Dugong Conservation Diver

Distinctive Specialty Course

Dugong Conservation Diver

DISTINCTIVE SPECIALTY

INSTRUCTOR OUTLINE

Introduction

This section includes suggestions on how to use this guide, an overview of course philosophy and goals.

How to Use this Guide

This guide speaks to you, the Dugong Conservation Diver Specialty Instructor. The guide contains three sections – the first contains standards specific to this course, the second contains knowledge development presentations, and the third details the open water dives.

All required standards, learning objectives, activities, and performance requirements specific to the Dugong Conservation Diver course appear in **boldface** print. **The boldface assists you in easily identifying those requirements that you *must* adhere to when you conduct the course.** Items not in boldface print are recommendations for your information and consideration. General course standards applicable to all PADI courses are located in the General Standards and Procedures section of your PADI *Instructor Manual.*

Course Overview and Goals

The purpose of the PADI Dugong Conservation Specialty Diver Course is to introduce divers and snorkelers to dugongs and familiarize them with proper recreational diving techniques for responsible interaction. Training should emphasize fun and safety. The goals of the Dugong Conservation Diver Specialty course training are:

The goals of Dugong Conservation Diver training are:

A. To familiarize with the role PADI in preserving endangers species of the marine environment.
B. Introduce the divers to dugong ecology, behaviour and distribution worldwide.
C. To introduce the divers about dugongs' population decline, importance of dugong to marine ecosystem and what they can do prevent further decline.
D. To provide the divers with the knowledge and skills needed to encounter the dugong and record sighted.
E. Provide an overview of dugong research and worldwide conservation status.
F. To enable divers to plan, organize and execute a dugong dive in a safe, passive manner.
G. To emphasize the importance of dugong monitoring activities and provide dugong conservation opportunities through participation in any dugong project conducting worldwide like Australia, South East Asia, Indian Ocean, Arabian Gulf and East Africa especially in the Red Sea.

Course Flow Options

This course contains knowledge development, class room exercises, interviews activities and open water training dives. When possible, you should conduct the knowledge development session before any open water training.

There are 2 open water dives to complete. You may rearrange skill sequences within each dive; however, the sequence of dives must stay intact. You may add more dives as necessary to meet student divers' needs. Organize your course to incorporate environment friendly techniques throughout each dive, to accommodate student diver learning style, logistical needs, and your sequencing preferences.

Section One:

Course Standards

This section includes the course standards, recommendations, and suggestions for conducting the PADI Dugong Conservation Diver course.

Standards at a Glance

Course Standards

Minimum Instructor Rating:	**PADI Dugong Conservation Diver Distinctive Specialty Instructor**
Prerequisites:	**PADI Open Water Diver, or qualifying prerequisite**
Minimum Age:	**min 15 years**
Ratios Open Water:	**8:1 instructor; plus 2 students per certified assistant to a maximum of 10 students**
Depth	**Maximum Depth 18 metres / 60 feet** or less according to the indication of dugong sighting 6-12 metres/20-40 feet recommended
Hours:	Recommended: 12
MinimumConfined Water Dives:	**1 (optional: If dugong feeding trails are recorded <2m depth)**
Minimum Open Water Dives:	**2**

Materials and Equipment - Instructor and Student::

- (***Dugong Conservation*) *Diver Course Instructor Outline*** **(**Instructor only)
- **Student and Instructor equipment as outlined in the PADI Instructor Manual, General Standards and Procedures**
- Standardized Dugong Catch / Bycatch Questionnaire.
- Project AWARE *Ten Ways a Diver Can Protect the Underwater Environment*
- Specialty equipment and supplies:

a. Spare parts kit
b. Extra weights in small increments - for student trim
c. compass
d. Underwater camera
e. Underwater measurements tap.
f. Underwater slate with pencil

Instructor Prerequisites

To qualify to teach the Dugong Conservation Diver course, an individual must be a Teaching status PADI Master Scuba Diver Trainer or higher. **PADI Instructors may apply for the Dugong Conservation Diver Distinctive Specialty Instructor rating after completing a Specialty Instructor Training course with a PADI Course Director, or by providing proof of experience and applying directly to PADI.** For further detail, reference Membership Standards in the General Standards and Procedures section of your PADI *Instructor Manual.*

Student Diver Prerequisites

By the start of the course, a diver must be:

1. **Certified as a PADI Open Water Diver or have a qualifying certification from another training organization.** In this case, a qualifying certification is defined as proof of entry-level scuba certification with a minimum of four open water training dives. Verify student diver prerequisite skills and provide remediation as necessary. Non diver route: Snorkelers may participate in the course by including the two snorkeling dives. Non divers may also participate by completing only the knowledge development portion.

2. **Be at least 15 years.**

Supervision and Ratios

Open Water Dives

A Teaching status PADI Dugong Conservation Diver Specialty Instructor must be present and in direct control of all activities and must ensure that all performance requirements are met. After all student divers have successfully demonstrated the required skills, the Instructor may exercise indirect control over the balance of the dive.

The ratio for confined and open water dives is 8 student divers per instructor (8:1) and to certified assistance (4:1).

Site, Depths, and Hours

Site

Choose sites with conditions and environments suitable for completing requirements. Shallow dives will provide divers with more time to complete tasks. Use different open water dive sites, if possible, to give students divers experience in dealing with a variety of environmental conditions (incorporate environment friendly techniques throughout each dive) and logistical challenges.

Depths

6-12 metres/20-40 feet recommended (or less depend on dugong sighting and/ or feeding trails occurred)
18 metres/60 feet limit

Hours

The PADI Dugong Conservation Diver course includes 2 open water dives. Conduct dives during daylight hours between sunrise and sunset. The minimum number of recommended hours is 12.

Assessment Standards

The student diver must demonstrate accurate and adequate knowledge during the open water dives and must perform all skills (procedures and motor skills) fluidly, with little difficulty, in a manner that demonstrates minimal or no stress.

Certification Requirements and Procedures

By the completion of the course, student divers must complete *all* performance requirements for Dugong Conservation Diver Open Water Dives One and Two. (More dives are optional)
The instructor certifying the student diver must ensure that all certification requirements have been met. The certifying instructor obtains a **Dugong Conservation** Diver certification by submitting a completed, signed PIC to the appropriate PADI office.

Non diver route: Snorkelers may participate in the course by including at least one snorkelling dives and completing only the knowledge development portion.

Section Two:

Knowledge Development

Use the following teaching outline as a road map of the conduct, content, sequence and structure for the Dugong Conservation Diver course. The result should be student divers with theoretical knowledge and pragmatic experience who can adapt what they have learned to (what will your students be able to do). **Student divers will be able to explain the following learning objectives.**

Knowledge Development

Learning Objectives

By the end of knowledge development, student divers will be able to explain:

1. **To introduce dugongs – including their taxonomy, description and original of mermaid legend.**
2. **Role of dugongs play in the marine ecosystem.**
3. **Dugong distribution, biology, life history, habitat and threats.**
4. **To provide information on behavioural categories of dugong.**
5. **To provide information on dugong research, monitoring activities and worldwide conservation status.**
6. **To teach participants how to identify individual dugongs through their distinct markings.**
7. **To prepare participants to passively interact with dugong.**

Knowledge Development Teaching Outline

A. Course Introduction

1. Staff and student diver introductions

Note:

Introduce yourself and assistants. Explain your background with (Dugong Conservation) diving if your student divers aren't familiar with you.

Give times, dates and locations as appropriate for classroom presentations, confined water skill development sessions, and open water dives.

1. Course goals –

- To familiarize with the role PADI in preserving endangers species of the marine environment.
- To introduce the divers about dugongs' population decline, importance of dugong to marine ecosystem and what they can do prevent further decline.
- Introduce the divers to dugong ecology and behaviour.
- Provide an overview of dugong research and worldwide conservation status.
- To provide the divers with the knowledge and skills needed to encounter the dugong and record sighted.
- To enable divers to plan, organize and execute a dugong dive in a safe, passive manner.
- To emphasize the importance of dugong monitoring activities and provide dugong conservation opportunities through participation in any dugong project conducting worldwide like Australia, South East Asia, Indian Ocean, Arabian Gulf and East Africa especially in the Red Sea.

2. Course overview

a. Classroom presentations
b. Confined water session. There will be at least one confined water session where the skills necessary to measure the feeding trail dimension will be demonstrated and practiced by student divers to gain confidence and mastery before the open water training dives.
c. Open water dives. There will be two (or once encountered the dugong) open water dives.

3. Certification

a. Upon successfully completing the course, you will receive the (Dugong Conservation) Diver Specialty certification.
b. Certification means that you will be qualified to plan, organize, and make dives in conditions generally comparable to or better than, those in which you are trained. Certificate recognizes that you:

- Have been trained to plan, organize, make and log a dive involving dugong sighting.
- Have been trained to improve the skills for identifying the dugong individual using photo ID techniques, assess dugong behaviour, feeding trail measurement and awareness.

Note:

Use the PADI Student Record File. Explain all course costs and materials, and what the costs do and do not include, including equipment use, dive site fees, etc.

4. Class requirements

a. Complete paperwork.
b. Course costs.
c. Equipment needs.
d. Schedule and attendance.

B. Course Content

Learning Objectives

By the end of this session, you will be able to:
- **Know an introduction to Sirenians**
- **International conservation conventions**
- **Explain Sirenians taxonomy**
- **Identify the difference between dugong and other Sirenians species**

Introduction to Sirenians:

Sirenians are aquatic herbivorous mammals, with almost hairless skin, and no hind limbs. The vestigial bones of the hind legs remain. The tail is flattened horizontally and two teats are situated on the chest. Current theories suggest that sirenians evolved from four-footed land mammals over 60-million years ago. The Sirenia are recognized as members of a clade called Tethytheria that also includes the Proboscidea (living elephants and extinct relatives). At least a dozen sirenian genera are known from the fossil record, which shows that this Order was once much more diverse and widespread than at present.

International conservation conventions:

The extant Sirenians are specifically covered under two international conservation conventions: the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the Convention on Migratory Species of Wild Animals (also known as CMS or the Bonn Convention). CITES controls international trade in specimens of selected species. The species covered by CITES are listed in three appendices, according to the degree of protection needed. Appendix I lists species threatened with extinction. Trade in specimens from these species is permitted only in exceptional circumstances. Appendices II and III provide a lower level of protection. The CMS is an intergovernmental treaty, concluded under the aegis of the United Nations Environment Programme, concerned with the conservation of species and habitats of wildlife that migrate across international borders. Additionally, the Convention on Wetlands (the Ramsar Convention) protects important sirenian habitats.

The IUCN lists the dugong as Vulnerable at a global scale. The dugong is also listed in Appendix I of CITES and under the CMS. All of the dugong's 38 confirmed range states are parties to CITES, except Timor-Leste and Bahrain; about half the range states are also parties to the CMS. A Memorandum of Understanding (MoU) has been developed to protect the dugong under the auspices of the CMS, and increasing numbers of range states are agreeing to sign this document.

Definite and possible range states of the dugong showing their Human Development Index (UNDP 2010) and whether or not they are parties to some of the international conventions important to the conservation of sirenians. As of October 2010, all the confirmed dugong range states are signatory to the Convention on International Trade in Endangered Species, except Timor-Leste and Bahrain.

Human Development Index	#	Range states including territories[1] showing parties to the Convention on Migratory Species and Dugong Memorandum of Understanding as of October 2010
Confirmed range states and territories		
Very High	8	Australia[2,3] (including Cocos Keeling); Bahrain[3], Brunei Darussalam; France (Mayotte; New Caledonia)[2,3]; Japan (Ryukyus); Qatar; Singapore; United Arab Emirates[3]
High	3	Iran[2]; Malaysia; Saudi Arabia[2]
Medium	11	Cambodia; China; Egypt[2]; India[2,3] (including Andaman Island, Laccadive Island, Nicobar Island); Indonesia; Philippines[2,3]; Solomon Islands[3]; Sri Lanka[2]; Thailand; Timor-Leste; Viet Nam
Low	10	Comoros (Union of)[3]; Djibouti[2]; Kenya[2,3]; Madagascar[2,3]; Mozambique[2]; Myanmar[3]; Papua New Guinea[3]; Sudan; Tanzania (United Republic of)[2,3]; Yemen (Socotra)[2,3]
N/A	5	Eritrea[2,3]; Palau[2,3]; Seychelles[2,3]; Somalia[2]; Vanuatu[3]
Total	37	
Possible range states and territories		
Very High	1	Israel[2]
High	2	Jordan[2]; Kuwait
Low	1	Bangladesh[2]
N/A	2	Iraq; Oman
Total	6	
TOTAL	43	Confirmed and possible ranges states and territories

Learning Objectives

By the end of this session, you will be able to:
• Explain Sirenians taxonomy
• Identify the difference between dugong and other Sirenians species

Taxonomy of the Sirenians:

Kingdom: Animalia
Phylum: Chordata
Subphylum: Vertebrata
Class: Mammalia
Order: Sirenia

Family: Dugongidae
Genus: Hydrodamalis
Species: *H*. gigas

Genus: *Dugong*
Species: *D. dugon*

Family: Trichechidae
Genus: Trichechus
Species: *T*. manatus

Species: *T. senegalensis*
Species: *T. inunguis*

What are the difference between dugong and other Sirenians species?

Dugong (*Dugong dugon*) is the only surviving herbivorous marine mammals, while other species, Steller's sea cow (*Hydrodamalis gigas*) was distinct in1768. Other three manatees species (family Trichechidae) are usually depend on or associated with the fresh water. Manatees species are geographically isolated from the others. All can occupy both saltwater and freshwater, except for the Amazon manatee that only inhabits the Amazon River and its tributaries. Sirenians at present inhabit the tropical coasts of west and east Africa, Asia, Australia, the Caribbean, Amazon River, and northern South America. The tail is spade-shaped. There are only six cervical vertebrae (differs from other mammals which have seven). There is only a slight deflection (about 40º) of the rostrum, so manatees are able to feed at any level from bottom to surface and are able to capture floating vegetation with ease. There are only three recent genera and, today, only four species remaining: one dugong and three manatees.

Different Sirenians species © Pieter Arend Folkens

1. **Steller's sea cow (*Hydrodamalis gigas*)** was the first marine mammal recorded as becoming extinct less than 30 years after being discovered due to over-hunting by Russian sealers. It grew to almost 10 meters in length and weighed up to 6,000 kg, used to live in the cold waters of the Bering Sea between Alaska and Russia. Steller's Sea Cow fed on kelp and became so well adapted to shallow waters that it could no longer dive, making it easy prey for hunters.

2. **Dugong sea cow (*Dugong dugon*)** grows to about 3.31m and an adult can weight from 250 to 600 kg. It grazes on near-shore seagrasses in the tropical Indo-west-pacific regions. The dugongs (*Dugong dugon*) exist mostly in developing countries and extend from the east coast of Africa to the Red Sea and the Persian Gulf in the Indian Ocean to Vanuatu and New Caledonia in the Pacific except for Australia, Japan, and Singapore are the only developed countries. The dugong is classified as vulnerable to extinction since 1996 at a global scale. Dugongs are bottom feeders and spend little of their time at or near the surface but must surface for few seconds for breathing at regular and frequent intervals. The dugong's range extends through the waters of about 37 countries in the tropical and subtropical coastal island waters of the Indo-Pacific from East Africa to the Solomon Islands and Vanuatu, and between about 26º north and 27º south of the equator. In most of this range, only relict populations of dugongs now exist. The largest dugong population abundance was estimated in Australia of about 85,000 individuals. This is followed by the population in the Arabian Gulf that estimated with 8000 individuals, while the Red Sea potentially supported up to 4000 dugongs. Dugong commonly frequent coastal waters occur in shallow, sheltered bays and lagoons, less than 5m deep.

3. **West Indian Manatee (*Trichechus manatus*)** grows to about 3.3 meters long and lives in coastal areas of the southeastern United States, eastern Mexico, Central America, the Greater Antilles (West Indies), and along the northern and eastern coasts of South America. These animals live in salt, fresh or brackish waters and feed on marine, estuarine and freshwater plants.

4. **Amazonian Manatee (*Trichechus inunguis*)** lives in coastal marine waters, estuaries, and rivers of West Africa and grows to between three and four meters long. They eat overhanging vegetation such as mangroves rather than aquatic plants.

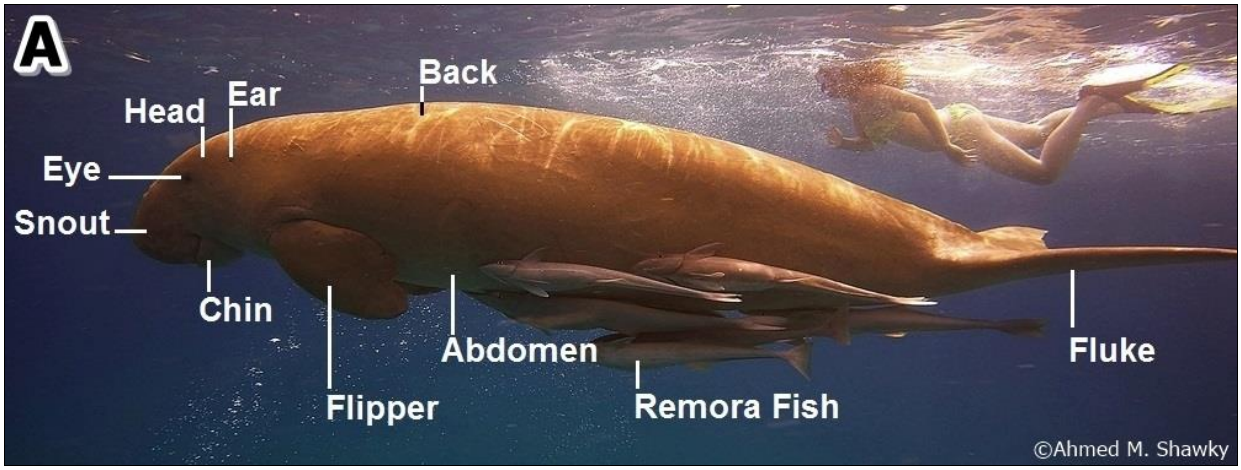
Map show the Sirenians geographical distribution worldwide.

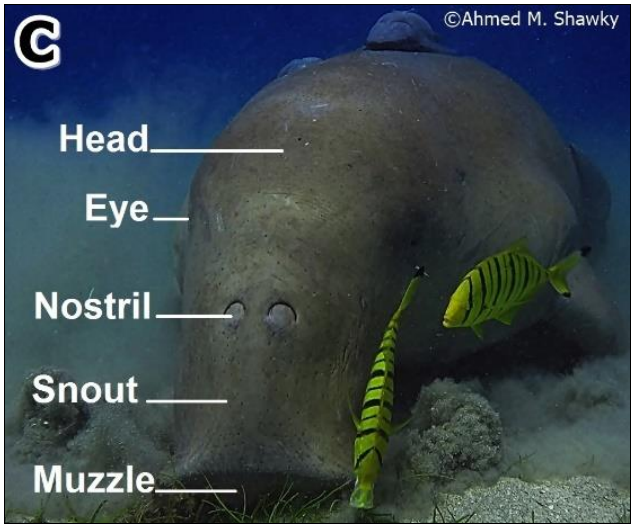
Learning Objectives

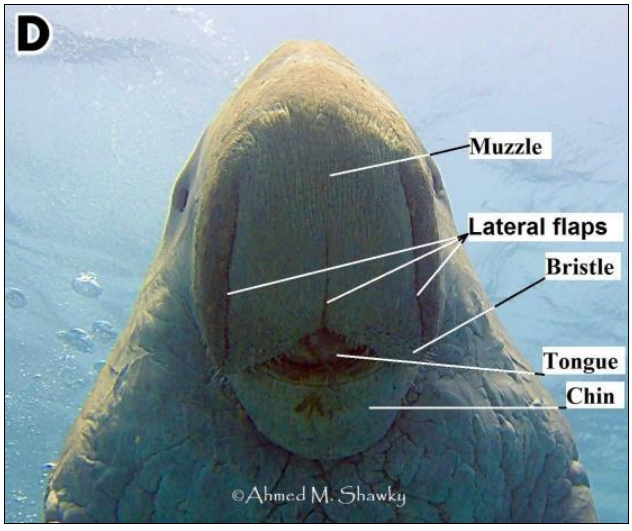
By the end of this session, you will be able to:
• Recognize of dugong description
• Understand the origin of mermaid legend

Dugong description:

- The body is barrel-shaped and streamline increases gradually until the umbilical region is reached, where the diameter becomes largest, and then it again decreases gradually to a fluke shaped tail.
- Elongated pointed flippers extinct outwardly of the trunk, a slight after the ear openings. The flippers are extensively used in the maintaining the equilibrium of the body during and for creeping over the bottom while grazing.
- The coloration of the dugong varies in different individuals and it is gray or faint brownish dorsally and laterally and pale white ventrally.
- The nostrils are a pair of crescent-shaped openings located dorsally behind the tip of the muzzle. The ear openings are small and located dorsolaterally on the head and the eyes are small.
- The head is small with broad flat muzzle with the horse-shoe shaped extension of the upper lip and covers with a many numbers of hair, bristles, and pores that used to uproot seagrasses.
- There are two nipples which are pectoral in position and situated one on each side covered by the flipper.







Dugong general description; A) External features, B) dorsal view, C) front view and D) head ventral view.

Origin of mermaid legend:

- The resemblance of dugongs to human beings when seen at distance and the female dugong suckling the young one by holding it with a flipper might have given rise to the numerous stories of mermaids told by sailors especially in medieval times.
- In the dugong, the oval ventral face of the relatively small head, of light color and roughly the same size as a human face.
- The fatty chin and the protruding nose-like alveolus of the upper jaw, lying over a small mouth; all these are characters that enhanced the resemblance to a human face.
- The flat ventral surface of the muzzle gives the impression of women hanging a veil over her head to below the eyes.
- It has also been claimed that the mother has been seen, in shallow water, holding her large size single young with one or both flippers and standing waist-high out of the water, while sucking the young at its well-developed pectoral breasts. During this process, the mother keeps its nostrils above the water level for respiration. The resemblance to a woman carrying her child has been accentuated by the great shyness of dugongs, which made it impossible to watch them except at a great distance, and often only in the darker nights.
- At the sight of an approaching object or person, they dived and the appearance of the tail beating the surface of the water aroused the curiosity and served to enliven and perpetuate the seaman's faith in such mythical creatures.

Learning Objectives

By the end of this session, you will be able to:
• Understand the role of dugongs plays in the marine ecosystem

What roles do dugongs plays in the marine ecosystem?

Dugongs are large herbivorous marine mammals, have high energetic requirements relative to other marine herbivores. An individual dugong must consume about 4-25% of its body weight per day. It is estimated that a dugong consumed 28-40 kg of seagrass per day. The role of dugong is largely a function of their feeding ecology. The ecological role of dugongs in seagrass ecosystems includes the following:

- Influence the dynamics of the plant community on which it feeds.
- Bio-turbation during feeding on seagrasses.
- Increased microbial nutrient re-cycling after excavation.
- Feeding by dugongs can aerates the soil and mixes some of the detritus with soil, providing a substrate for bacterial nitrogen fixation, increasing seagrass productivity.
- Dugong grazing can influence on seagrass species composition and change the biomass of seagrass beds. Some seagrass species can increase in growing more than others. This is depending on the intensity of grazing even if low, medium or high grazing.
- Promotion of seagrass growth through fertilization by dugong feces and increased seagrass productivity post-grazing.
- The potential for seed and propagule dispersion.
- Effect of grazing on nutritional quality. The response of seagrasses to grazing distribution alters the chemical composition of the plants. These changes are likely to complement the detrital recycling enhancement.

Learning Objectives

By the end of this session, you will be able to:
• Know the life history of dugongs

Life history:

Dugongs are long-lived with a low reproductive rate, long generation time, and a high investment in each offspring. The oldest dugong was estimated to be 73 years old when she died. The dugong age estimated from the number of growth layer groups in the tusks. Females do not bear their first calf until they are at least ten and up to 17 years old. Dugongs producing their first calf as early as age 6 years. Gestation lasts about 13-15 months. The usual litter size is one. The calf suckles for 14-18 months or so, and the period between successive births is estimated range from 2.4 to 7 years. Dugongs start eating seagrasses soon after birth, but they grow rapidly during the suckling period when they also receive milk from their mothers. Population simulations indicate that even with the most optimistic combinations of life-history parameters (e.g., low natural mortality and no human-induced mortality) a dugong population is unlikely to increase more than 5% per year.

Learning Objectives

By the end of this session, you will be able to:
• What is the dugong prefer to eat?
• How dugong forage?
• How can you take the dimensions of feeding trail?

Dugong Food

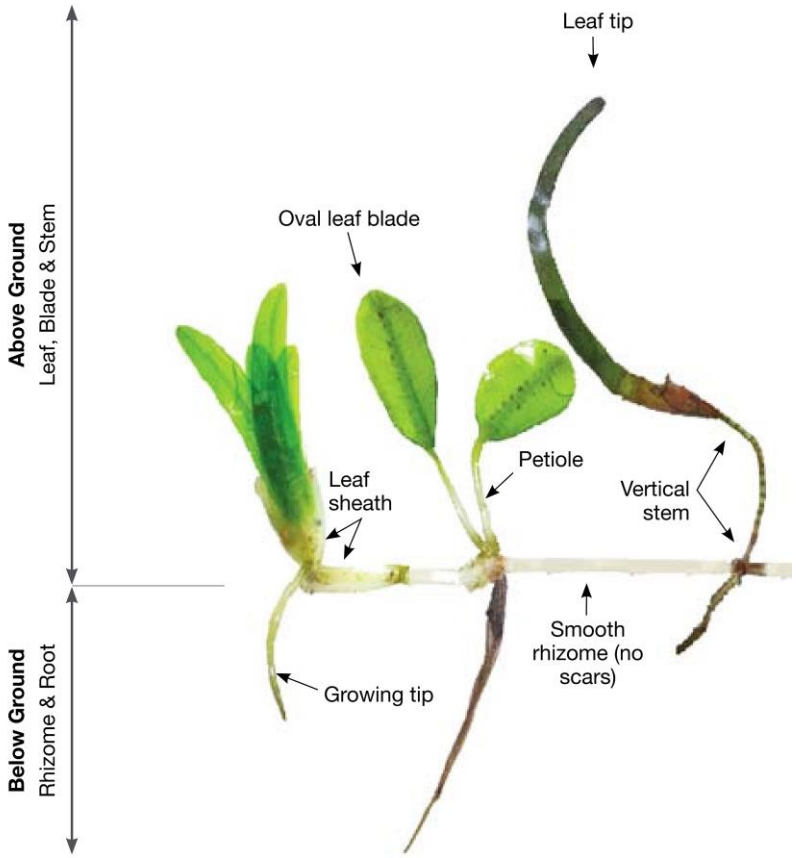
The shoots and leaves of seagrass have higher percentage nitrogen than the rhizomes, which have a higher percentage starch. Rhizomes were probably targeted because they typically have a higher sugar and starch content than other seagrass parts. There are about 60 species of seagrasses worldwide, with most restricted to sand habitats in coastal waters where they sometimes form large meadows composed of one or more species.

How dugong forage?

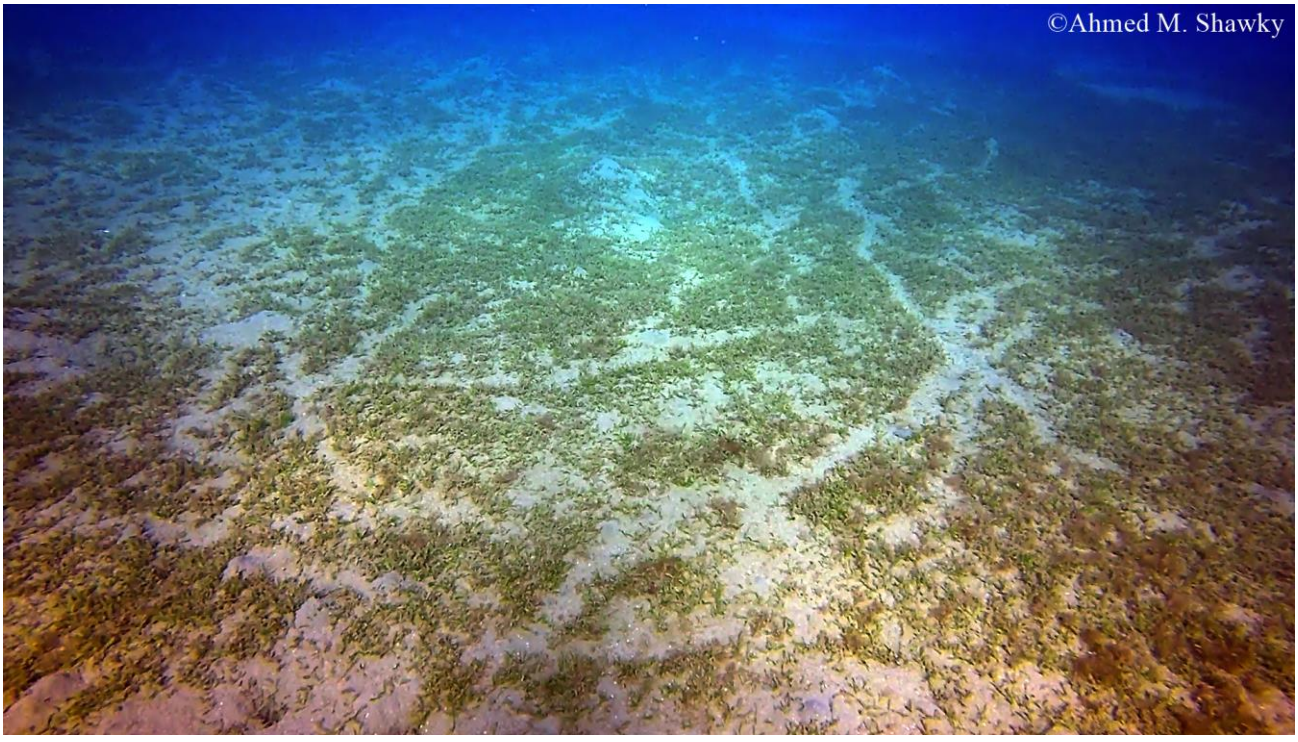
When feeding, dugongs apparently swim slowly forward, perhaps supported by their flippers, removing seagrass leaves, and (usually) rhizomes, as they go. In the process, the typically produce distinctive trails, referred to feeding trails. Analogus to those produced by foraging walruses, which have similar callused areas on the ventral edges of their flippers.

Measurements of feeding trails

The edges of feeding trails begins to collaps immediatly after formation. The density of feeding trails may be high and the ends of individual feeding often could not be determined. The length (m) and width (cm) of trails can be measured by means of a plastic tape.



A diagrammatic and stylized representation of a seagrass structure which is a merge of the three major morphological forms of seagrass found in the Red Sea. This does not represent a single species, but illustrates the characteristics of many species. © El Shaffai (2016).



High density of dugong feeding trails

A diver swim over the seagrass bottom to determine the start and end of the feeding trail

Measurement of feeding trail length (A) and width (B).

Learning Objectives

By the end of this session, you will be able to:
• Understand the different threats affecting Dugongs

What are the different threats affecting on the dugongs population?

1. Habitat loss and degradation

- Seagrass beds may be destroyed directly by mining, destructive fishing such as trawling, and boat propellers, or lost through the effects of disturbances such as dredging, inland and coastal clearing, and land reclamation. These activities cause increases in sedimentation and turbidity that, in turn, lead to degradation through smothering and lack of light.
- Other threats include sewage, detergents, heavy metals, hypersaline water from desalination plants and other waste products. Most losses, both natural and anthropogenic, are attributed to reduced light intensity due to sedimentation and/or increased epiphytic growth caused by nutrient enrichment.
- Herbicide runoff from agricultural lands also presents a potential risk to seagrass functioning adjacent to sugarcane production areas.
- Storms affect mortality indirectly by destroying the seagrass beds on which dugongs feed. The heavy rains during the cyclone flooded the region and lowered the salinity very much.
- Floods increase the export of nutrients and suspended sediments in coastal waters, which impact on seagrasses by reducing the availability of photosynthetic light or modifying sediment characteristics. It is also possible that flooding increases the exposure and/or susceptibility of dugongs to disease.
- Coastal development is listed as a problem for the dugong in 29 of the 37 countries. As the human population increases in coastal areas so does pressure on coastal ecosystems through habitat loss and change, increased pollution, and demand for coastal resources.

2. Fishing pressure:

- Fisheries impacts are seen as a problem in at least 35 of the 37 countries. The major impact of fisheries on dugongs throughout their range results from their being caught as by-catch, especially in gill nets.

3. Indigenous Usage and Hunting

- The indigenous use of dugong products in most of the 37 countries. Dugongs are still caught for meat, oil, medicaments, amulets and other products. In many countries, dugong hunting is now banned and animals are no longer hunted deliberately. Dugong tusks are used in sword handles and the hide is used to make shoes, bones and tusks are used to cure a variety of ailments.

4. Vessel Strikes

- There are few documented dugong deaths due to vessel strikes; increasing vessel traffic in the dugong's range increases the likelihood of strikes. Areas, where there are extensive shallow areas used by dugongs close to areas of high boat traffic, are, particularly at risk.

5. Ecotourism

- The expansion of ecotourism has resulted in the establishment of operations involving dugong-watching cruises at several locations in Australia, Philippines, Vanuatu, and Egyptian Red Sea. Vessel strikes and the alienation of dugongs from key habitats as a result of harassment are possible adverse impacts from ecotourism.

6. Acoustic Pollution

- Explosions have the potential to cause indirect effects to the dugong such as injury, social disturbance, displacement or habitat damage.
- Dugongs are not displaced from an area by repeated passes boats.
- Seismic surveys may have an effects includes, interference with the animal's natural acoustic communication signals, damage to their hearing systems, behavioural changes including disturbance reactions, ranging from brief alterations in behaviour to short- or long-term effects on individuals or populations.

7. Chemical Pollution

- Dugongs accumulate high levels of some heavy metals with age.

8. Predation:

- Tiger Shark and rays attack dugongs and are a source of danger to them. A spine of a ray, about 7 cm long was found attached to the peritoneum of a captured dugong. A callous area filled with lymph-like fluid was seen around the spine and it was considered that the dugong would have been stung by a ray when it came into contact with the ray.

Learning Objectives

By the end of this session, you will be able to:
• Understand the purpose of the interview survey for dugong conservation.
• Know the questions that ask by the participant (the interviewer) to the responder.

Important of interview survey as a tool for dugong conservation:

- Interview surveys can give a first look at the place that will be working, especially valuable in an area not previously surveyed.
- By conducting the interview using the questionnaire survey, more information about dugong can be achieved like biological and ecological parameters including their habitats such as areas or sighted frequency; populations; types of habitat use; group size; behaviour; life history and seagrass boundaries.
- Traditional use of dugong and their body parts can obtain ethnobiological and old information; the number of hunters within a local community; past exploitation; motivation for hunting and cultural beliefs.
- Conservation-related information like the potential application of management actions; people's willingness to work with an education project; community attitudes toward a protected area designation or hunting ban; local perceptions and level of knowledge about endangers species and conservation issues; destructive fishing or activities affecting the coastal zone.

Questions of the Interview survey:

The standardised dugong catch/bycatch questionnaire developed by CMS-UNEP Dugong MOU was divided into different sections for questions (Appendix 1). These sections includes: Dugong catch/ bycatch, Sighting record, Perceptions and Fishery information.

Learning Objectives

By the end of this session, you will be able to:
• Important of Photo identification technique (Photo ID).
• Identification of dugong individual underwater using Photo ID.

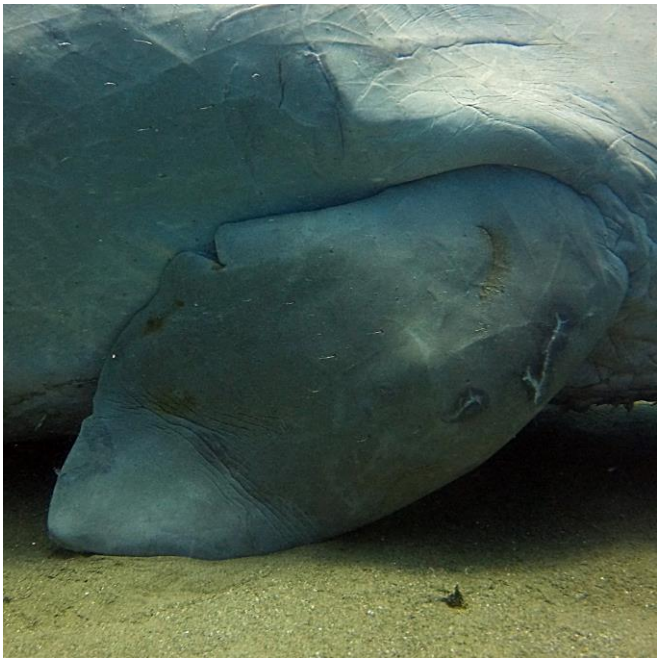
Photo Identification:

Photo identification is a powerful field technique for studying marine mega fauna likes; whales, dolphins, sharks, manta ray and turtles in their natural environment. Photo ID technique is only useful when the individuals of a population have consistent marks. Identification and monitoring of dugong individuals can provide insights into questions of reproductive success, detection of the sex ratio, survival rate of a population, and credentials of any differences in appearance over time. This technique depends on the degree of marking and the quality of the photographs. By submitting dugong photographs, divers can help link to other photos of the same dugong, constructing information on patterns of movement and distribution essential to active conservation and management plans.

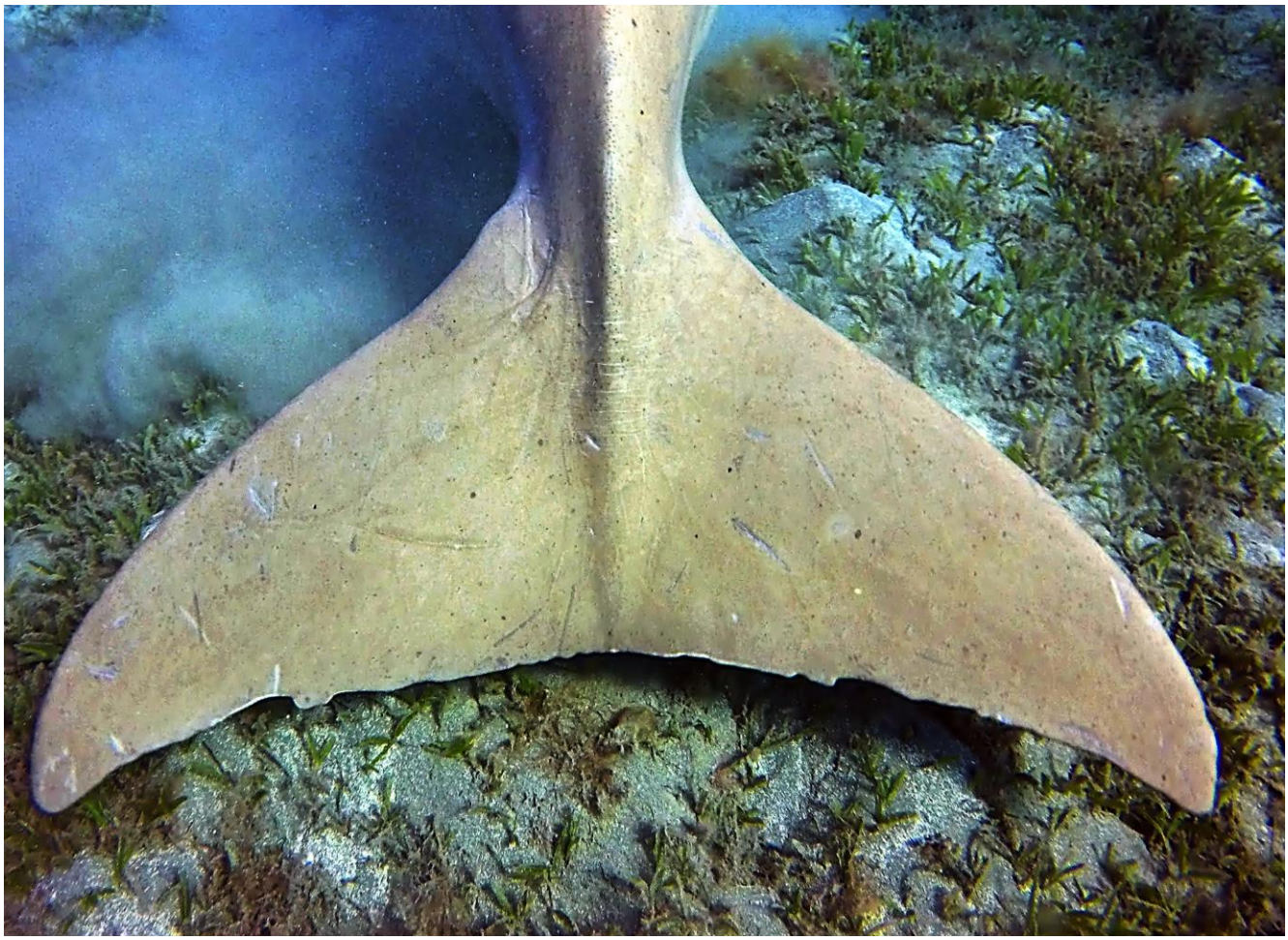
How can to identify dugongs underwater using Photo ID?

- Dugong bservation can be carried out by snorkelling, freed diving and/ or SCUBA diving.
- Maintaining a distance of 1 to 3m from the individual.
- Focus the photo perpendicular on the right and left flippers as well as the tail edges (flukes). These are key areas for dugong identification from the clear notches since they are more permanent than scars.
- For sex determination, focus the photo to the ventral view of the dugong and below the flipper when it moves it away. Male can determined by observing a far distance between the genital silt and the anus; while in females they are close together. Nipple size is less than 2 cm in male and more than 5 cm long in females.
- All observed dugongs were listed, assigned a five-digits identification number based on the location of initial sighting. The first letters of the site name were written followed by the number of the individual. For example, the code of the dugong in Marsa Abou Dabbab would be MAD18.
- Notes on the sex of the individual as well as the date of sighting, location/ region, div site name.
- Remember to send these information's with photos to the correspondence person or institute in your area working on dugong.

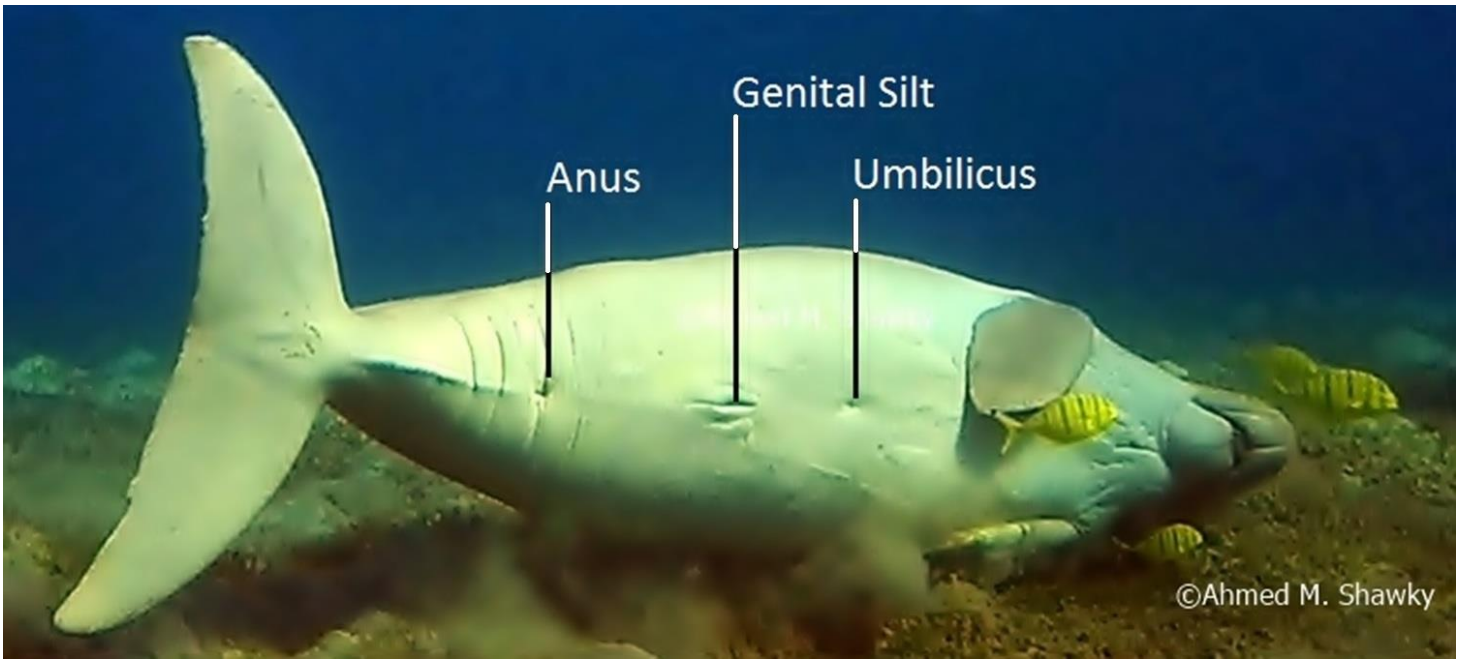
Left flipper



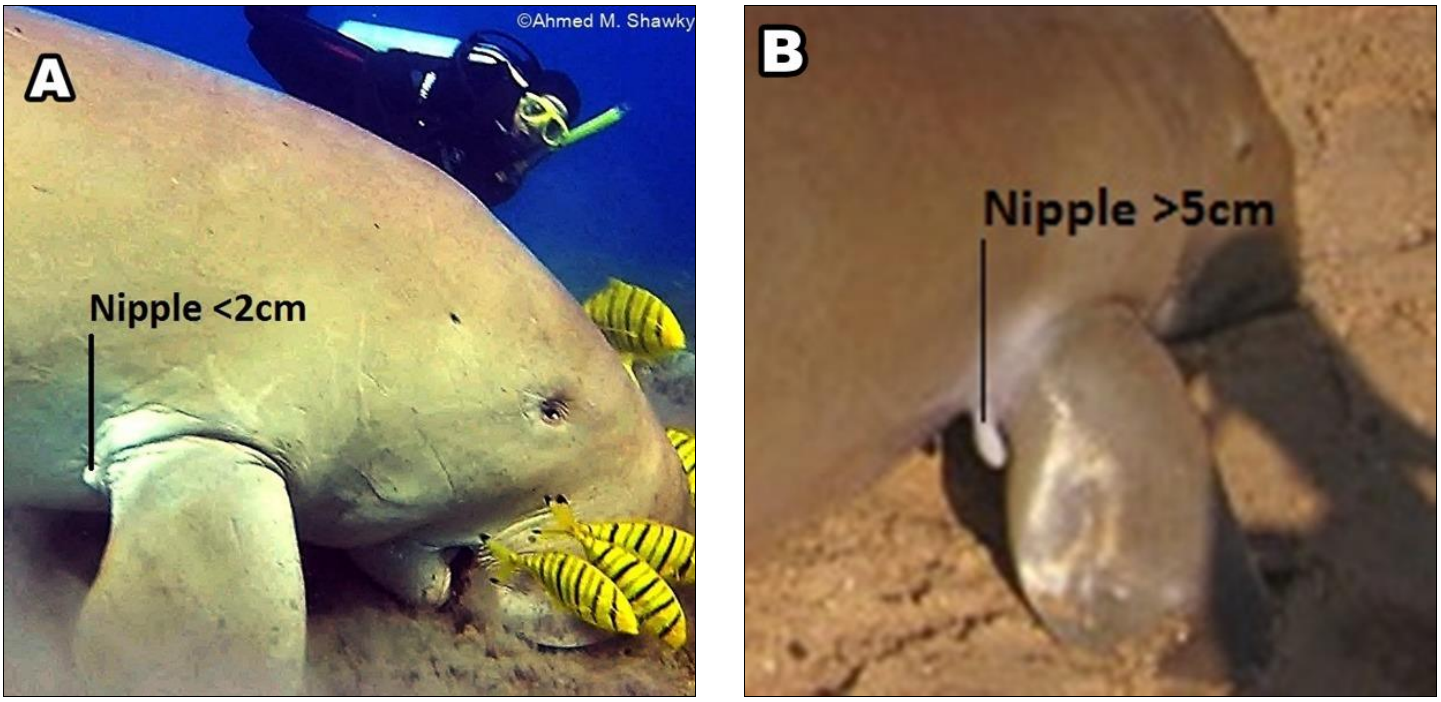
Right flipper



Tail

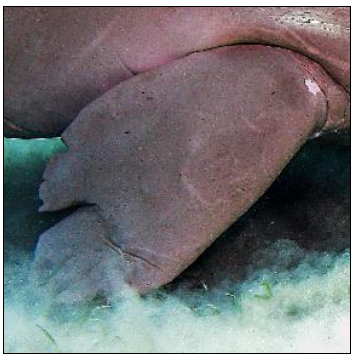


Ventral view of male during rolling on seagrass bed showing the position of the genital silt and anus.



Male (A) and female (B) dugong showing different nipple size.

Examples of Dugongs individuals identified with reliable notches

Code	Left Flipper	Fluke	Right Flipper
SAL10			
MEG15			
MAD18			
MMO26			

Learning Objectives

By the end of this session, you will be able to:
- **Name and describe the different behavioural activities of the dugong**
- **Assess the time budget of each behavioural bout**
- **Recognize the surface and submergence intervals of dugong dive cycle**

What are the different behavioural activities of the dugong?

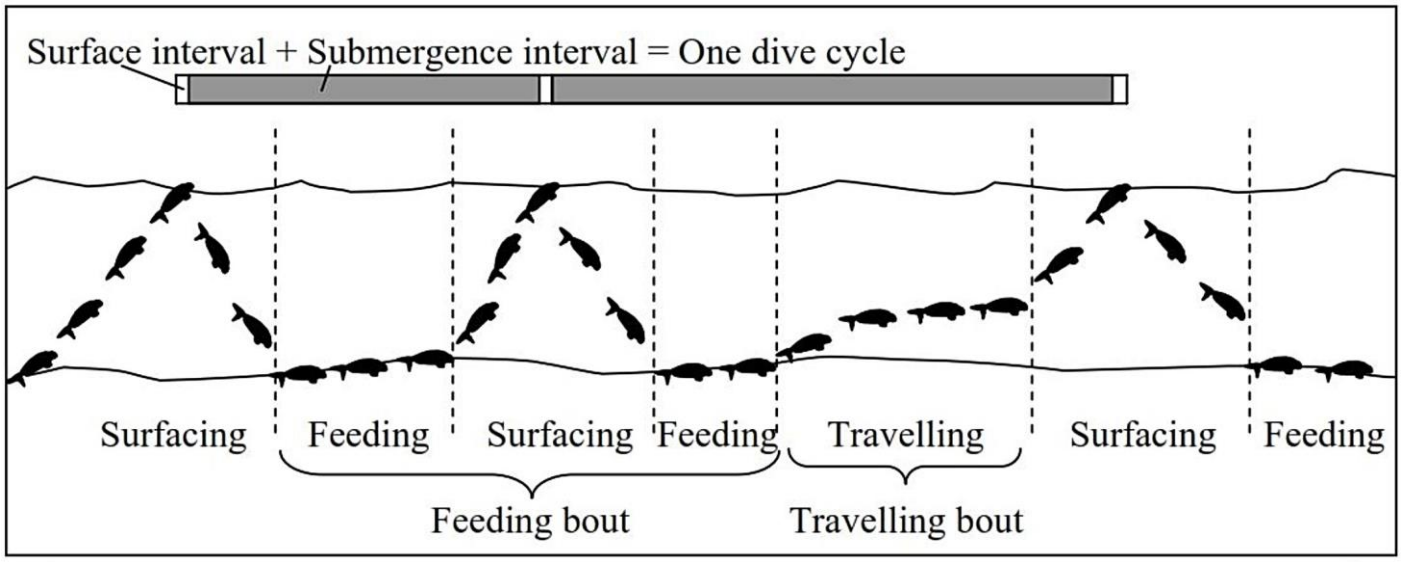
1. Feeding – body resting on a substrate with slow movement forward and nose pressed to substrate. Feeding may be with or without visible sediment plumes.
2. Travelling – swimming forward using the tail and it may be slow, cursing or fast.
3. Resting – floating without moving at all, or above the bottom with no movement or pumping the tail and nose not pressed to substrate. Resting may be occurs at surface, at mid-water column or on the bottom.
4. Surfacing – starts ascending to the surface to exhales and inhales at surface, descent by pumping the tail to reaching the bottom to feed.
5. Rolling – body rotating horizontally or ventrally at substrate or mid-water column.
6. Socializing – all contacts and non-contacts interactions between dugong individuals that near to each other.
7. Fleeing – a fast back-way where dugong turns and swim rapidly away from vessels/ swimmers.
8. Playing – free swimming with other animals like turtles and dolphins.

How can you assess the time budget for the dugong behaviour using video footage?

- Divided each video into bouts.
- A bout includes a specific behaviour carried out consistently and only interrupted by surfacing behaviour. During the bout, surfacing time was combined in the bout length.
- Surfacing time was measured a separate behaviour when it took place in the change between different behavioural activities.
- The percentage of time the dugong spent perform surfacing behaviour was calculated using all surfacing, together with those in bouts.

Dugong Dive cycles:

- Each full dive cycle can divided into surface and submergence period of time.
- The surfacing interval can noted from the point at which the dugong's nostril broke the surface, frequently with an associated spray as the dugong exhaled, and ending when its nostrils were again submerged.
- The remaining time that dugong stayed below the surface is defined as the submergence interval.
- The dive rate was obtained by adding the mean submergence and surfacing intervals through all dives and calculating the number of complete dive cycle per hour. When assessing dive times, the video used for dugong extended from the beginning of the first observed surface interval until the end of the last clearly distinguishable surface interval.

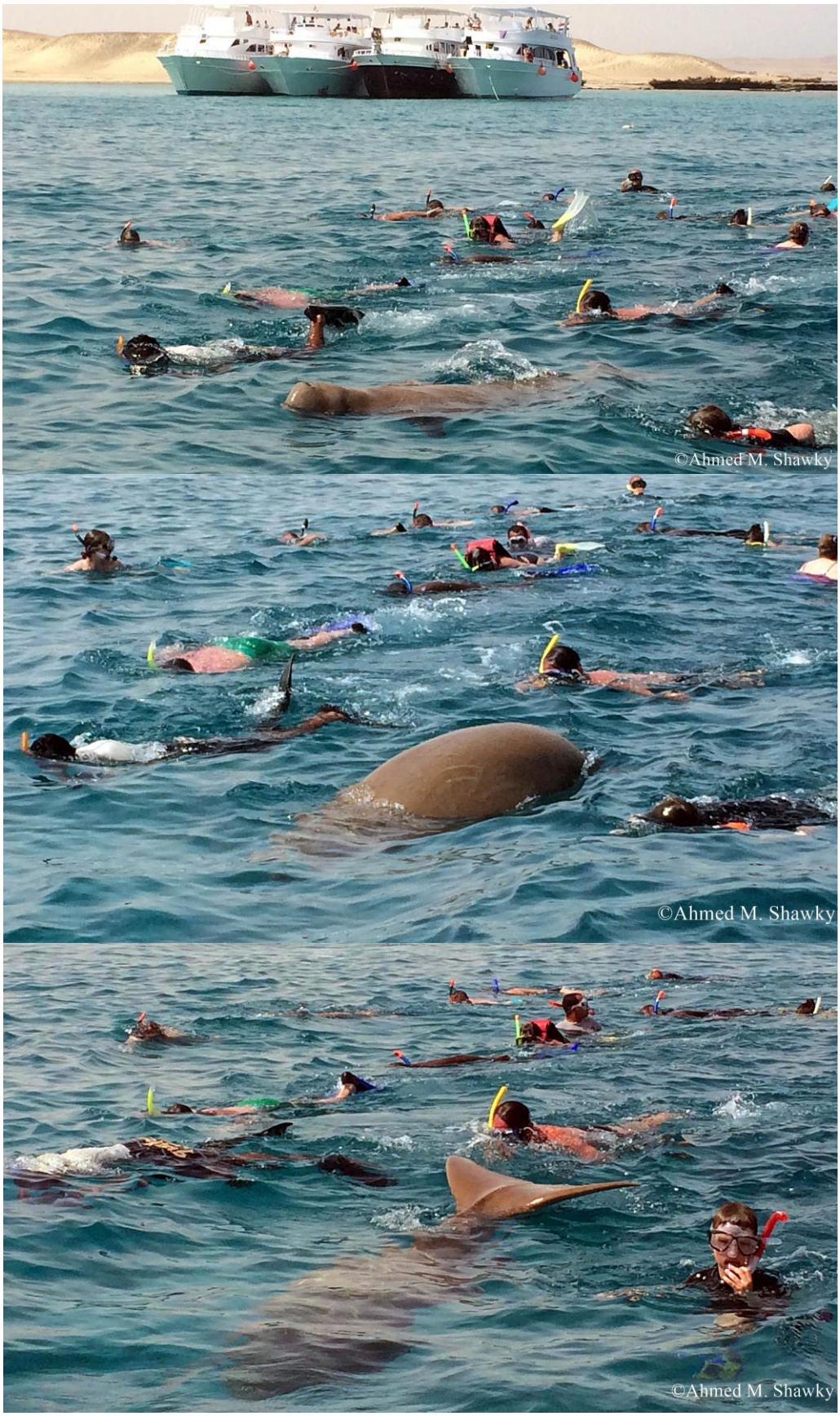


The classification of dugong activities into categories and bouts. © Hodgeson 2004.

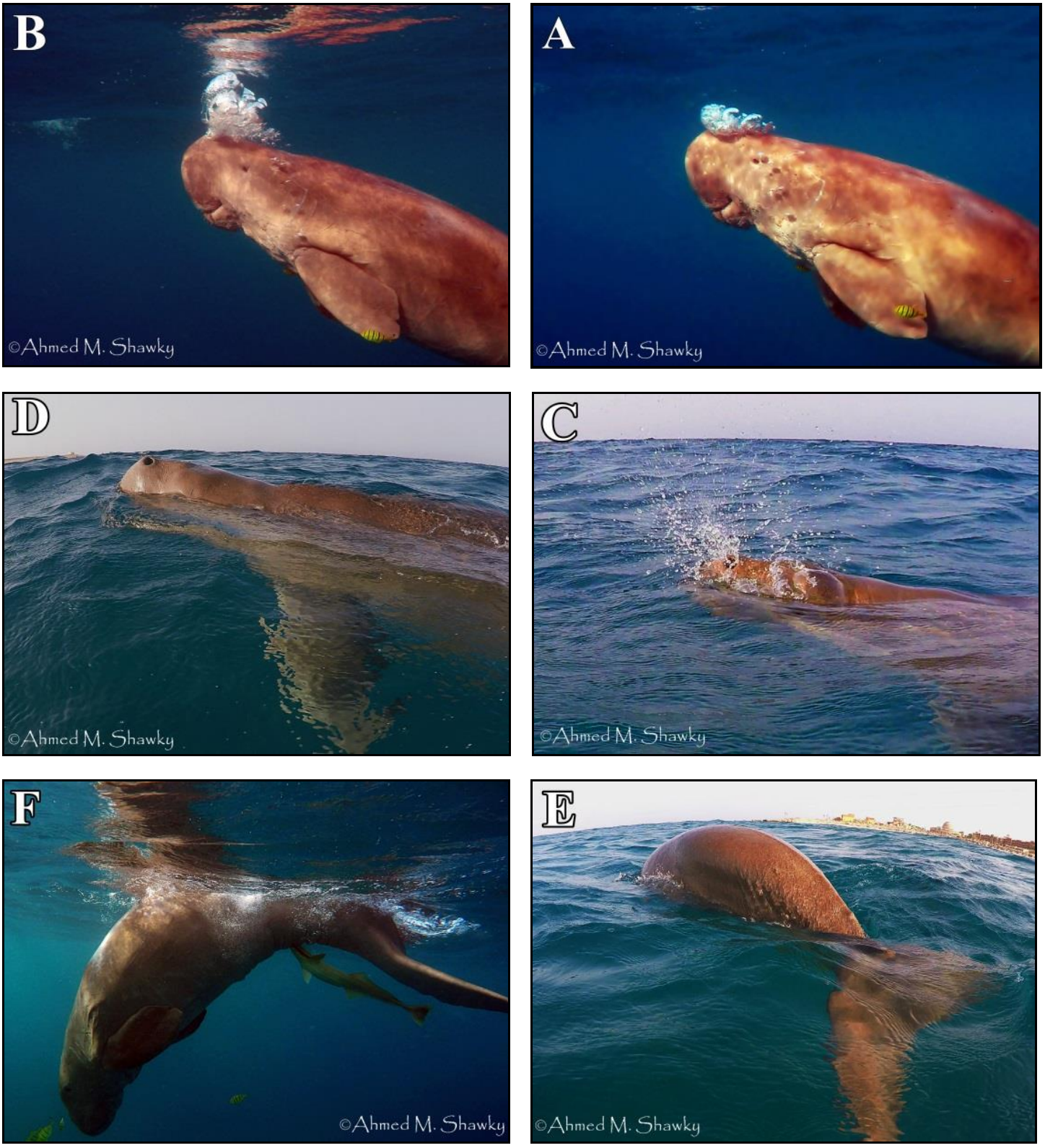
Dugong feeding

Dugong feeding

Dugong travelling



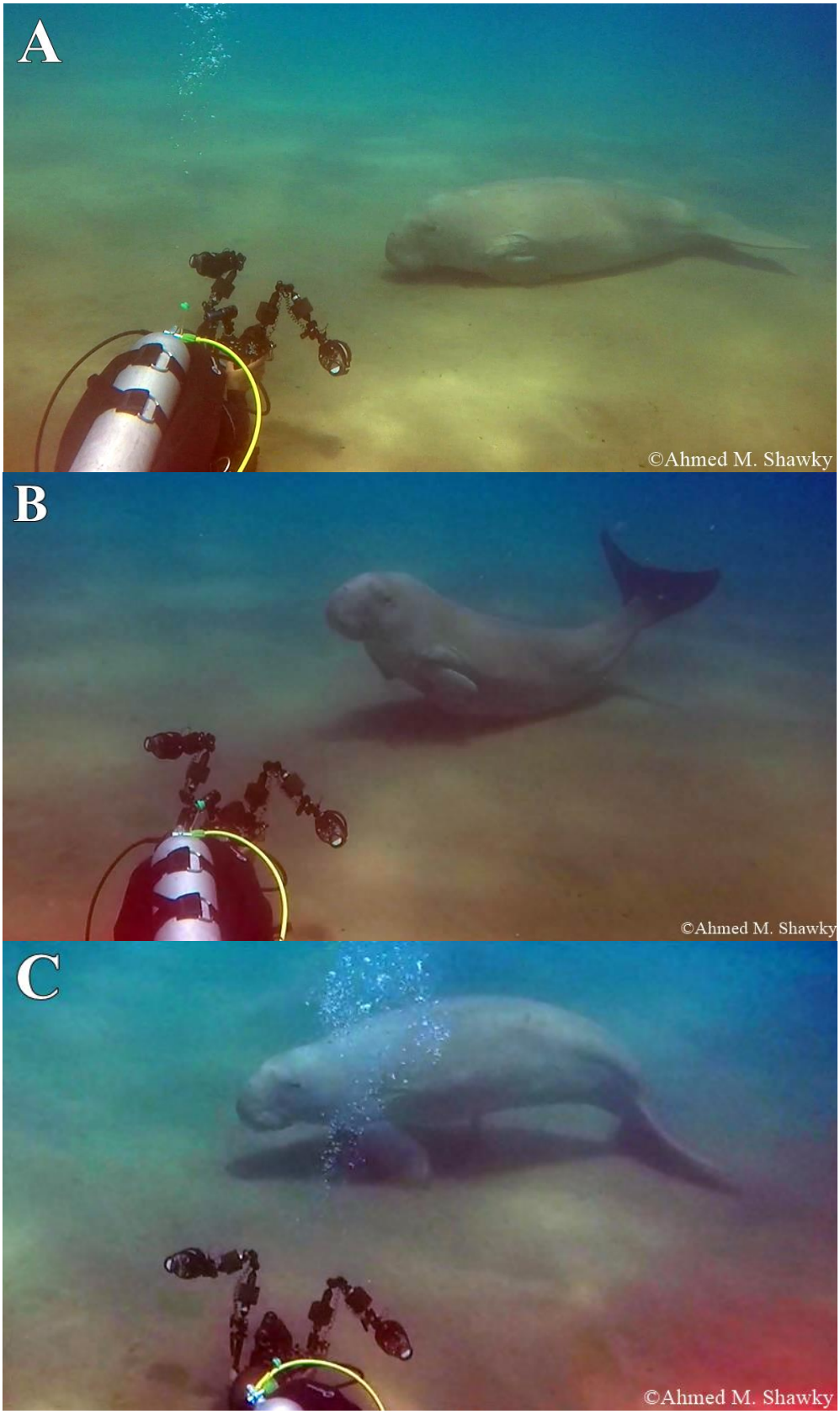
Dugong breathing among snorkeling at surface



Sequence dugong breathing at surface

Dugong resting on the bottom

Dugong resting at the surface



After resting on the bottom, the dugong active by arching its body and pushed the bottom for ascending

Learning Objectives

By the end of this session, you will be able to:
• List and understand the major considerations when diving and/ or snorkeling with dugongs

For divers:

- Don't get close to dugong and keep at least 3m a distance (less distance may only for Photo ID).
- During photographs, avoid using flash.
- Don't touch the dugong.
- Don't stop or swimming in front of dugong during feeding. It moves forward and in S-shape anytime.
- Aware of your buoyancy and don't disturb the bottom.
- Be familiar with and follow local regulations.
- Go back when see dugong rolling. It can swim fast directly in undefined direction.
- Don't follow the dugong while ascending, until rest on the bottom again.
- When saw dugong resting on the bottom, be standby to do quick reverse when dugong gets active. It will starts to be active by arching its body to push the substrate for ascending

For snorkelers:

- Don't swim over the dugong during ascending to the surface. Allow it to breathing.
- Keep at least 3m a distance of the dugong.
- Don't touch the dugong.
- Don't disturb dugong while resting at surface. Between two breath, the dugong may stay below the water surface for resting before take another breath followed by a longer third breath before diving again by arching the body and a forward downward.
- Don't cash the dugong to avoid more traveling and missed it.

Section Three:

Open Water Dives

General Open Water Considerations

1. Involve student divers in dive-planning activities. Give special attention to student diver anxiety and stress levels, in addition to student diver equipment preparedness.
2. Conduct a thorough briefing. The better the briefing, the more smoothly the dive will proceed. Assign buddy teams according to ability (weak with strong) and establish a check-in/check-out procedure
3. Assign logistical duties to staff and review emergency protocols.
4. Remind divers to familiarize themselves with their buddies equipment.
5. Evaluate diver's thermal protection for appropriateness for the dive site and expected conditions.
6. Make yourself available to answer questions during equipment assembly, safety checks and gear-up.

Performance Requirements

By the end of the open water dives, student divers will be able to:

Dive One

Performance requirements

Simulate one interview survey between students using the dugong questionnaire in appendix 1.

By the end of this training session the diver will able to do:

- **Apply diving techniques used to preserve bottom dwelling organisms and minimize disturbance of all marine life.**
- **Aware of your orientation and depths.**
- **Passively observe marine life and detect the seagrass area.**
- **Locate and identify the shape of at least one local seagrass**
- **Observe, determine and measure the dugong feeding trails.**
- **Perform a proper exit**

A. Briefing
   1. Evaluation of conditions
   2. Facilities at dive site
   3. Entry technique to be used – location dependant
   4. Exit technique to be used – location dependent
   5. Bottom composition and topography around training site
   6. Depth range on bottom
   7. Ending tank pressure – when to terminate the dive
   8. Interesting and helpful facts about the dive site
   9. **Sequence of training dive – review Dive 1 skills**
      a. **Suiting up**
      b. **Predive Safety check**
      c. **Buoyancy check at the surface**
      d. **Draw and describe the shape of at least one seagrass species using underwater slate (more is recommended).**
      e. **Determine the start and end of at least three feeding trail using measuring tape.**
      f. **Measure the width (cm) and length (m) of at least three feeding trail (more is recommended).**
      g. **Dive for fun and pleasure**
      h. **Ascent**

B. Predive procedures
C. Descent
D. Dive 1 skills
E. Post-dive procedures
F. Debriefing
G. Log dive (instructor signs logbook)

Dive Two

Performance requirements

During dugong sighting underwater the diver will able to do:

- **Observe, monitor and record the status of dugong behaviour and depth.**
- **Demonstrate a control entry and descent.**
- **Demonstrate neutral buoyancy by hovering.**
- **Identify surface features that may reduce impacts on sharks in the dive location.**
- **Demonstrate appropriate and responsible diving practices and behaviours to minimize negative environmental effects**
- **Take video footages for the dugong all the time during the dive.**
- **Identify the distinctive notches on the dugong flippers and tail.**
- **Determine the dugong sex.**
- **Perform a proper exit.**

After the dive with dugong and/or if dugong not sighting underwater the instructor shows some dugong videos to the diver and asks the following to do:

- **Identify the different behavioural activities of dugongs with each video.**
- **How many minutes the dugong feeding, ascending, descending and resting.**
- **How many breath dugong takes at surface.**

Notes:
The diver can do these performances in the first dive if the dugong was sighted in the first dive.

A. Briefing

1. Evaluation of conditions
2. Facilities at dive site
3. Entry technique to be used – location dependent
4. Exit technique to be used – location dependent
5. Bottom composition and topography around training site
6. Depth range on bottom
7. Ending tank pressure – when to terminate the dive
8. Interesting and helpful facts about the dive site
9. **Sequence of training dive – review Dive 1 skills**
    a. **Suiting up**
    b. **Predive Safety check**
    c. **Buoyancy check at the surface**
    d. **Observe and identify the different behavioural activities of dugong.**
    e. **Identify of dugong notches. If diving with a camera, take photographs on flippers (right and left) and tail.**

f. Observe the ventral view during ascending or descending to determine the dugong sex by observing the distance between the genital opening and the anus. Photo to the ventral is highly recommended.

g. Observe the nipples of the dugong below the flipper and detect if it is less than 2cm or more than 5 cm. It is occurs when the diver can monitor the movement of flipper during moving on the bottom or ascending. Photo is highly recommended.

h. Record and count any remora fishes attached to the dugong.

i. Assess any human impacts in the area may effect on the behaviour and presence of dugong (e.g., boats, divers and snorkelers).

j. Dive for fun and pleasure

k. Ascent

B. Predive procedures
C. Descent
D. Dive 1 skills
E. Post-dive procedures
F. Debriefing
G. Log dive (instructor signs logbook)