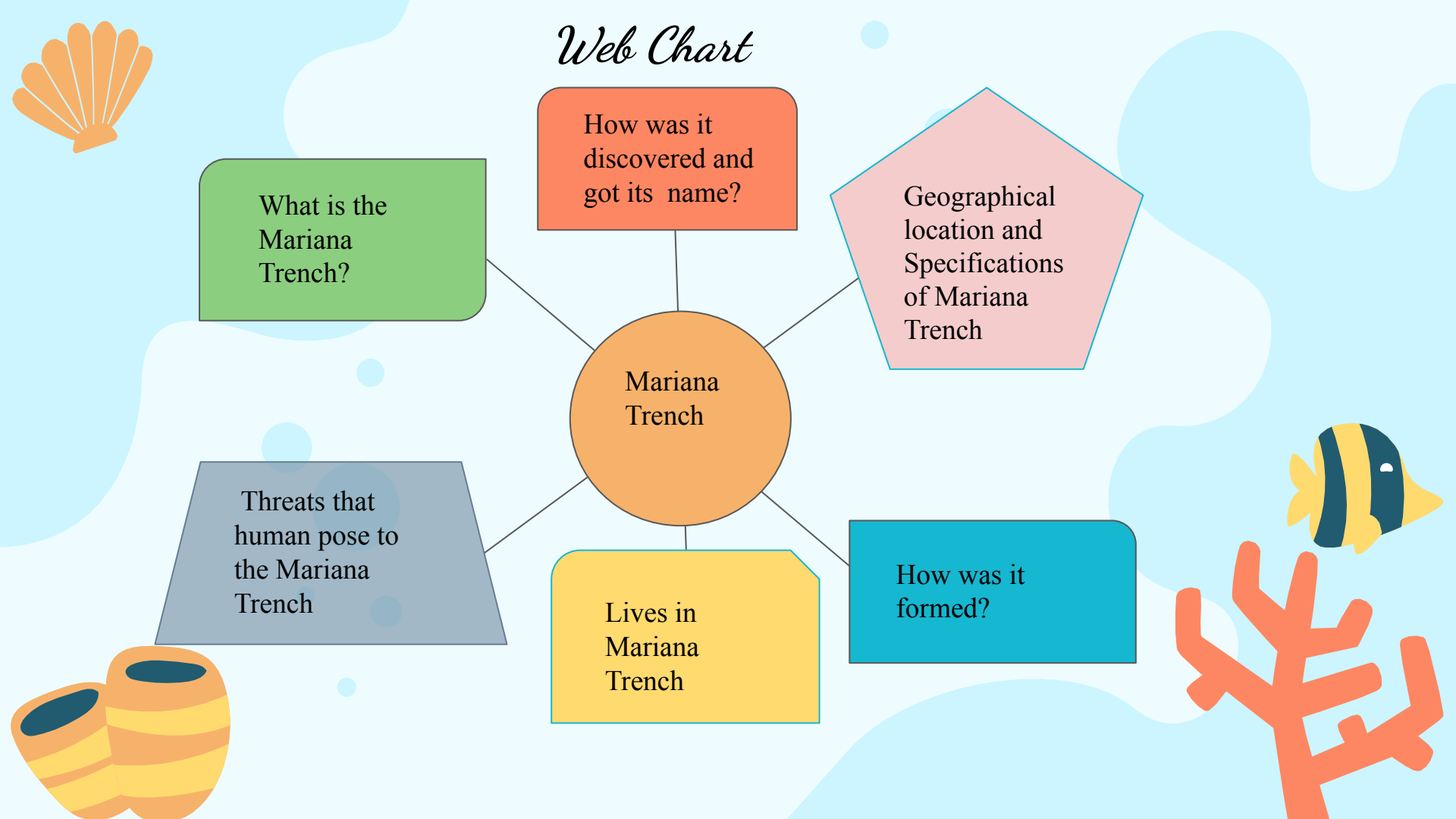
The Mariana Trench

Deep Dive Club

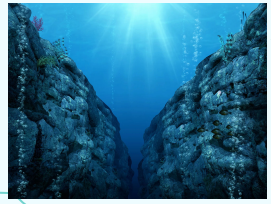
Content

Web Chart

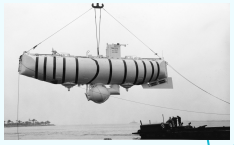

Mariana Trench
How was it discovered and got its name?
Geographical location and Specifications of Mariana Trench
What is the Mariana Trench?
Threats that human pose to the Mariana Trench
Lives in Mariana Trench
How was it formed?

Topics I Covered in the First Term

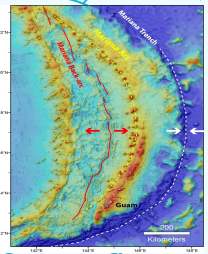
Introduction to the Mariana Trench



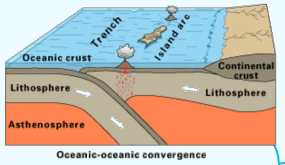
It's Discovery



Geographical Location and Specifications



Formation of the Trench



All Image Credit:NOAA

Topics I Will Cover in The Second Term

- *Lives in the Mariana Trench*
- *Human Impacts Into the Trench*
- *My Takeaway*

Lives in The Mariana Trench

- *Diversity of life can be seen in the Mariana Trench.Broadly they can be categorized as*

- ***Microscopic organisms** are the primary producers of deep sea food chain*

- *Variety of **corals and sponges** which provide habitat to other animals.*

- *Several **vertebrates** like deep sea fishes and **invertebrates** like dumbo octopus,sea cucumber and worms that dominate the depth of the Trench.*

Microorganisms-Bacteria

- *Two types of bacteria can be seen in the Trench*
- ***Vent bacteria*** *which is found in bacterial mat around the hydrothermal vents which are like geysers on the ocean floor which spew out hot water seeped in and come in contact with hot volcanic core and become enriched with chemicals.*
- ***Symbiotic bacteria*** *which lives within tissues of animals like tubeworms and mussels which live around the hydrothermal vents.*
- *These bacteria converts chemicals discharged from the vents into food in complete absence of light.This process is called* ***chemosynthesis***.

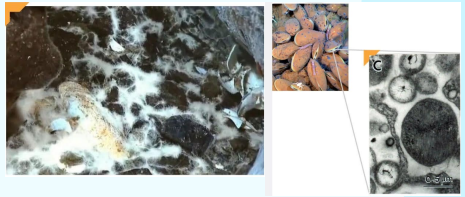


Image Credit:NOAA and Schmidt Ocean Institute

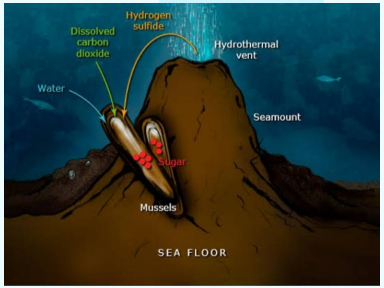


Image Credit:Encyclopedia of New Zealand

Mariana Trench Vent Food chain

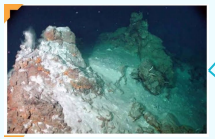
Simple Chemicals	Primary Producers	Primary Consumers	First Order Carnivores	Top Order Carnivores

H2S

CO2

O2

CH4

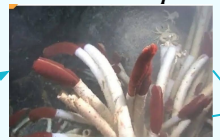


Vent Bacteria

Vent Zooplankton

Vent Shrimp

Symbiotic Bacteria



Riftia Tubeworms

Vent Mussel

Squat Lobster

Dandelion Siphonophore

Eelpout

Vent Ratfish

Blind Crab

Octopus

All Credit:NOAA and Schmidt Ocean Ins

Other Sources of Food

- As food is scarce in the deep sea,some creatures also depends on the nutrients of the planktons,the primary producers of the ocean surface,flow downward with the ocean currents.
- Sponges and corals which can not move from their places primarily depend on these nutrients.
- The deep sea scavengers, such as shrimplike amphipods,some worms ,sea cucumbers feeds on dead animals sink down to the ocean floor.

Bamboo Coral

Sea Cucumber

All Image Credit: NOAA Ocean Explorer

Sponges and Corals In the Mariana Trench

- *Corals of different shapes colours and types have been discovered during various dives. Some of them are black corals,octocorals,sea pens etc.*

Bubblegum Coral

Octocoral Polyps

- *Coral and sponges are like 'rainforest' of deep sea as they provide habitat to other animals and crabs,octopuses lay their eggs on them.*

Venus Flower Basket Sea Sponge

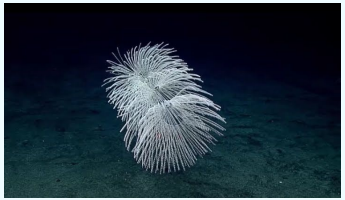
All Image Credit: NOAA

- *Sea stars,shrimps, crabs ,brittle stars perch on coral and sponges to find food in the fast-flowing ocean current.*

Glass Sponge

Metallogorgia Coral

- *Deep sea corals and sponges feed on the organisms and nutrients that flow in the ocean current using their tentacles.*



Iridogorgia Octocoral

Anemone

- *Deep sea coral and sponges are important for biomedical reason.For example bamboo coral which makes calcium based skeleton can be used to create artificial bones for human*

Bamboo Coral

All Image Credit: NOAA

Adaptations in Animals In The Trench

Image Credit:Smithsonian Magazine

Hagfish: *Has tentacle-lined mouth to feed on carcasses dropped down to seafloor.They can absorb carcasses nutrients through their skin.*

Zombie Worm:*Don't have mouth or stomach. They secrete an acid from their skin which dissolve bone and free up the fat and protein which it feeds on.*

Image Credit: National Geographic

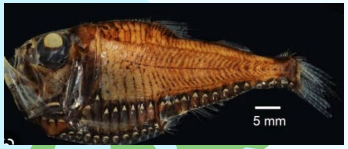


Image Credit: Encyclopedia of Life

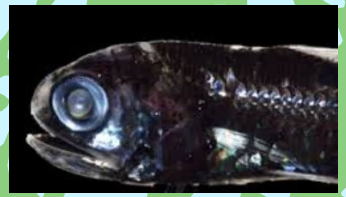


Image Credit:Nature Picture Library

Hatchetfish and Stout Blacksmel*t: Have large eyes to capture the little light that makes it to the bottom*

Image Credit:NOAA

Dumbo Octopus*:Have gelatinous body to withstand pressure and lacking ink sack due to scarcity of predators in the depth*

Image Credit:Aquarium of the Pacific

Tripod Fish*: Has elongated fins for sensing vibration and finding prey*

Image Credit:NOAA

Image Credit:NOAA

Image Credit:NOAA

***Glowing Shrimp,Glowing Jellyfish and Holothurians or glowing Sea cucumber**: Produce their own light to survive in the darkness of the depth*

Image Credit:NOAA

Image Credit:National Geographic

***Chaunax or Coffinfish:**hold their breath upto four minutes as it has massive inflatable gills to fill their body with sea water.Also special fins allow them to walk on the seafloor.*

Image Credit:NOAA

***Snailfish and Amphipods**: have unsaturated fats in the membranes of body cells which keep their membrane loose and prevent water to force into their proteins and to break their body so that they can survive in the extreme pressure and cold of the trench.*

New Species of Animals in The Mariana Trench

Unknown species of sponge

New Species of Eel-"Eelpout"

Giant Amphipods 'Hirondellea Giga]s' at depth of 35,797ft

Slit Snail

Xenophyophore:Giant Single Cell Organisms

Benthic Ctenophore:A New Species of Coral

New Species of Cusk Eel with Unusual Shape of Head

All Image Credit:NOAA

Human Impacts Into The Trench

Plastic Pollution

Several dives confirmed plastic trash at the depth of the Mariana Trench. Most of them are single used plastic like packing bags,plastic water bottles and discarded fishing gears.

Image Credit:National Heralds

These plastics in ocean eventually break down into smaller particles and form microplastics which are less than 5mm long

Image Credit:NOAA

Researchers found that concentration of microplastic in sediment and in water increases with the depth as the narrow trench traps the sinking particle

Scientists found plastic fibres and particles in the digestive system of all the amphipods collected from the Challenger Deep of the Trench.

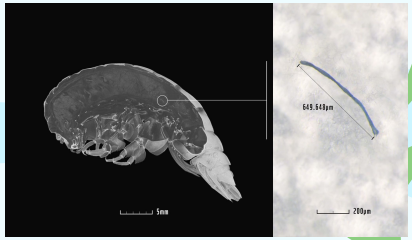


Image Credit:United Press International

Chemical Pollution

Litters
Image Credit:NOAA

In one recent study it has been seen human-derived methylmercury, a toxic form of mercury in the fishes and amphipods collected from 36,000 ft depth of the Mariana Trench.

Eurythenes plasticus:a new species of amphipods contaminated with plastic

Image Credit:Oceanographic magazine.com

As per the scientists this chemical can largely accumulated in the atmosphere and entered the ocean via rainfall.

During studying the amphipods researchers discovered extremely high level of persistent organic pollutants(POPs) in the amphipods' fatty tissues.

These POPs were released into the environment through industrial accidents and landfill leakages from 1930s until the 1970s when they were finally banned as they can cause cancer.

Circulation of the Pollutants

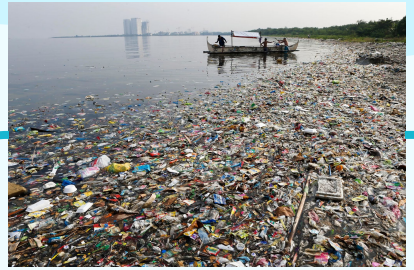


Image Credit:National Geographic

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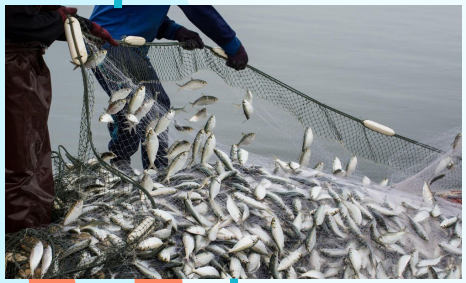


Image Credit:WWF

Image Credit:Science Pho Library

Image Credit:NASA

My Takeaway

Though Mariana Trench is the deepest and darkest place on the planet,it is not arid.It's unique environment is full of vibrant lives, adapted to withstand the intense pressure,darkness and make food out of the chemicals!

Some of the species and their adaptations to the environment are still unknown to humans.But it is well known fact that humans are responsible for polluting the environment of this remote place and made it as polluted as Suruga Bay in Japan-the 'infamous pollution blackspot' on the Earth.

Oceans absorb most of the carbon dioxide and regulate climate.So,like our other activities,littering oceans can be the another reason for the planet's climate change.

Sources

1. *Website of National Oceanic and Atmospheric Administration*
   www.noaa.gov
2. *www.livescience.com*
3. *www.nationalgeographic.org*
4. *www.schmidtocean.org*

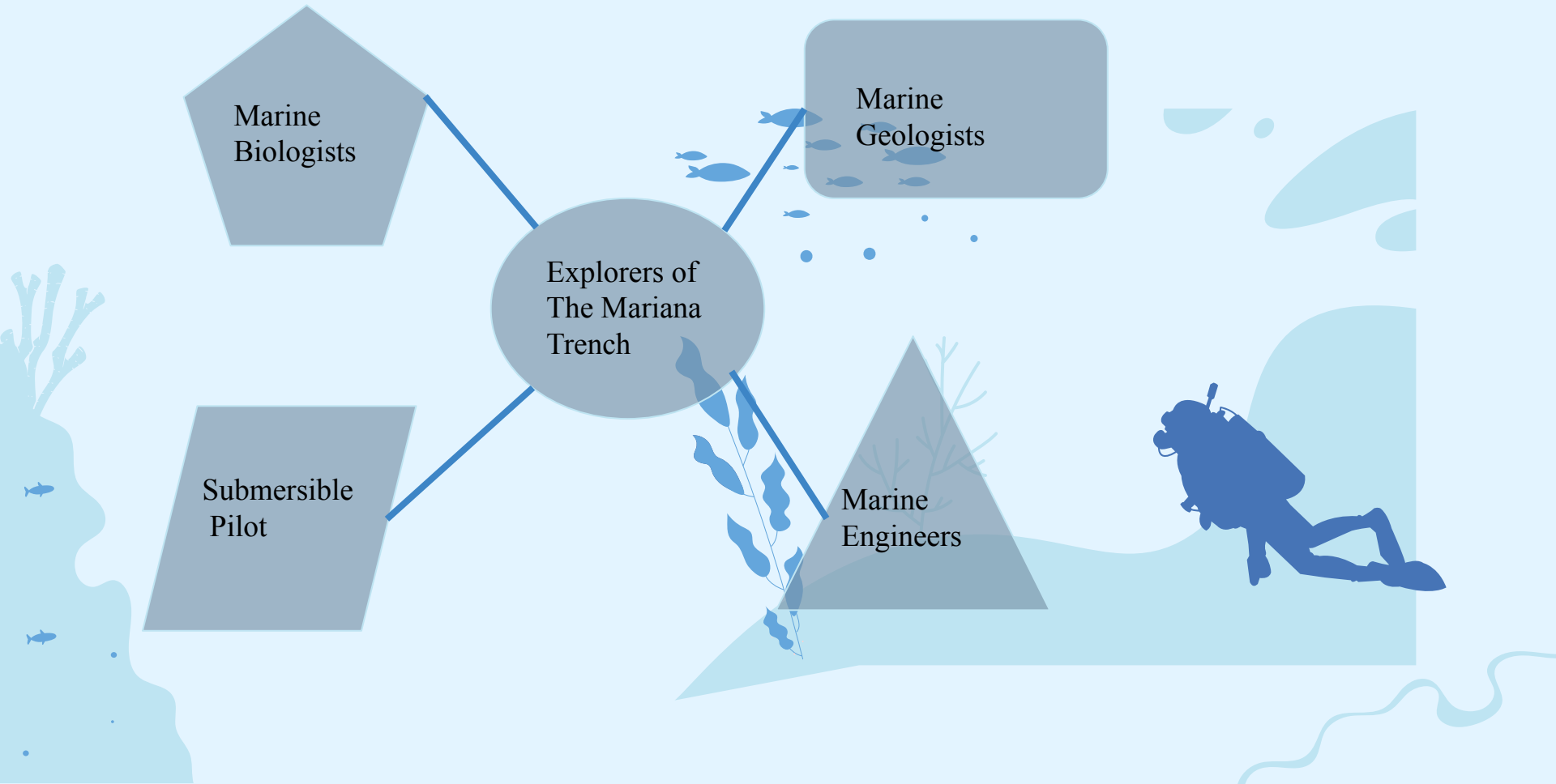
Money Club

Oceanographers

Introduction

In money club I’ve done some research on the career aspects in the field of oceanography as it is related to my exploratory project-topic ‘The Mariana Trench’.During my research I came to know about the persons who have an extraordinary contributions in exploring Mariana Trench,their achievements,their education and earnings.

Web Chart


Marine Biologists
Marine Geologists
Explorers of The Mariana Trench
Submersible Pilot
Marine Engineers

Marine Biologist

Marine Biologists are scientists who study about ocean and aquatic life.They collected samples, analyze them and conduct experiments to understand the behaviours of marine animals,their species,habitats whether they are exposed to pollutants and take care if any animal is sick or injured.

Average salary of a Marine Biologist is $53,950 or ₹44,36,498 per annum.

Marine Biologist Associated with The Mariana Trench:*Dr.Alan J. Jamieson*

Education:PhD in Zoology from Aberdeen University

Glimpse of Work:

- Dr.Alan J. Jamieson,a Scottish biologists,
  best known for his deep-sea ,Hadal Zone (6000-11,000m)
  exploration and study of life at the deepest places in the oceans.

- He was the chief scientists in The Five Deeps Expedition in 2018 - 2019 .
  in a submersible named DSV Limiting Factor.

Dr. Alan J. Jamieson
Image Credit:University Western Australia

- He and his team has discovered new species of snailfish at depth of 27000 ft and a giant Stalked Sea Squirt which has been never seen before.

Stalked Sea Squirt
Image
Credit:Wikipedia

Snailfish
Image Credit:
National Geographic

- He was the first British person to reach hadal depth of 7,180 metres and He is the 8th deepest diving person in history.
- He is the one who discovered microplastics inside amphipods' guts.
- He is professor at the Ocean Institute and the School of Biological Sciences at the University of Western Australia.
- He has also written a book named-The Hadal Zone:Life in the Deepest Oceans.

Marine Geologist

Marine Geologists conduct research studies to understand how the structure of ocean floor and events in the Earth's crust under the ocean affect the environment.

Average salary of a Marine Geologist is $66,616 or ₹55,000,00(approx) per annum

Marine Geologist mapped the Mariana Trench: Dr. Dawn Wright

Education:PhD in Physical Geography and Marine Geology from University of California

Dr. Dawn Wright
Image Credit:
ESRI Australia

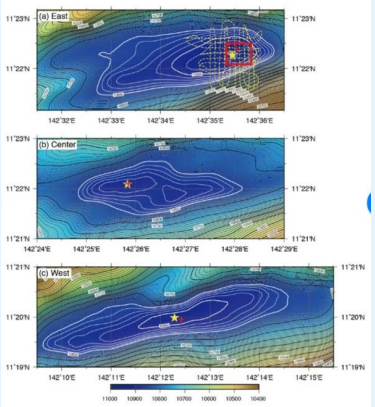
Glimpse of Work:

- Dr.Dawn Wright is an American marine geologist and chief scientist of Environmental Systems Research Institute (ESRI).
- She is the first African to dive more than 35,000 ft down to Challenger Deep.She was also first one to operate side scan sonar system at the deepest known point for high resolution mapping the ocean floor.

- She has closely surveyed the area by taking video of the cavern,taking water samples and observing biology like amphipods as well as plant like colonies of animals called hydroids.

- She was able to create detailed outline of the area.

- As ocean influences weather and climate by storing solar radiation,distributing heat and moisture around the world,Wright's detailed maps of the ocean floor,rich with data, will help scientists to learn more about climate change.



Bathymetric image of three depressions of Mariana Trench
Image Credit:researchgate.net

Tube-dwelling anemone on a basalt rock formation
Image Credit: Popular Science

Marine Engineers

Marine Engineers design,construct,maintain and repair variety of marine vessels like ships,submersible,remote operating vehicles etc.

Average salary of a marine engineer:$90271 or ₹74,73,969 per annum

Marine Engineer associated with Mariana Trench: ***Ron Allum***

Education:Technician Traineeship with Australian Broadcasting Corporation, cave diver and a self-taught engineer.

Ron Allum
Image Credit: National Geographic

Glimpse of Work:

- Ron Allum,an Australian submarine designer,was the Head Engineer who co design and built submersible ‘Deepsea Challenger’ which took James Cameron to the Challenger Deep on 26th March,2012.

- Ron Allum’s ingenuity to find simple,local solutions to overcome all the hurdles is the key to gave him success in building Deepsea Challenger despite of having no background in mechanical engineering and no qualification in oceanic science.

- *He invented a buoyant material called 'Isofloat' capable of withstanding 16,500 pounds per square inch pressure at the bottom of the Mariana Trench and he made this material using a cake mixture in the laundry room!*

- *He built the body of his craft with 'Isofloat' rather than expensive titanium shell other submersible have which also reduce the weight of the vehicle.*

- *He also discovered an aerosol spray called 'Dry Glide' to protect the conical acrylic slab,the 'window' of the craft from breaking due to intense pressure.*

- *He had also invented a two-way communication system capable of transmitting through rock.*

- *Ron Allum's inventions help scientists to understand more about the trench by supplying samples of sediment,microbes,some crustaceans and videos during the expedition.*

Deepsea Challenger Image Credit: National Geographic

Submersible Pilots

Submersible pilot is a person who ensures that all the scientific equipments in the submersible are in proper operating conditions prior to every dive.His job is also to take the scientists underwater,help them to do their research efficiently ,and to take them back safely.

Average salary of a submersible pilot is $117,290 or ₹9645170(approx)

Submersible Pilot dived in the Mariana Trench: ***Victor Vescovo***

Education:MBA from Harvard Business School and MS from Massachusetts Institute of Technology.

Victor Vescovo
Image
Credit:guinnessworldrecords.com

Glimpse of Work:

- Victor Vescovo is a former American navy officer,investor, submersible pilot and the first person who reached the deepest point at 10,924 m in the Mariana Trench.

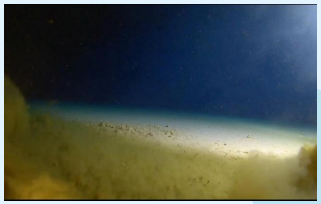
- In 2019 he is recognized by Guinness World Records as the person who covered the greatest vertical distance without leaving Earth by both climbing Mount Everest (8,848 m) and diving into the deepest point(10,924 m) at the Challenger Deep in Mariana Trench.

- He launched the ‘Five Deep Expedition’ in 2018 and explored the deepest known points in each of Earth’s five ocean piloting deep-sea submersible called Limiting Factor,world’s only full-ocean depth submersible,which he developed along with Triton Submarines.

DSV Limiting Factor
Image Credit:U.S Naval Institute

- He is the first person who has made a total of eight dives into the challenger Deep and collected data like sample of deep sea dwellers, mantle rock etc.

- After analysis of his data it is confirmed that Challenger Deep is much deeper that we previously thought.The new depth recorded for Challenger Deep is 10,934 m.



Bottom of Challenger Deep
Image Credit:guinnessworldrecords.com

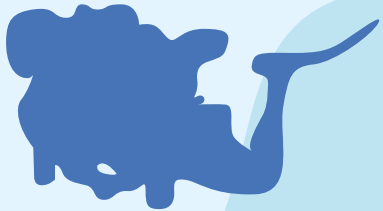
My Learnings

From the research I have done under money club, I learnt that though every profession related to oceanography offer healthy salaries and fame.But,the aspects of these professions which encouraged me to opt oceanography as my future career are-

- The adventures of exploring new things
- Joy of learning things which are still unknown to human
- Courage of overcoming challenges a deep sea offers
- Creativity of developing more advanced devices for exploration
- Glory of making a new limit of knowing the least explored places of mother Earth

Sources

1. *Wikipedia*
2. *The University of Western Australia*
3. *www.popsci.com*
4. *www.guinnessworldrecords.com*
5. *www.deepseachallange.com*
6. *The Australian Museum*



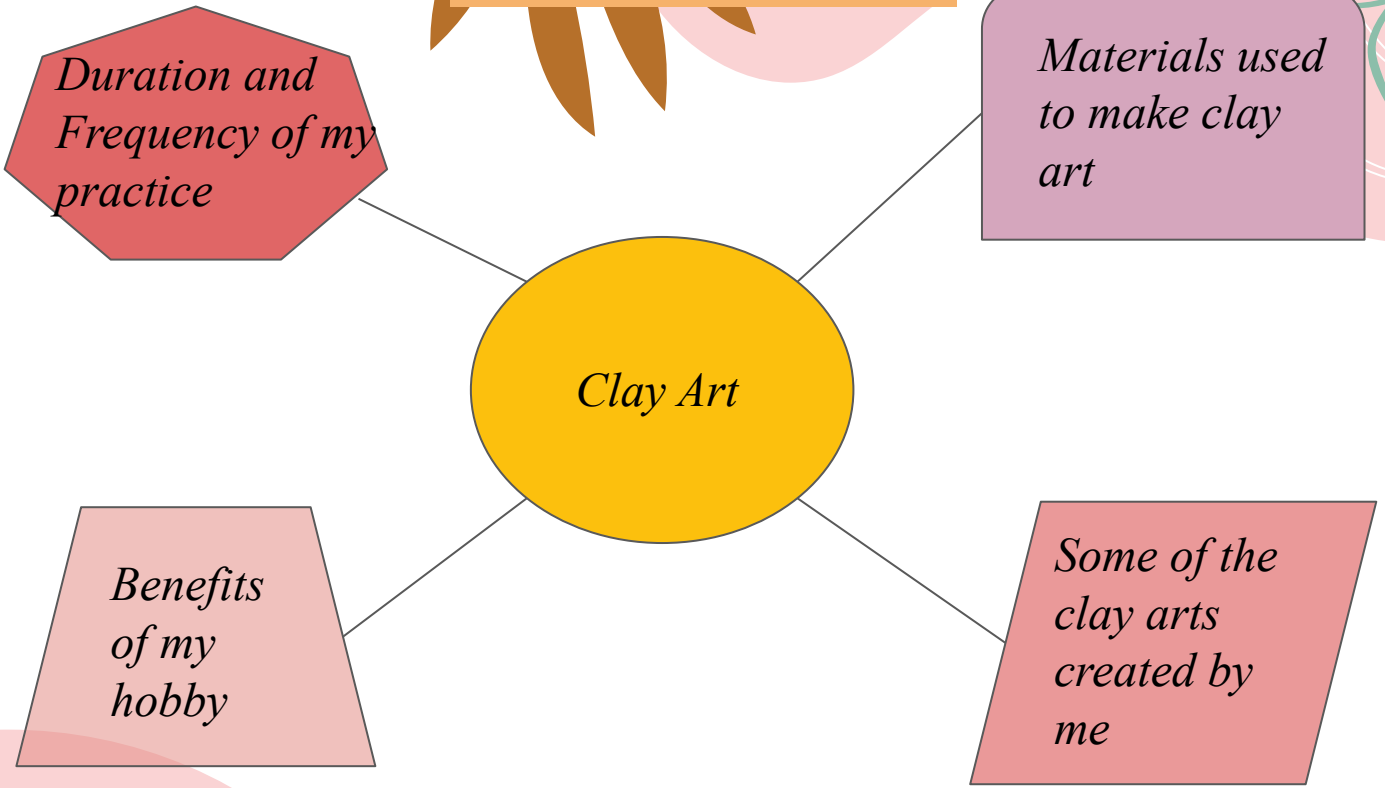
Clay Art

Hobby club

Inspiration

I chose Clay Art as my hobby because I love and enjoy making colourful clay miniatures.

Web Chart


Duration and Frequency of my practice
Materials used to make clay art
Clay Art
Benefits of my hobby
Some of the clay arts created by me

Duration and Frequency of my Hobby

At the starting I did four times a week for almost 1 hour. Then I slowly reduce the duration and frequency of my hobby to twice a week for 30 minutes.

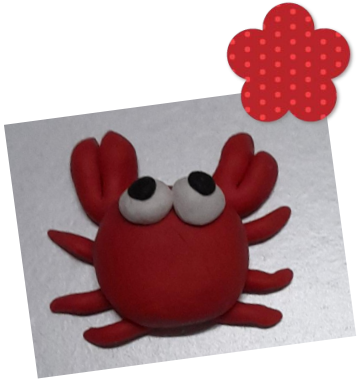
Materials I Used to Make the Clay Art

In the beginning I used polymer clay and carving tools to shapes the clay into various miniatures.Then I baked those miniatures at 160 degree Fahrenheit for 30 to 40 minutes to harden the clay miniatures.

Later I used foam air drying clay for the clay art as this clay don't need baking and dry quickly in normal room temperature.

Some of the Clay Arts created by Me

Some More



Benefits of my Hobby

Creating and shaping things with clay makes me more imaginative,boosts up my concentration and help me to utilize my time more efficiently.I enjoy using various colour combinations to make my creations more attractive.


Thank
You