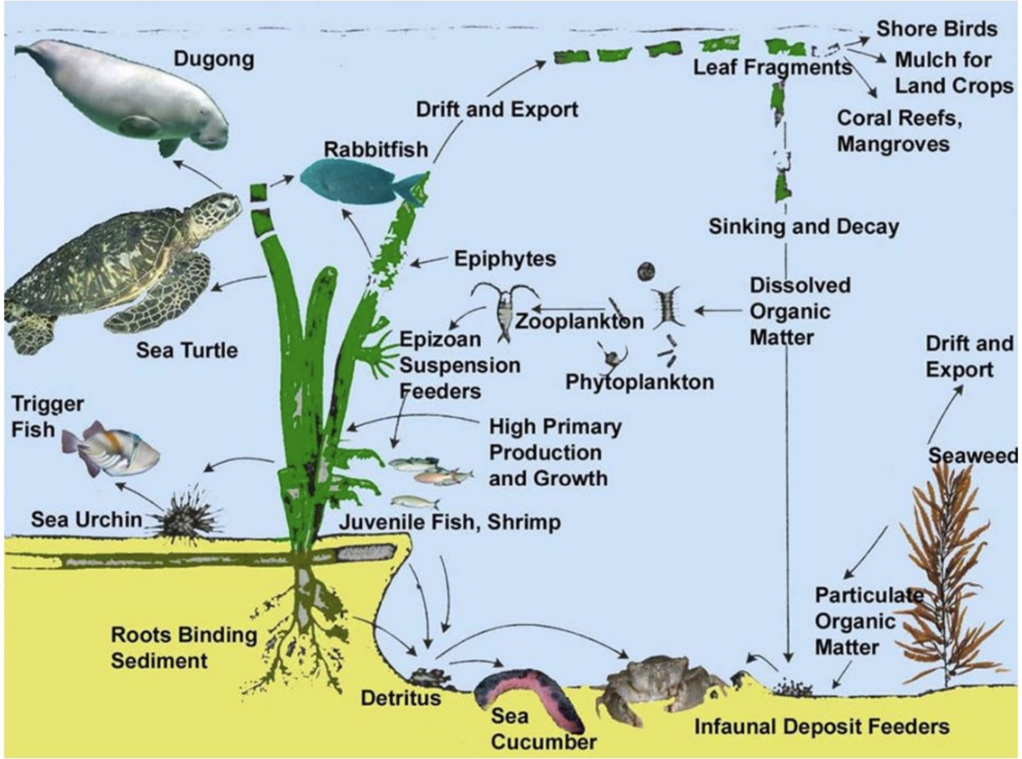
Keeping Seagrasses Healthy

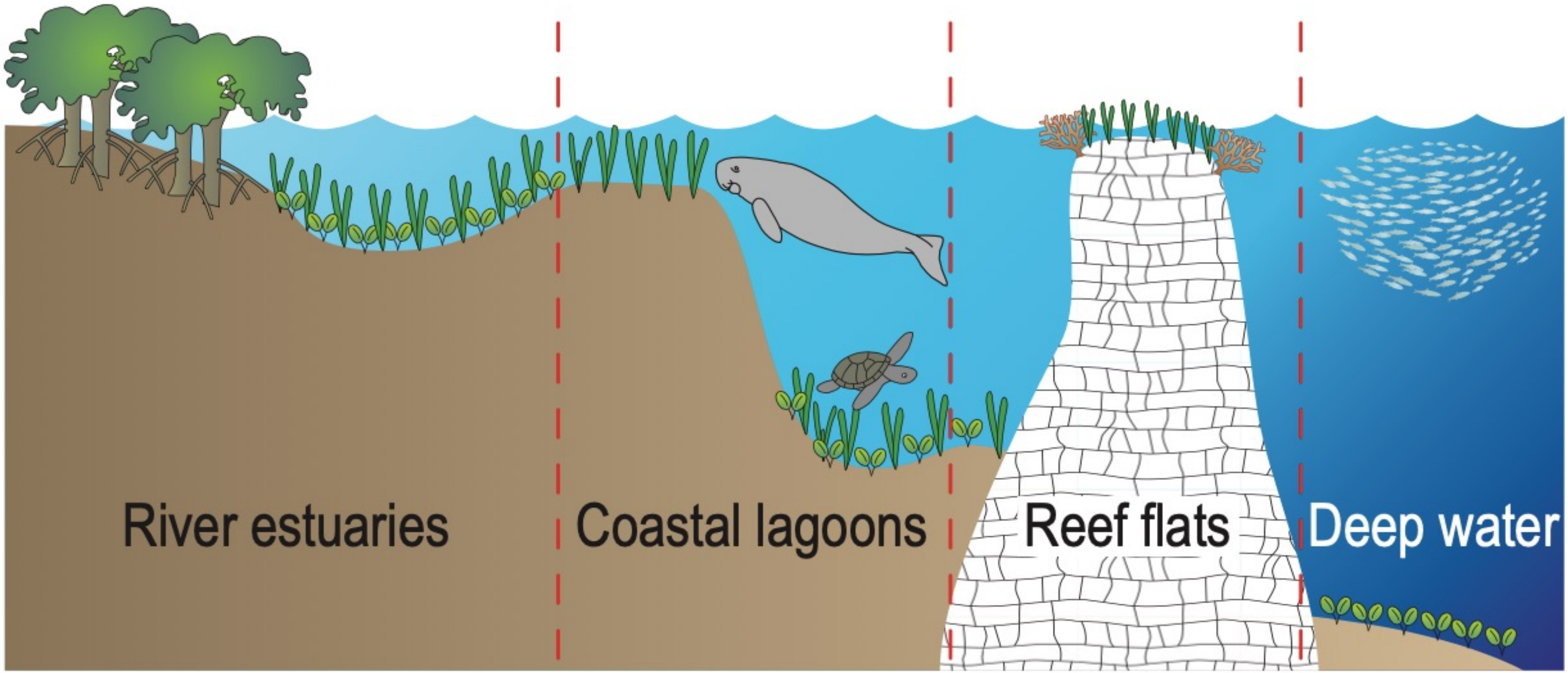
- Clear water
- Light to produce food
- Low nutrient supply
- Some physical disturbance
- Low wave energy
- calm and shallow water



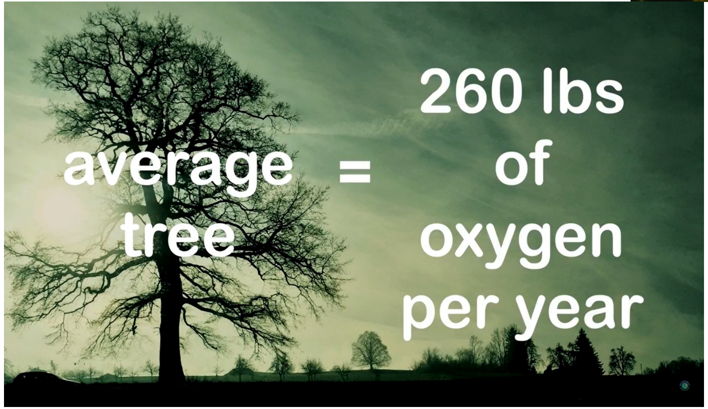
Ecological Role

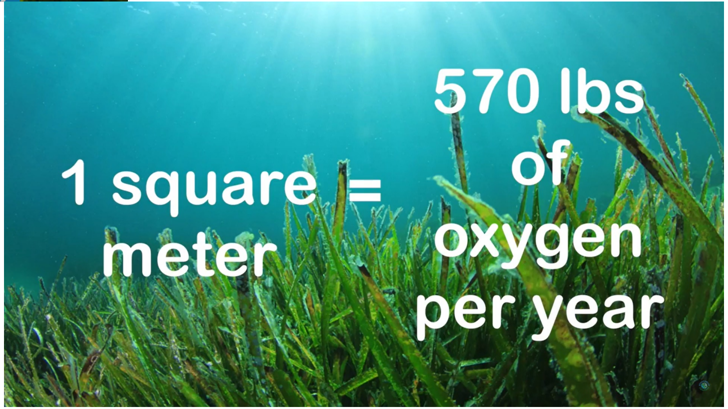
- ➢ Provide food
- ➢ Refuges and nurseries
- ➢ Reduce coastal erosion, filter water, and trap sediment
- ➢ Produce oxygen and take up carbon dioxide




River estuaries
Coastal lagoons
Reef flats
Deep water

Ecological Role





Ecological Role

- 18% of oceanic carbon dioxide worldwide absorbed by seagrasses

- 35 times faster than the rain forest

Source: Lyimo Lebiratus Dominick,; Carbon sequestration processes in tropical seagrass beds 2016

Service Seagrass Provide

Threats

- Industrial discharge
- Development of infrastructures
- Dredging and other mechanical damage
- Overexploitation of seagrass fauna
- Climate change

Source: (Pitanga et al., 2012), Yuku-Baja-Muliku Ranger Base - 2014 - seagrasswatch.org

Marine Macro-algae/Seaweeds

- most are photosynthetic
- Algae lack leaves, roots and the elaborate vascular structure
- Largest and most complex marine forms are called "seaweeds"
- More than 600 species had been reported in the country (Trono 1998)
- 365 species documented to be economically important

Brown Algae

Sargassum **(samo) on rocky substrate**

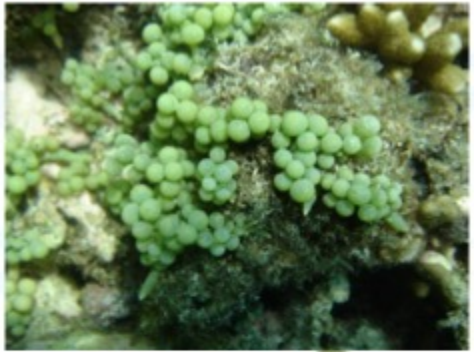
(VSU Marine Team 2007)

Turbenaria Calumpong 1997

Padina (Calumpong 1997)

Green Algae

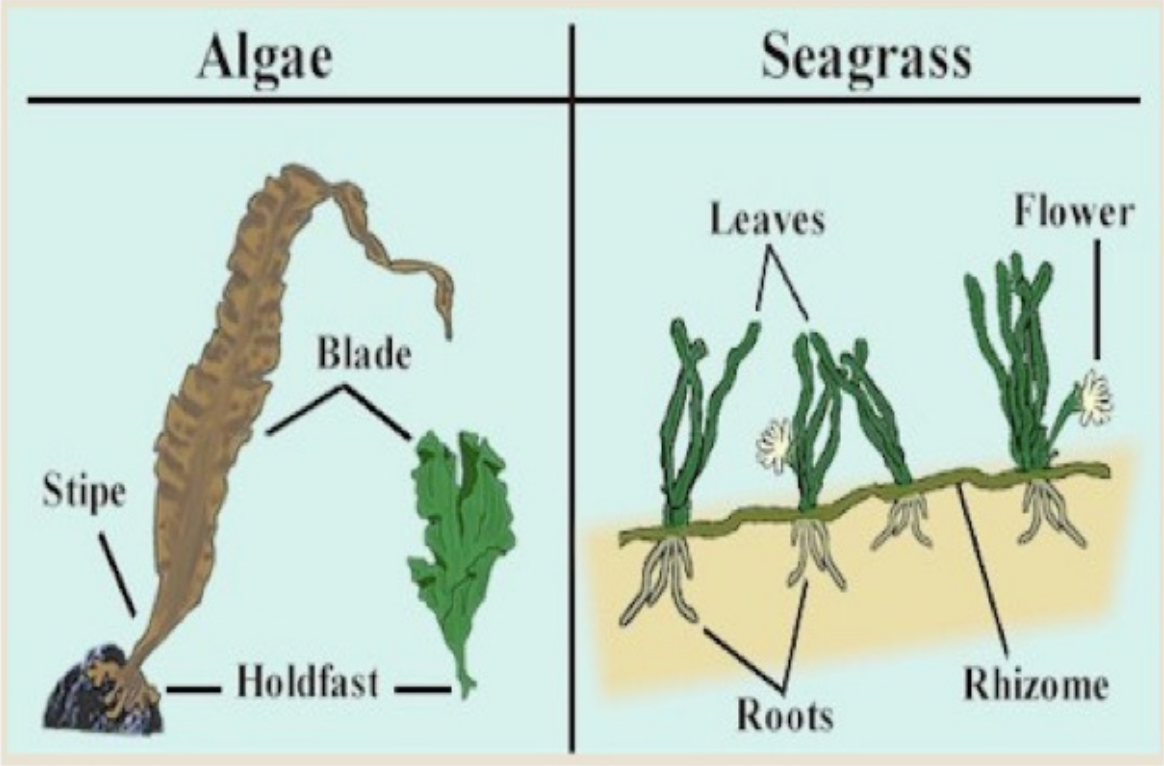
Bornetella (VSU Marine Team 2007)



Caulerpa (VSU Marine Team 2007)

Halimeda (VSU Marine Team 2007)

Picture showing an important distinction between Seagrass & Seaweeds



Seaweed/Algae **Seagrass**

Key Distinguishing Features

Leaf

- shape
- tip morphology
- vein pattern
- smooth or serrated edge
- sheath type
- attachment type (rhizome or stem)

Root

- Size and thickness
- Presence of root hairs

Where found

- Location (geographical and depth)
- Substrate type

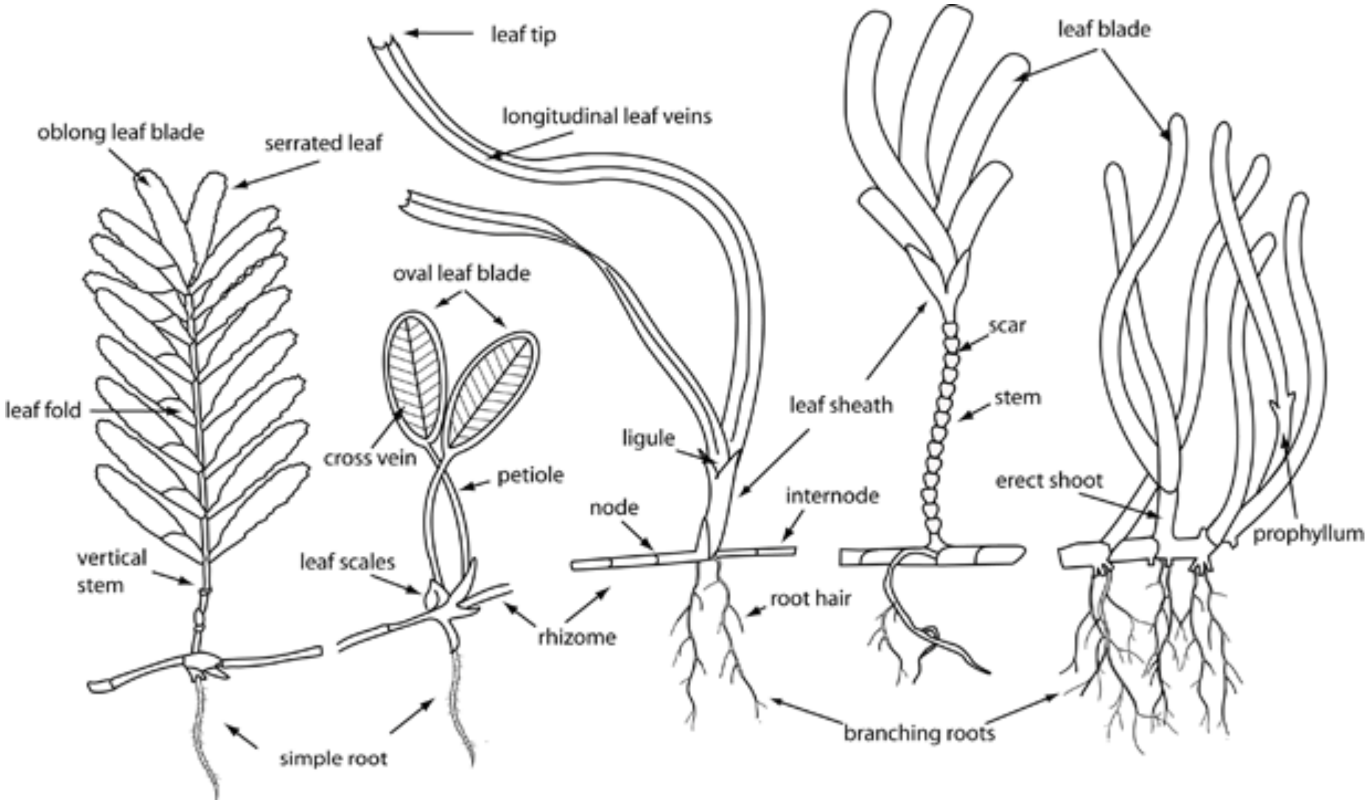
Rhizome

- morphology

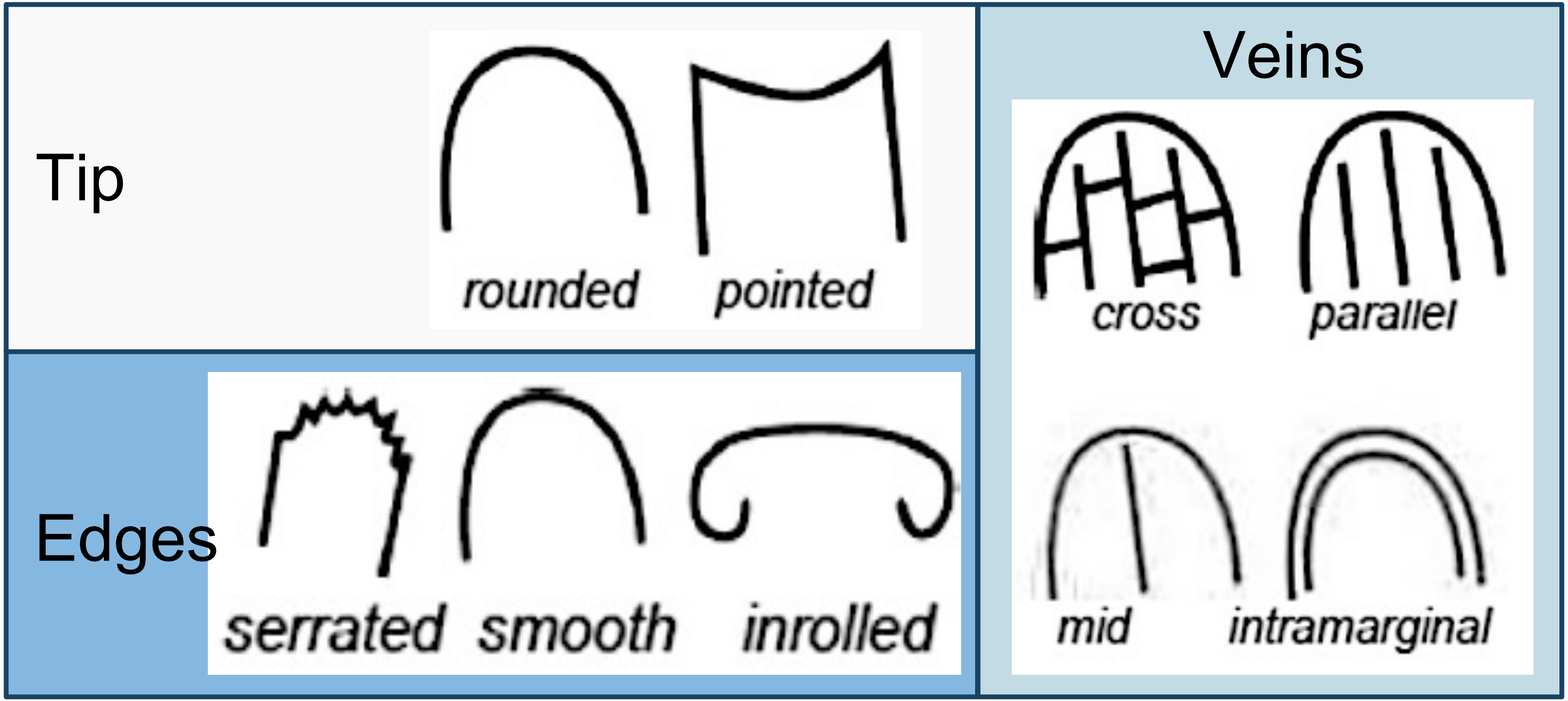
Stem

- Closed or open leaf scars

Seagrass Morphology

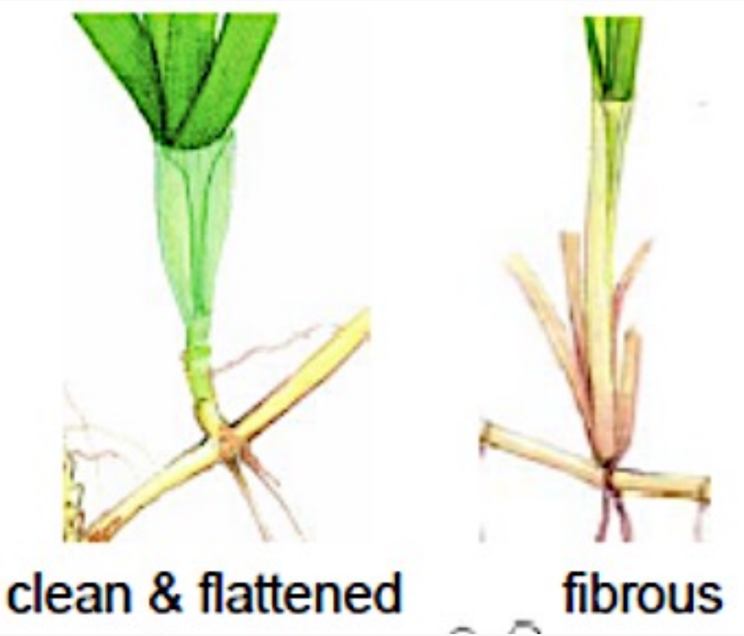


Lea
f

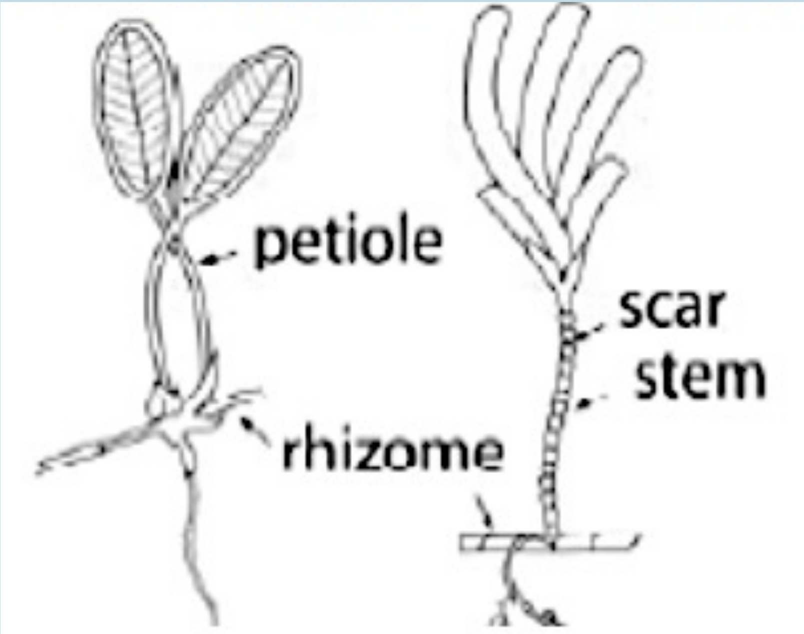

Tip
rounded
pointed
Veins
cross
parallel
mid
intramarginal
Edges
serrated
smooth
inrolled

Leaf

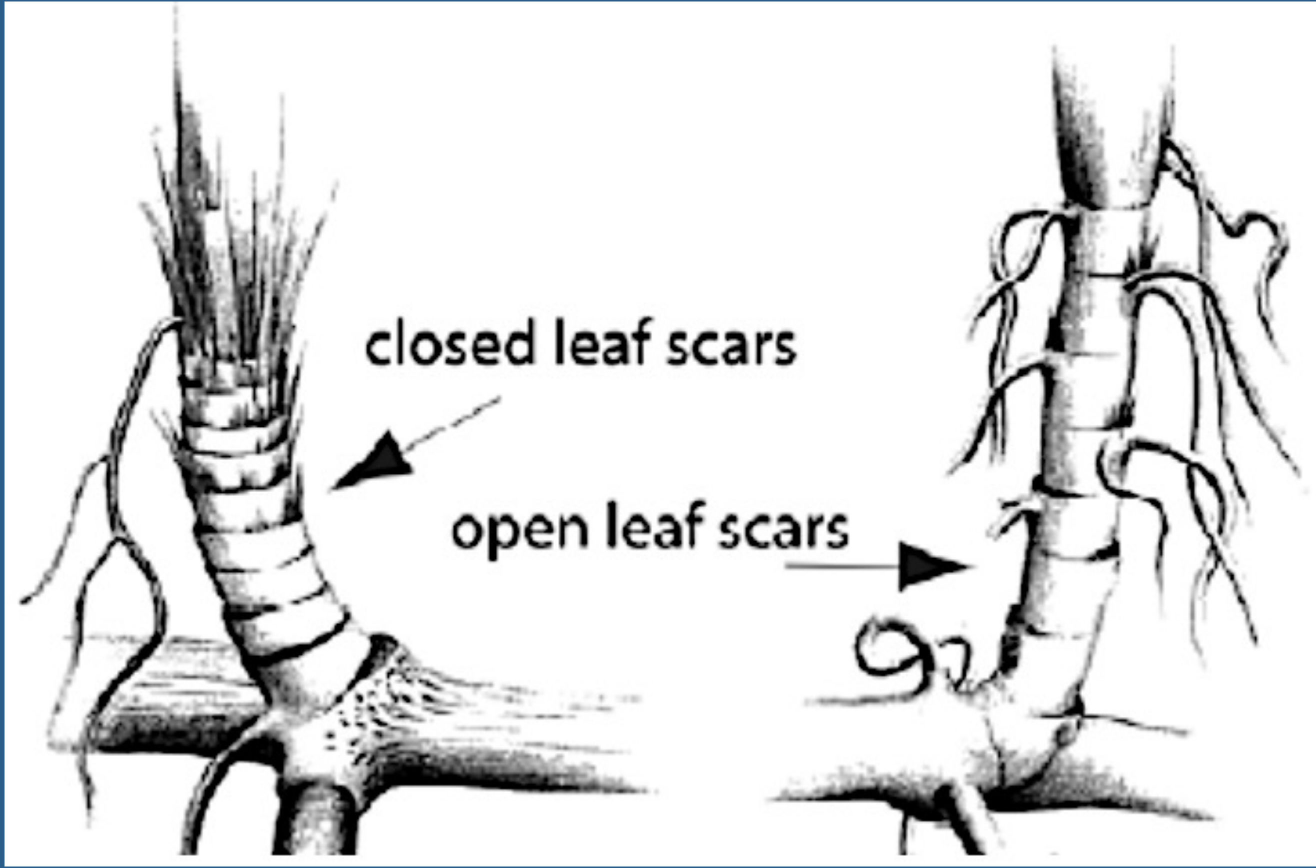
Sheath



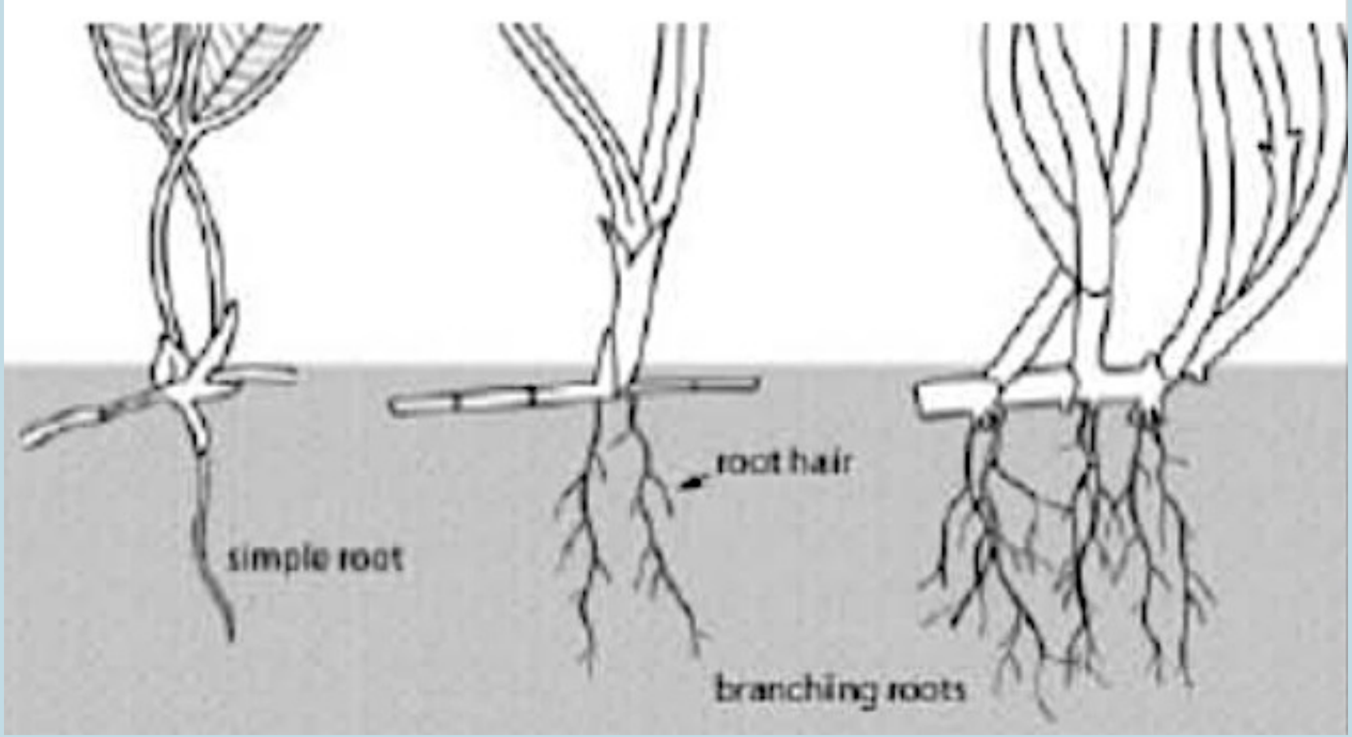
Attachment



Stem



Root



Types of Seagrasses commonly found in the Philippines and each identification

Cylindrical Leav

Syringodium isoetifolium ***(SI)***

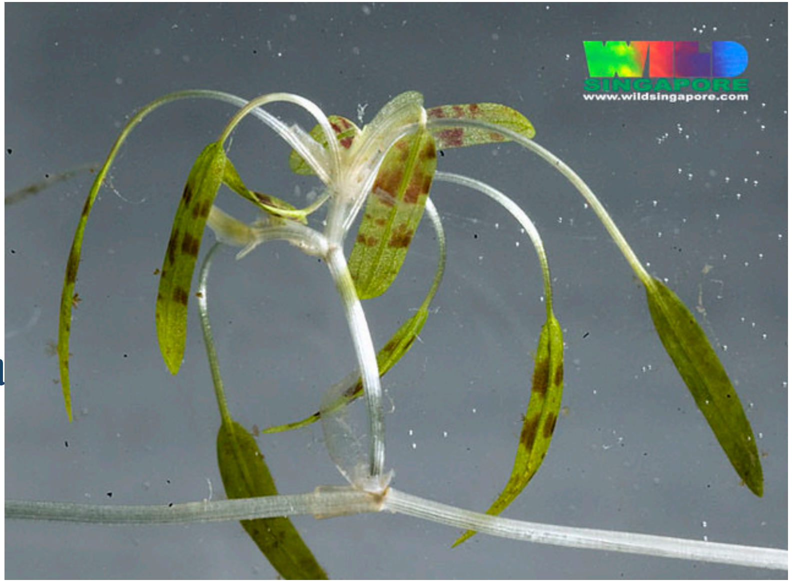
- Narrow spaghetti-like leaves, 1-2mm diameter
- Leaf tip pointed
- Leaves contain air cavities
- Inflorescence a “cyme”

Oval to Oblon

Halophila spinulosa **(HS)**

- Leaves arranged opposite in pairs
- Leaf margin serrated
- Shoots ≤ 15cm long
- 10~20pairs of leaves/shoot
- Leaf 15~20mm long and 3~5mm wid
- Thin rhizomes

Oval to Oblong



*Halophila beccarii **(HB)***

- Leaves arranged in clusters of 5-10, at a node on vertical stem
- Short vertical stem between clusters
- Leaf clusters do not lie flat
- Leaves elongate, with mid-vein and no obvious cross-veins
- Leaf margin finely serrated

Oval to Oblong Leaves with petioles, in pairs

Halophila ovalis **(HO)**

- Cross veins more than 8 pairs
- Leaf margins smooth
- No leaf hairs
- Leaf 5~20mm long

Oval to Oblong Leaves with petioles, in pairs

Halophila decipiens ***(HD)***

- Leaf margin serrated
- Fine hairs on both sides of leaf blade
- Leaves are usually longer than wide

Oval to Oblong Leaves with petioles, in pairs

Halophila minor ***(HM)***

- Leaf ≤5mm wide
- Cross veins ≤8pairs
- Leaf margin smooth
- No leaf hairs

Strap-like leaves arise from vertical stem

Thalassodendron ciliatum ***(TC)***

- Cluster of ribbon-like curved leaves at the end of an erect stem
- Round, serrated leaf tip
- Tough, woody rhizomes with scars from successive shoots
- Very coiled, branched roots

Strap-like leaves arise from vertical stem

Thalassia hemprichii ***(TH)***

- Ribbon-like, curved leaves 10-40cm long
- Short red/black bars of tanning cells, 1-2mm long, in leaf blade
- Leaf tip rounded may be slightly serrated
- 10-17 longitudinal leaf veins
- Thick rhizomes ≤5mm with conspicuous scars

Strap-like leaves arise from vertical stem

Cymodocea rotundata **(CR)**

- Leaf tip rounded with smooth edge
- Leaf sheath not obviously flattened, fibrous
- leaf sheath scars continuous around upright stem

Strap-like leaves arise from vertical stem

Cymodocea serrulata **(CS)**

- Leaf tip rounded with serrated edge
- Leaf sheath broadly flat and triangular, not fibrous
- Leaf sheath scars not continuous around upright stem

Strap-like leaves arise from vertical stem

Halodule uninervis ***(HU)***

- Leaf tip tri-dentate or pointed, not rounded
- Leaf with 3 distinct parallel-veins, sheaths fibrous
- Narrow leaf blades 0.25-5mm wide
- Rhizomes usually pale ivory, with small black fibers at the nodes

Strap-like leaves arise from vertical stem

Halodule pinifolia ***(HP)***

- Leaf tip rounded
- Leaf with 3 distinct parallel- veins, sheath fibrous
- Rhizome usually white with small black fibers at the nodes

Strap-like leaves arise from rhizome

Enhalus acoroides ***(EA)***

- Large plant, leaves >30cm long, >1cm wide
- In-rolled edges of leaves
- Long, black bristles protruding from thick rhizomes
- Cord-like roots


Monitoring

Equipment Needed

- Calibrated transect line(50~100m)
- Quadrat (1㎡)
- Slate board with attached pencils
- Seagrass field guide
- Global Positioning System (GPS)
- Snorkling gear(mask, snorkel, booties, fins)

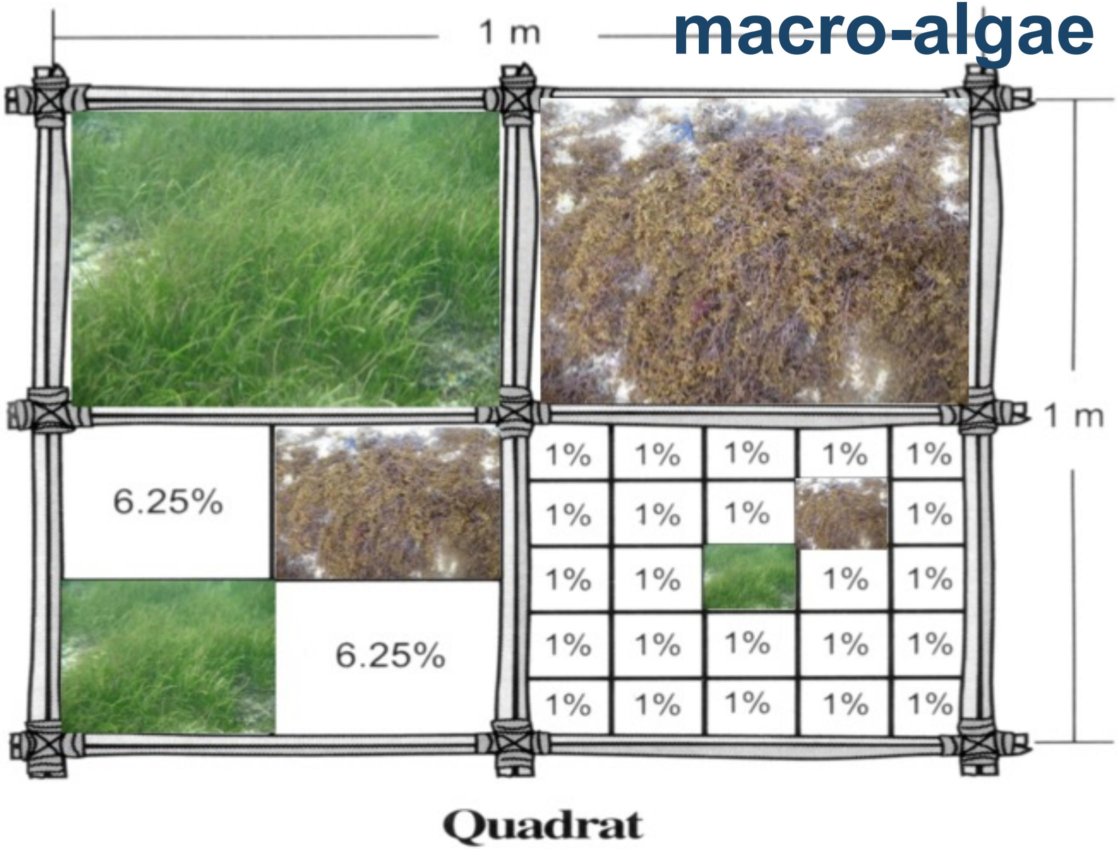
Transect Quadrat Method

- Determine the Seagrass Beds in the Area
- Select at least 3 stations per Area/Barangay – distribute the stations evenly within the area
- Record the location/GIS coordinates of the station/s
- Lay 100m transect perpendicular to the shoreline
- Place 1x1m quadrat in every 5m interval staring from 0m-100m

Transect Quadrat Method

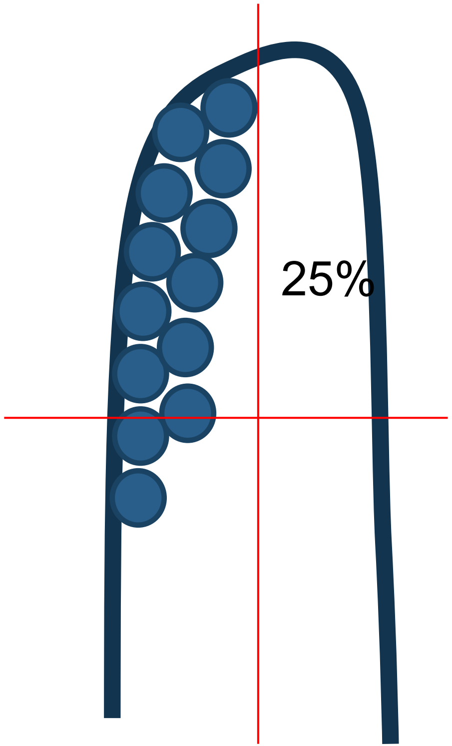
- Collect the following data
    - Seagrass % cover
    - Epiphyte % Cover
    - Number of Shoots
    - Average leaf height

Estimating % cover of seagrass, seaweeds and macro-algae



- Identify species present
- Include in the overall % cover the macroalgae and substrate type (sand, rock, coral)

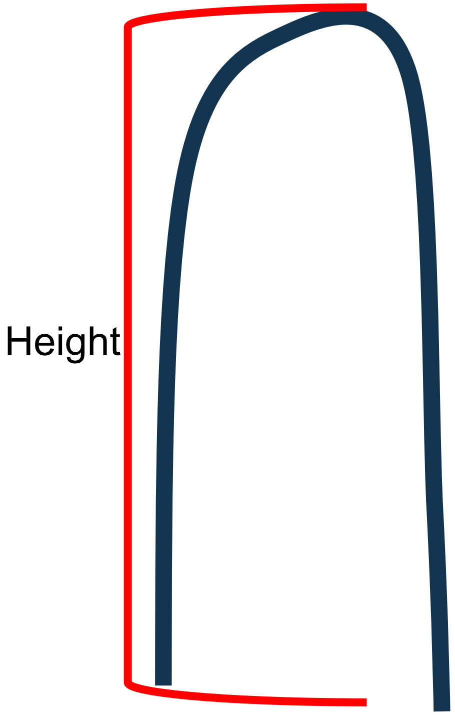
Epiphyte % Cover in Leaf Blade



- Check the presence of epiphyte in the leaf blade
- Determine the % cover of epiphyte by:
  - Consider 1 leaf blade as 100%
  - Imaginarily divide the leaf blade into 4
  - Estimate the % epiphyte cover

Counting of Seagrass Shoots

Average Height Leaf Blade



- Select at least 3 different sizes of leaf per species
- Using a tape measure, record the height of the leaf