



SHORE

Empower students as the agents of change

D2.5 TEACHERS ROUTES
for
BLUE SCHOOL and CURRICULA

February 2024



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List of acronyms

Acronym	Full name
EC	European Commission
EU	European Union
SHORE	SHORE: EmpOweR Students as the agents of cHangE
DG-MARE	DG for Maritime Affairs and Fisheries
CH	Country HUBs
MOSE	Italian: Modulo Sperimentale Elettromeccanico, lit./'Experimental Electromechanical Module'
NGO	Non-profit Organisation
EMSEA	European Marine Science Educators Association (EMSEA).
JPI Oceans	Joint Programming Initiative Healthy and Productive Seas and Oceans
ERRIN	The European Regions Research and Innovation Network
MOOC	Massive Open Online Courses
UNESCO	The United Nations Educational, Scientific and Cultural Organization



TEACHERS ROUTES for BLUE SCHOOL and CURRICULA

1. INTRODUCTION

The European Union defines Blue Economy as “all economic activities related to oceans, seas, and coasts” which covers a wide range of interlinked established and emerging sectors. As water is a vital need, home for many living things, the largest carbon sink, a transport corridor, a global resource and many more, without healthy waters, there will be no life on earth. Today, marine and freshwater ecosystems are rapidly degrading and efforts to protect them have not been sufficiently effective according to the implementation of the Marine Strategy Framework Directive Report (2008/56/EC) in 2020. As a result of human activity, the degradation in marine ecosystems is threatening European citizens’ and societies’ health, well-being, and prosperity and it is urgent to act to fulfill its EU Green Deal and Mission Restore Our Ocean and Waters by 2030 objectives.



To support the Mission Ocean, it is **essential to empowering and engaging citizens to take action and drive the transitions through deliberative democracy, social innovation, citizen science and awareness campaigns** and following the ECOSOC (Economic and Social Council) Youth Forum on “Youth taking action to implement the 2030 Agenda”, young people must be recognized for the agents of change whose contributions will bring benefits both to themselves and society. Currently, a global effort is underway to deliver the 2030 promise -by mobilizing more governments, civil society , and businesses and calling on

all people to make the Global Goals their own. Even if there is progress being made, overall, the aims and goals are not yet performed at the desired scale required. **SHORE** Project aims to tackle these issues with coordinating activities and engaging the communities first on local then international level and mobilize all sectors of society for a “Decade of Action” and for the implementation of the Sustainable Development Goals.

1.1 ABOUT US: SHORE

“A journey of a thousand miles must begin with the first step. - Lao Tzu-”

SHORE Project aims to **engage youth in European policies, and lifestyle with the help of local life-changing projects** integrated into the curriculum of schools to achieve both at the grassroots and international level, mobilization of teachers, schools, students, and their families. To equip **communities with relevant knowledge and skills** with a sense of excitement for individuals to understand the importance of the ocean to their lives and realize how their individual actions affect the marine environment with community activities, exhibitions, school projects and online interaction platforms.

The main objective of SHORE is to enhance the ocean literacy of primary and secondary school students and educators with a multidimensional perspective and international coordination & cooperation, to equip them with the necessary skills and knowledge to become eco-citizens. It is aimed to fund up to 100 projects in 36 months in total and each school project can receive up to 10,000 euros funding.

The specific objective of the SHORE is to expand and broaden the ocean and water literacy knowledge/programmes among children and youth, teachers and schools (primary and secondary schools) in cooperation with the Network of European Blue Schools and **EU4Ocean coalition**.

Project SHORE is a pioneering initiative aimed at improving ocean literacy among primary and secondary school students and educators. The recognition of the Blue Economy by the European Union underlines the interconnectedness of various economic activities related to oceans, seas and coasts and highlights their vital role in sustaining life on Earth. The urgency to address the degradation of marine and freshwater ecosystems is aligned with the wider objectives of the EU Green Deal and the Mission to Restore Our Ocean and Waters by 2030.

Therefore, **SHORE** will act as a bridge between research and education communities to increase the professional development of educators first, for them to teach ocean-related information in an informal way to foster lifelong learning of the present and future generations and have an impact first locally then on a global level.



2. FEATURES OF A BLUE SCHOOL AND HOW TO PROCEED TOWARDS IT

The concept of Blue School comes from the need for involvement of schools in the environment and sustainable development for the education of its pupils/students in order to make them aware and be proud of their cultural heritage around the sea which could be used as a source of ideas for job creation (diversification of professional and entrepreneurial opportunities), economic growth and social cohesion (equal access to marine resources in order to cover basic needs such as health, security and employment). The idea is therefore to introduce the blue economy into school education in order to build a generation based upon environmental sensitivity and empathy, inspired by local cultural heritage, linking marine life to economic growth and employment.¹

2.1 What is Blue School



European Blue Schools bring the ocean into the classroom. On the journey to becoming a European Blue School, teachers and pupils will improve their understanding of the ocean and develop a sense of responsibility towards our shared planet. Creating awareness and a feeling of responsibility for our ocean (so-called Ocean Literacy) encourages students

to become more active and responsible European and global citizens. The program challenges schools to *Find the Blue* and explore their connections to the ocean while creating networks all across Europe. The Network of European Blue Schools is an initiative of the European Commission, supported by DG MARE and was developed by the EU4Ocean Coalition partners.²

2.2 What to do to become a Blue School?

A blue school is a school turned towards its local sea, ocean and its coastline. It must develop an educational project as a whole establishment, on the functioning of its infrastructure, and on the commitment of the teaching teams and the participation of the students. This means that the school implements sustainable practices (sorting and recycling of waste, reduction of greenhouse gasses, saving of renewable energies, etc.), in connection, or in partnership, with the local ecosystem of the maritime economy through a specific school program (integrated into each of the different subjects)

¹<http://www.blue-schools.eu/wp-content/uploads/2021/03/Blue-Schools-Concept-EN.pdf>

² https://maritime-forum.ec.europa.eu/theme/ocean-literacy-and-blue-skills/ocean-literacy/network-blue-schools/how-develop-project_en

composed of recreational activities and educational outings on the environment and its preservation, enhancement of local cultures, know-how and marine heritage and the employment in this sector. A blue school educates its students (secondary level – between 12 and 16 years old) on sustainable development and encourages them to be involved in the society as an interested citizen on sustainability issues and by the participation in the development of local agendas to build a responsible future. ³

3. ANALYZING THE REGIONS:

3.1 SHORE Regions

SHORE will cover five different regional areas including **Baltic Sea, Black Sea, Mediterranean Sea, Rhine, and Danube River Area**, and will offer different project grants in total of three different call periods for schools in the region. The regional areas are selected according to the Mission Implementation Plan, Lighthouse Areas and topics about ocean literacy that the open calls will be about can be seen in the Figure below.

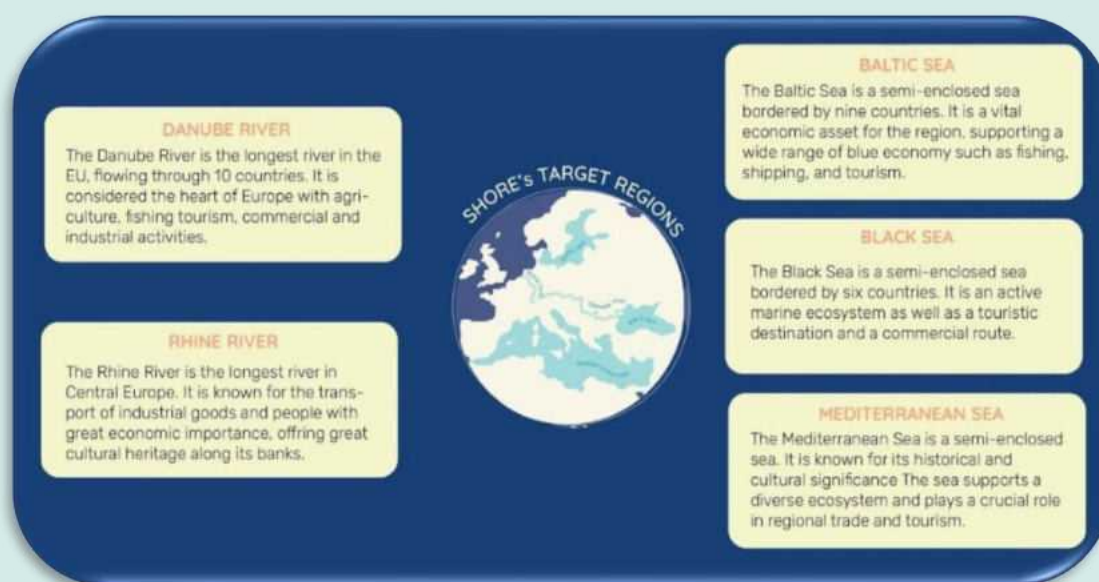


Figure 1: SHORE - Open Call # Target Areas

The target countries in the mentioned regions are as follows:

- **Baltic Sea Area:** Germany, Poland, Estonia, Latvia, Lithuania, Denmark, Sweden, Finland;
- **Black Sea Area:** Romania, Bulgaria, Ukraine, Georgia, Türkiye;
- **Mediterranean Sea Area:** Croatia, Cyprus, France, Greece, Italy, Malta, Slovenia, Spain, African countries (Algeria, Egypt, Libya, Morocco, Tunisia), Balkan countries (Albania, Montenegro, Bosnia and Herzegovina), Israel, Jordan, Lebanon, Türkiye;

³ <http://www.blue-schools.eu/wp-content/uploads/2021/03/Blue-Schools-Concept-EN.pdf>

- **Danube River Area:** Austria, Bosnia and Herzegovina, Bulgaria, Croatia, Czechia, Germany, Hungary, Moldova, Montenegro, Romania, Serbia, Slovakia, Slovenia, Ukraine;
- **Rhine River Area:** Austria, Belgium, France, Germany, Luxembourg, The Netherlands.

3.2 Country HUBs (CHs) and Analysis

The implementation of **SHORE** activities and the coordination of the national networks of schools will be supported by the Country Hubs. The Country Hubs are selected according to their expertise in sustainable and climate education, and already have a wide range of networks among the schools within their area and working in the framework of current initiatives. They have been selected with the idea of creating links within their regional area. With the support of the Country Hubs, an **effective support mechanism that will provide guidance, training, improvements and recommendations will be set in place** to the actors involved (teachers, museum educators, outreach groups and citizens)

There are seven Country HUBs serving in **Austria, Estonia, Hungary, Italy, Poland, Romania and Turkiye**. As each Country Hub analysed its region by conducting a Base Analysis as part of the project, the Teacher's Guide and the training modules reflect the findings and suggestions of each CH for a sustainable and future-oriented commitment to ocean literacy in their respective country.

Austria



Austria/Vienna: While local efforts have established a solid foundation for ocean literacy, the global perspective remains a critical aspect that SHORE is uniquely able to approach. Efforts to help the wider society in Austria truly realize the importance of the ocean and our global water system could be significantly boosted in the short-to-medium term by pursuing two approaches: On the one hand, internationalization enables cross-thematic networking while simultaneously promoting global interconnections. On the other, providing ready-made educational materials for everyday school activities will offer the support many teachers need.

The international consortium, dedicated educators and a range of local and global stakeholders in global initiatives make SHORE a powerful force in promoting ocean literacy. For the future, SHORE's commitment to a holistic and global approach in Austria may have a lasting impact in how the oceans are perceived, understood and will be protected.

Estonia





Despite being a country that has only indirect access to the oceans, through the Baltic and the Sound, Estonia still recognizes the importance of fostering ocean literacy among its citizens. The unique geographical context of Estonia, situated on the eastern coast of the Baltic Sea, provides an opportunity to emphasize the interconnectedness of inland waters and the larger marine ecosystem. Although ocean education is not mandatory in the current curriculum, the Estonian Country Hub aims to collaborate with schools and teachers to enhance the existing educational framework.

In Estonia, environmental education is a key component of the curriculum, covering topics related to climate change, biodiversity, and sustainability. The SHORE project will play a crucial part in expanding the scope of these educational efforts, offering additional resources and guidance to educators. Through collaboration with local schools, the Estonian Country Hub seeks to empower students to become active participants in the protection of water resources.

Hungary



Nowadays, the protection of our oceans and other natural waters is among the leading priorities worldwide, but ocean literacy among the population has room for a lot of improvement. In our opinion, learning about “blue” topics should start at school, because the necessary resources are already available in these institutions, and the young target group can be reached with relative ease there. Teachers play a big role in spreading knowledge, so it is very important that they receive adequate support, even from outside the school.

The SHORE project aims to provide guidance to educators and schools regarding the blue curriculum. The goal is to increase the available teaching materials, and to facilitate the development and implementation of school projects.

The Budapest University of Technology and Economics, as the head of the Hungarian CH, supports the work of teachers in the Danube and Rhone region, the participation of schools in the SHORE project, and the efforts to join to the Blue School Network. These activities, as well as the development of relations with comparable entities in other countries, will greatly promote the active participation of our citizens in the protection of our waters in the future.

Italy



As the Italian Country Hub, the University of Padova is dedicated to supporting proactive schools, some of which are already implementing water-related projects which can benefit from SHORE. The overall goal is to empower the Italian youth in taking action in the preservation of various precious



characteristics of the Italian coastline and the Mediterranean. The CH is home to a wide range of marine research initiatives reflecting the wide range of distinctive features of Italian coasts, and interaction of people with the sea.

Italy is a country with marked environmental contrasts, and this is also evident in the context of water literacy. Positioned in the center of the Mediterranean, it has, since Antiquity, been actively engaged with the sea in terms of meeting primary needs of the population, supporting industry, and providing transportation routes. However, Italy suffers from a very unequal access to the sea affecting the number of schools enrolled in the Network of European Blue Schools. Indeed, the low number of Blue schools in the country is probably related to the rarity and limited scope of active programs about ocean literacy at the national level. On the other hand, Italy can rely on a strong net of NGOs and blue economy actors and stimulate a very dynamic educational system. In this context, teachers and schools have a relatively large space and significant freedom in developing projects. Against this background the SHORE project presents a major opportunity to effectively boost ocean literacy of the youth population primed to include the sea in their understanding of the world, and to provide the tools required from any agent of change.

Poland



Currently in Poland, 'ocean education' does not entail a separate, mandatory block of classes in schools, only the content is. The topics are usually covered in other courses including, among others, geography, biology, Polish language, various inter-subject pathways, often at the discretion of the teacher.

According to the Ministry of Education, the requirements and content specified in the core curriculum are comprehensive and allow teachers to address the most relevant topics in this area. Regardless, schools have the opportunity to organize additional educational activities on topics such as climate and environmental protection, including those that correspond to the special interests of students. In Poland, the students' awareness about climate change is at a very low level, and as a result, they do not effectively undertake activities to explore and efforts to tackle this problem. Thus, one would not be very off-the-mark to claim that, in the eyes of young people, this topic is neither cognitively important nor pragmatically relevant. In Poland most of the schools in the Blue Schools Network is situated at the coastal area of Baltic Sea. Polish Country Hub is represented by WSB University which, together with a group of experts and dedicated teachers, will promote ocean literacy among students and other teachers, focus on promoting ocean literacy among students and increasing the number of Blue Schools in other parts of Poland as well. Through active endeavors under the SHORE project, Polish Country Hub aims to provide guidance to educators, teachers and schools regarding the blue curricula, by showing them alternative ways to educate students and promote ocean literacy with special focus on participatory approach and involvement of local communities.

Romania



In an era where the health of the global ecosystem is intricately tied to our understanding of our world's vast and mysterious oceans, the blue activities take center stage as a pioneering initiative to enhance ocean literacy in the blue education institutions. The Romanian Country Hub is represented by Mare Nostrum NGO situated along the Black Sea coastline and has been dedicated to fostering a positive shift in mentalities and behaviors for the past 30 years, all aimed at conserving and enhancing the marine environment.

Besides the challenges and obstacles faced in advancing ocean literacy education in Romania, there are numerous avenues through which awareness, education, and environmentally conscious behaviors can be introduced and promoted. Achieving long-term success will require embracing creative ways and securing the involvement of a diverse range of stakeholders. We aim to offer guidance, training, enhancements, and recommendations to various stakeholders including teachers, museum educators, outreach groups, and citizens. The primary rationale for establishing the country hubs is to enhance SHORE's influence by collaborating with regional and local stakeholders, guiding schools in project implementation, and efficiently executing dissemination and communication activities in the Black Sea and Danube regions.

One way SHORE can make a significant impacts is through its connection with the Black Sea, particularly via Romanian schools. This association is pivotal as it sets the stage for the future rollout of a comprehensive 'Blue Schools' initiative, which aims to enhance Ocean Literacy within the classroom environment. Also, we will promote education and training in the fields of marine sciences, we will advance Ocean Literacy in Romania in general and the Black Sea and Danube regions in particular, and will raise educators' awareness of ocean issues and the need for a sustainable future for our coasts and seas. Another benefit of these efforts will be the improved quality of marine sciences education.

Türkiye:



Surrounded by seas on three sides, Türkiye presents a unique geographical context for SHORE's efforts. Leveraging the efforts of an international consortium, committed educators, and engagement with numerous local and global stakeholders, SHORE emerges as a formidable advocate for promoting ocean literacy in Türkiye. By adopting a holistic and global approach, SHORE aims to have a lasting impact on how the oceans are perceived, understood, and ultimately protected in Türkiye's context.

4. TRAINING METHODOLOGY

It is vital to engage youth to drive meaningful changes and safeguard the Earth. Education, including schools, plays a critical role in this effort. SHORE will focus on getting students, teachers, and schools involved in advancing Mission Ocean objectives by boosting ocean literacy through collaborative activities and projects. The objectives of the cooperation with schools are;

- Increasing awareness among students and teachers about sea-related issues and their connection to environmental preservation.
- Encouraging ocean education, environmental awareness, and promoting activities related to the blue economy.
- Advocating for inclusion of sea literacy and sustainable sea management in educational systems.
- Empowering students to drive change and promote sustainable practices related to the sea.
- Looking for guidance and assistance in integrating relevant sea topics into school curricula and communities.

These engaging activities can help students deepen their understanding of the marine environment while fostering their curiosity, creativity, and appreciation for the sea.

It is important to notice that, to utilize modern, innovative teaching methods for both student groups to engage their interest and enhance learning outcomes. Employing technological and digital tools, along with the methods outlined in educational training methodologies, and generating digital outputs during activities are highly recommended approaches.



4.1 Primary Schools

Primary education lays the groundwork for a lasting passion for learning and equips students with essential skills to succeed academically and socially throughout their lives. The social and emotional skills developed during this stage serve as the foundation for maintaining healthy relationships and emotional wellness in the future.

Considering the primary school specifications, it is recommended to focus more on play-based and interactive activities. At this stage, teachers are expected to select the appropriate applications based on students' individual traits, awareness levels and learning styles.

Although the final decision will be made by the educator; methods such as Personalized Education, Collaborative Learning, Flipped Classroom, Inquiry-Based Learning, Montessori, Project-Based Learning, Student-Centered/Constructivist Approach, and Teacher-Centered Instruction can be counted among the recommended methods for primary school students.

4.2 Secondary Schools



Secondary education has a significant impact on students' lives, offering a variety of subjects and extracurricular activities for them to discover and pursue their interests and passions. It allows students to explore their interests and potential career paths. Moreover, it utilizes formal teaching methods to foster critical thinking and independent learning, prompting students to engage with diverse groups and navigate complex social scenarios.

For secondary school students it is highly recommended to utilize interactive, exploratory applications that facilitate communication with Mission Ocean stakeholders, allow for assessment, and encourage hands-on experience.

Flipped classroom, Experimental Learning, Real-Life Learning, Work Experience, Student exchange, Collaborative Learning, Game based Learning, Project Based Learning, Problem-based learning, Web based learning, Learning by searching, Effective class discussion methodologies are recommended for secondary schools.

5. ROAD MAP/A LESSON PLAN

5.1 Sea-based activities

Topic: Sea-Based Activities			
Content <ul style="list-style-type: none"> ● Fisheries and Aquaculture ● Coastal Tourism ● Marine and River Transport and Shipping ● Biotechnology ● Water Sports 	Goals : <ul style="list-style-type: none"> ● Preserve the environment ● Sustain food quality ● Maintain fish welfare ● Cost efficiency ● Tailormade solutions ● Space efficient systems ● High levels of hygiene ● Efficient freezing time 	Skills: <ul style="list-style-type: none"> ● Information and communication ● Creative and critical thinking ● Scientific and technological knowledge ● Reasoning and problem solving ● Environment ● Interpersonal relationship 	Subjects: <p>Biology Geology Chemistry Science Social sciences</p>
Target Audience: primary and secondary school students		Duration: 3 hours of activity	
Material:			
Description <p>The main goal of this lesson is to develop students' own judgment and evaluation mechanism by doing research on the title they choose. Students will choose one of the five topics and conduct a research on this topic. Each child will present their work on the topic they have chosen using a free method (short video, presentation, painting, music, interview recording, photography, etc.).</p>		Strategies: <p>Students will be encouraged to share the information they have obtained as a result of their research in the way they think best expresses themselves. With this method, students are enabled to learn from their peers, from their own perspectives, in a perspective that is easily understandable and reflects daily life.</p>	
Assessment	Feedback from students, the outputs of the student group works		
Comments	Teachers' diversification of topic selection and avoidance of repetition on the same topic will increase the flow and impact of the lesson.		
examples	<ul style="list-style-type: none"> ● Aquaculture is a controlled rearing system of fish which offers opportunities and substantial challenges. It is limited to high-yielding species with a commercial value, and it uses a lot of feed and necessitates close husbandry. Improvements are planned through the better understanding of fish welfare, life cycle, physiology, threats and genetic background to make aquaculture part of sustainable development. 		

5.2 Biodiversity

Topic: Biodiversity			
<p>Content</p> <ul style="list-style-type: none"> • Migration of the Species • Damage to Coral Reefs and Riverbeds • Microplastics Uptake by Aquatic Animals • Erosion and Flooding • Preserve biodiversity in waters • Avoid alien species 	<p>Goals :</p> <ul style="list-style-type: none"> • Preserve the environment • Protect and restore marine and freshwater ecosystems and biodiversity (in line with the EU Biodiversity Strategy 2030) • Prevent and eliminate pollution of our ocean, seas and waters • Make the sustainable blue economy carbon-neutral and circular • Mitigate alien species invasion • Understand the concept of local biodiversity 	<p>Skills:</p> <ul style="list-style-type: none"> • Information and communication • Scientific and technological knowledge • Reasoning and problem solving • Environment • Interpersonal relationship 	<p>Subjects:</p> <p>Biology Geology Chemistry Science Social sciences</p>
Target Audience: primary and secondary school students		Duration: 3 weeks (each week 3 hours)	
Material:			
<p>Description:</p> <p>The aim of this lesson is to increase students' awareness about marine diversity and to have information about the 2030 Biodiversity Strategy.</p> <p>As part of the study, students will be grouped and assigned specific titles. Each group will research the measures taken in their city and country concerning the 2030 targets relevant to their assigned title, and then present their findings</p>		<p>Strategies:</p> <p>Students are required to engage in research and experience actual initiatives to enhance their understanding and knowledge of the 2030 Biodiversity Strategy.</p>	
Assessment	Feedback from students, the outputs of the student group works		
Comments	Teachers' information about the 2030 Biodiversity Strategy with students and providing guidance on how to access resources and information can enhance the effectiveness of their learning process.		
Examples	<ul style="list-style-type: none"> • Alien species in the Mediterranean Sea: The invasion of the Mediterranean Sea by the blue crab is a concerning issue. Many alien species have made their way into our rivers and seas. How did they arrive there, and what measures can be taken to mitigate the impact? • Were you aware that the Mediterranean Sea is home to a diverse range of cetaceans, which are marine mammals including dolphins, orcas, and whales? 		

5.3 Hazardous substances and marine litter

Topic: Hazardous substances and marine litter			
Content: <ul style="list-style-type: none"> • Oil rigs • Heavy Metals • Plastics & Microplastics • Various Wastes from Cruise Ships • Various Wastes from Cities • Fossil fuel reserve exploration 	Goals : <ul style="list-style-type: none"> • Preserve the environment • Space efficient systems • Prevent and eliminate pollution of our ocean, seas and waters • Make the sustainable blue economy carbon-neutral and circular • Prevent noise pollution 	Skills: <ul style="list-style-type: none"> • Information and communication • Scientific and technological knowledge • Reasoning and problem solving • Environment • Interpersonal relationship 	Subjects: <ul style="list-style-type: none"> Biology Geology Chemistry Science Social sciences
Target Audience: primary and secondary school students		Duration:	
Material: Oil floating on water, different plastics of different sizes and densità, ink , loud sonar sounds			
Description : The goal of this lesson is to educate students about the various risks and ongoing pressures on the marine and aquatic ecosystems, why these challenges exist, and how they can be addressed. Student groups are assigned a specific topic to explore, considering the significance of the threat, its societal relevance, and possible solutions to reduce its impact.		Strategies: Students are anticipated to show the connection between hidden, indirect repercussions of their resource consumption in daily life, emphasizing that accountability is a shared responsibility	
Assessment	Multi-level maps of interlinked activities, the richer the better		
Comments			
List of examples:	<ul style="list-style-type: none"> • Create artwork using litter collected from the beach • Simulate underwater environments with ambient noise (including human voices) to study how acoustic species are affected in their hunting and feeding behavior • The Venice lagoon is a unique and delicate ecosystem, home to numerous native species and a carefully maintained equilibrium. It also serves as a stopover for migrating species each year. 		

5.4 Climate change

Topic: Climate Change		Sub-Topic	
Content: <ul style="list-style-type: none"> • Water-body acidification • Eutrophication • Rising Temperature • Droughts • Rise in Sea Levels 	Goals: <ul style="list-style-type: none"> • Detect local/regional challenges • develop ideas and solutions • illustrate changes across time 	Skills: <ul style="list-style-type: none"> • information and classification • interconnections • Scientific and technological knowledge 	Subjects: <ul style="list-style-type: none"> • Biology • Geography • Chemistry • Physics • Life Science • History
Target Audience: Primary and secondary school students		Duration: 50 minutes	
Material: Map, Statistics			
Description: <p>The aim of this lesson is to illustrate the impact of climate change in the (local) area. Gather (historic) public information like environmental data, statistics, weather data to demonstrate the changes occurred during time.</p> <p>Whereas primary school students can illustrate the impact in a colorful way, secondary school students can provide several statistics and compare them.</p>		Strategies: <p>Students get together in groups. Each group take over one subtopic.</p> <p>These illustrations and comparisons highlight the impact of global climate change on local situations and simultaneously demonstrate the impact local occurrences have on global developments.</p>	
Assessment	Which conclusions do the school students draw from the interconnections, how do the interpret the data and findings		
Comments	Besides collecting data, interviews with people particularly affected by the changes (e.g. farmers) could be conducted		
Examples	<ul style="list-style-type: none"> • The MOSE is a multi-billion euro project funded by the EU to protect the Venice Laguna from rising waters which are evermore prevalent. During specific high-risk periods, the doors are raised and keep the laguna from overflowing with sea water. It is a marvel of engineering but also has impacts on biodiversity. 		

5.5 Sustainable use of water resources

Topic: Sustainable use of water resources		Sub-Topic	
Content: <ul style="list-style-type: none"> • Renewable Marine and Water Energy • Nuclear power plants on shores • Drinking water • Food from sea and water 	Goals: <ul style="list-style-type: none"> • Understanding the importance of the relation between water and energy • Understanding the importance of achieving "clean water and sanitation for all" 	Skills: <ul style="list-style-type: none"> • Information and communication • Scientific and technological knowledge • Reasoning and problem solving • Environment 	Subjects: <p>Energy Economy Life Science Science</p>
Target Audience: Primary and secondary school students		Duration: 1 hours a day for 2 weeks	
Material:			
Description: The aim of the lesson is to increase students' awareness about sustainable use of water sources. Students who will attend the course will be grouped and each group will be asked to choose one of the 4 titles mentioned above. The groups will be asked to prepare an awareness project on the topic they choose. The project will consist of a maximum of two activities. One week will be given for the preparation of the project and one week for its implementation. Each group will promote its own topic for one week. At the end of one week, the group with the most effective promotion will be chosen by the students.		Strategies Project based learning Group study/team work Research, analysis and promotion	
Assessment	Assessment will be done by the students votes		
Comments			
Examples:	<ul style="list-style-type: none"> - Ricicliamo: reuse of sea urchin shells from markets to make high-calcium feed complements, and biofilms in patches to help wound healing - Some algae are edible and are exploited to create a variety of daily-use products. - Crops of the sea: Some innovating programs are using air bells to grow ground vegetables under the sea in perfect conditions, without pesticides or synthetic fertilizers 		

6. LEARNING RESOURCES

There are numerous resources available to enhance your ocean literacy skills or use it in your classroom.

Here are some helpful links where you can find examples:

6.1 Platforms



Web address: <https://missionoceanwaters.eu/#/>

With a 2030 target, the EU Mission "Restore our Ocean and Waters" aims to protect and restore the health of our ocean and waters through research and innovation, citizen engagement and blue investments. The Mission's new approach will address the ocean and waters as one and play a key role in achieving climate neutrality and restoring nature.



Web address: <https://marine.copernicus.eu/>

Provides free and open marine data and services to enable marine policy implementation, support Blue growth and scientific innovation



Web address: <https://www.emsea.eu>

EMSEA is a membership organisation, representing academia, researchers, NGO's, companies, formal (schools) and informal (science) education institutes, engaged to increase ocean literacy in society.



Web address: <https://www.blue-schools.eu>

The top priority of Blue Schools is to introduce the principle of the blue economy into school education in order to build a new generation sensitive to environmental issues, maritime heritage and sustainable economic development. It will raise awareness and help students to build a sustainable future in coastal areas and encourage them to participate actively in society and to engage with local stakeholders.



Web address: <https://www.jpi-oceans.eu>

The Joint Programming Initiative Healthy and Productive Seas and Oceans (JPI Oceans) is a pan-European platform that increases the efficiency and impact of research and innovation for sustainably healthy and productive seas and oceans.



Web address: <https://errin.eu>

The European Regions Research and Innovation Network ([ERRIN](https://errin.eu)) is a well-known Brussels-based platform that gathers around 120 regional organisations from more than 20 European countries. Established in 2001, ERRIN supports members to enhance their regional and local research and innovation capacities and further develop their R&I ecosystems.



Web address: <https://noc.ac.uk/>

"Ocean Science in Action" (OSA) aims to build a unique collection of open access online educational and capacity development video resources dedicated to the innovative marine technologies and how they are used to tackle the challenges of sustainable management of marine ecosystems.



Web address: <https://crowdhelix.com/helices/mission-oceans>
Increasing the awareness of ocean literacy among society, with a specific focus on empowering students as agents of change



Web address: <https://bluemissionbanos.eu>

BlueMissionBANOS inspires, engages and supports stakeholders across the Baltic and North Sea to reach a carbon-neutral & circular blue economy



Web address: <https://www.unesco.org>

Ocean literacy is defined as an understanding of the ocean's influence on you, and your influence on the ocean. Ocean literacy is a way not only to increase the awareness of the public about the ocean, but it is as an approach to encourage all citizens and stakeholders to have a more responsible and informed behaviour towards the ocean and its resources.

6.2 Digital Resources

[MOOC: “Bring the Ocean into Your School”](#)

The European Schoolnet developed a MOOC aiming to *“inspire and guide participants in crafting their unique “Find the Blue” project. Participants will learn how to identify ocean topics, develop school projects in collaboration with local partners, and work towards achieving a European Blue School certification”*

Target group: all interested with a special focus on primary and secondary school teachers

Duration: approximately 16 hours to complete the MOOC

Structure: 4 modules:

- Module 1: Navigating Ocean Literacy
- Module 2: Building Ocean Knowledge with European Blue Schools
- Module 3: Becoming European Blue Schools: The Find the Blue Challenge
- Module 4: Ocean Literacy in Action



<https://www.seasmartschool.com>

The organization is offering free resources to educators that make learning about ocean conservation hands-on, fun and accessible to all learners! The resources are created by experienced environmental educators.

Topics:

- Differentiated Kindergarten to Grade 12 lesson plans
- BC Curriculum connections
- Presentation slides
- Educational videos
- Extension resources



Blue Wonder

https://feature.undp.org/blue-wonder/?gad_source=1&gclid=Cj0KCQiA5-uuBhDzARIsAAa21T-8I0pCOS2jHU55AH0LUqKFOB7iNVvJ9Ime272JywKNdcYt9mdxGY0aAhFaEALw_wcB



Schmidt Ocean Institute

<https://schmidtocean.org/>

Schmidt Ocean Institute is a 501(c)(3) private non-profit operating foundation established in March 2009 to advance oceanographic research, discovery, and knowledge, and catalyze sharing of information about the oceans.

Topics:

- Marine Geochemistry & the Southern Ocean
- NEMO (NOAA enrichment in Marine Sciences and Oceanography)
- Exploring Deep-Ocean Coloring Book
- Science Scope Article (Engage Your Students in Ocean Exploration Science)
- Ocean Portal: Educator’s Corner

7. JOIN the MOVEMENT

7.1. Application Process for SHORE Open Calls

The SHORE – Open Calls # aims to support student and schools-led projects that can:

- contribute to the achievement of the objectives under the **EU Mission Restore Our Ocean and Waters by 2030**, among others through development and implementation of innovative solutions and products contributing to those objectives;
- reinforce and contribute to the [EU4Ocean coalition](#) and its European Network of Blue Schools.

In doing so, SHORE aims to engage students, teachers and other actors from the school ecosystem and the wider community to co-design, co-develop and co-implement projects that can contribute to expand and broaden ocean & water literacy.

The SHORE – Open Call # is open to proposals that address at least one topic and subtopic of the open call.

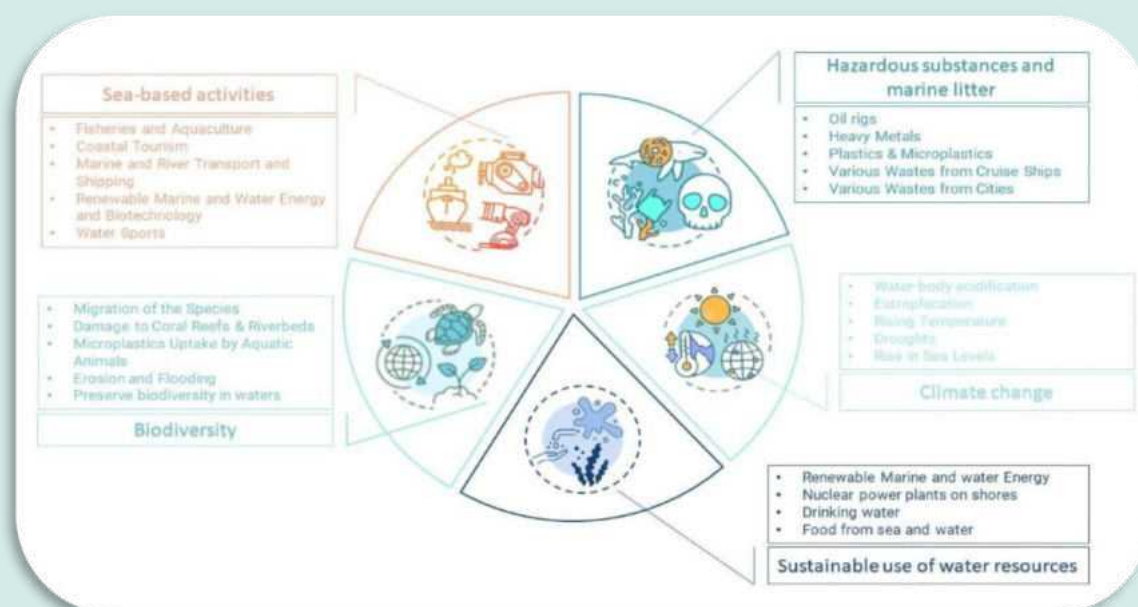


Figure 2: Topics and subtopics of SHORE

Applicants should select the most relevant topic and subtopic in line with their proposed activities, the regional context and local environmental challenges. In case more than one topic is relevant, applicants are encouraged to choose the one more suitable for proposed activities.

For more information visit <https://shoreproject.eu/open-calls/>.

7.2. Development of project ideas for mission ocean

The mission of the SHORE project is to engage students in exploring and understanding the marine environment through diverse activities.

The SHORE - Open Calls # are open to proposals which include different types of activities aimed to mobilise primary and secondary schools' students and/or teachers of the school(s). Applicants are advised to choose at least one activity from a fixed list:

Table 6: A list of the different types of activities

Activity	Description and examples
workshops	<p>Interactive meetings in which a group of students can meet to discuss questions, brainstorm ideas, identify problems, and develop solutions.</p> <p>Examples of workshops to be led: sustainability action, impacts of climate change, exploring biodiversity, endangered species, sustainable transport, reducing carbon footprint, renewable energy, water conservation, etc.</p>
meetings	<p>Gatherings of students that share a common purpose.</p> <p>Examples: presentation the outcomes of the project, etc</p>
trainings	<p>Trainings can be used to develop and embed skills in students, teachers and parents on different issues related to the ocean and water literacy projects. These include interactive sessions to help learners practice and be effective in their role, supporting lifelong learning.</p> <p>Examples: training on waste management, energy use, pollution, biodiversity, etc.</p>
exhibitions	<p>The aim of an exhibition is to showcase innovative solutions to environmental issues tackled by the blue project and is designed to empower students and visitors to develop their own creative solutions and become advocates for ocean and water literacy.</p> <p>Examples: humorous original drawings, contemporary photographs, artworks made from recycled materials, from litter, fashion shows, etc.</p>
conferences	<p>The purpose of a conference is to provide a platform for students to present their work, talents, and ideas to a wider audience which can include students and teachers from other schools, representatives of local communities, parents, etc.</p> <p>Examples: conferences covering topics related to oceans and rivers, marine science, conservation, education, etc.</p>
meetNtalks	<p>These kinds of meetings aim to provide quality information, advice, and guidance. Students can organise inspiring meetNtalks to present the hot topic of their project, create interactive discussions and make use of networking opportunities.</p>

competitions	<p>Competitions are available to students of all ages and come in a slew of different structures and styles.</p> <p>Examples: Students create their own work of art, prose, poetry, or film/photography that interprets a topic as climate heroes, in the wild, recycling, food chain, etc.</p>
virtual educational activities	<p>Virtual educational activities are learning experiences that take place in online or digital environments. They leverage technology to facilitate teaching and engagement, allowing students to access educational content, interact with instructors, and collaborate with peers remotely.</p> <p>Examples: online courses, webinars, virtual field trips, video lectures, interactive simulations, virtual labs, etc.</p>
field trips	<p>A field trip is one of the tools that can be used to provide every student with real-world experiences. When students leave the classroom, they see the connections between what is happening at school and in the 'real-world'.</p> <p>Examples of field trips: to a recycling centre, alternative energy plant, science labs, watch a show with a specific theme related to ocean and water literacy, etc.</p>
local expeditions	<p>These expeditions might be focused on regional and local issues: national parks in the region, botanical gardens, maritime museums, planetarium, zoos or conservation centres, farms, aquariums, fish hatchery, etc.</p>
technical trips	<p>The technical trips are the ones that can be taken to a recycling centre, garbage processing facility, ecological cleanup site, manufacturing plants, science labs, research institutes, etc.</p>
boat activities	<p>These kinds of activities introduce participants to the natural environment of the sea/river, through an educational, on-the-water experience.</p> <p>Examples of activities that can be organised on a boat: observe marine life, bird watching, observe the beach landslides and erosion, etc.</p>
virtual laboratories	<p>Adopting virtual labs represents a step forward in engaging students through active participation. They can be in touch with the latest innovative lab technologies, lab experiments and simulations.</p>
laboratory trips	<p>Laboratory trips to a science laboratory from a research institute/university can substantiate the information received during</p>

	<p>classes where students can gain hands-on experience and observe scientific experiments or research processes in a real-world condition.</p> <p>Examples: visits to university research labs, government research facilities, industrial research and development centres, and science museums.</p>
museum trips	<p>Museums are great resources and these trips to museums must be truly impactful and lead to a deeper learning. Students should not be just information consumers, but they can play a role in improving the experience and get actively involved by thinking critically. They can look for specific objects, find their story, take photos, create their own exhibition, worksheets, etc.</p>
technical field trips	<p>Technical trips will give real life context to the skills students are learning, build connections between the classroom and the community.</p> <p>Examples: visits to science museums, different environments such as a beach/forest, farms, or just to collect different samples for a project, marine litter monitoring or observation of pollution sources.</p>
laboratory testing and analysis of results	<p>A science lab offers conducting controlled experiments to collect data or samples for analysis. Analysis of results includes the interpretation and evaluation of the data to draw conclusions, make inferences, or generate scientific findings.</p> <p>Examples: testing the composition of a water sample for pollutants, microplastic analysis, etc.</p>

7.3 Cooperation/twinning with other blue schools

SHORE – Open Call #1 welcomes proposals submitted by schools, which are open for collaboration/twinning with other blue schools. The cooperation can already be established, or schools can intend to establish cooperation during implementation of the project. The cooperation can be established with schools from the Network of European Blue Schools and those aspiring to become accredited members of the Network of European Blue Schools.

In the proposal applicants should describe cooperation activities with other teachers and their students, designed to enable them to exchange experiences, best practices and successful stories stemming from their blue projects and ocean literacy-driven actions.

Twinning activities aim to promote shared learning among students and teachers with a focus on encouraging learning inside and outside the classroom. Also, teachers can join eTwinning (Community for schools in Europe) to run on-site or online activities with their students along with colleagues from other European countries. Examples of twinning activities include capacity building through knowledge sharing, enabling both partner schools to adopt best practices from each other, twinning visits, etc. To find suitable partners for cooperation/twinning, please refer to the [EU4Ocean Platform](#) or [eTwinning portal](#).

7.4 The European Climate Pact

SHORE – Open Calls# are open to schools which participate in climate actions and support values of the [European Climate Pact](#). The school's proposal should entail a commitment to Climate Pact Pledge leading to decarbonisation or at least to carbon neutrality of the project and school activities.

Info on the pledge is here: [European Climate Pact](#) go to take climate friendly action and make a pledge: Take individual action.

7.5 Make EUBlue Award

Following its success over the past 2 years, the EU4Ocean coalition announces the start of applications for its annual [MakeEUBlue Awards](#) recognising innovative and outstanding initiatives in the field of ocean literacy in Europe. The winners are to be announced at the European Maritime Day, which this year takes place on 30-31 May in Svendborg, Denmark.

Applications are open until **23 February**.



8. CONCLUSION

Restore our Oceans, Seas and Water by 2030" mission is a key initiative within Horizon Europe's Strategic Agenda. It focuses on safeguarding and revitalizing Europe's aquatic environments to align with both EU and global goals. The mission's Implementation Plan outlines three main objectives: protecting and rejuvenating marine and freshwater ecosystems, combating pollution, and transitioning the sustainable blue economy to be carbon-neutral and circular. To facilitate these goals, the mission emphasizes the



involvement of the general public in creating and delivering innovative solutions. This inclusive approach aims to engage children and youth in developing collaborative projects that can make significant contributions by 2025 and 2030. By fostering active participation from younger generations, the mission not only raises awareness but also empowers them to play a role in shaping the future. Additionally, through comprehensive communication and outreach strategies, the project seeks to enhance ocean literacy among various stakeholder groups, including local communities and the broader public in targeted regions. Furthermore, the initiative supports the shift towards a cleaner and more sustainable blue economy by promoting inventive student projects across different sectors, such as circular economy, clean energy, biodiversity, and food systems. By establishing support structures at local and network levels, as well as providing educational resources and training opportunities, the project aims to amplify its impact within communities.

Fostering positive-impact projects, the SHORE partnership will influence local and possibly regional policies only if short-term projects are supported to evolve into long term initiatives, embedded in the mesh of the local Blue Economy and stakeholders. The SHORE project will be promoted as a grassroots movement, although possible top-down regional institutions could help reach a wider audience, and through ocean literacy, increase the engagement of local communities beyond the school system, to promote action at the hands of current and future generations of citizens.

The SHORE partnership has effectively employed a collaborative strategy to empower educators by providing insights, training, assets, and solutions. This initiative has paved the way for the process of integrating Ocean Literacy into European school curricula and marine educational policy.

Through these efforts, SHORE contributes to advancing the EU's vision for a sustainable blue economy and encourages active involvement in shaping a more environmentally friendly future...





SHORE

Empower students as the agents of change



Funded by the
European Union

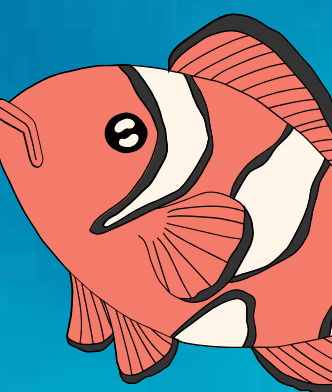
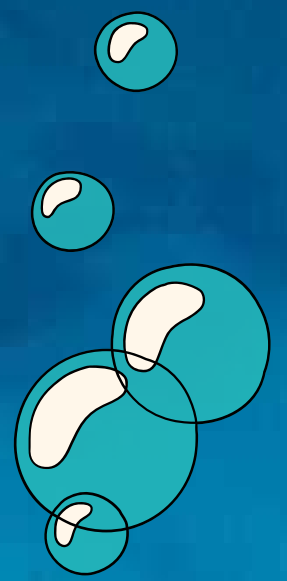


PRESCHOOL HANDBOOK



SHORE

Empower students as the agents of change



CONTENT

WHY IS EARTH CALLED THE BLUE PLANET?

THE SOURCE OF OUR LIFE: WATER

WATER RESOURCES ON EARTH

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AQUATIC ORGANISMS

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GUARDIANS OF THE SEAS: SHARKS

**THE WORLD'S LARGEST
CREATURE: BLUE WHALE**

**THE SMILES OF THE UNDERWATER:
DOLPHINS**

POLES

POLAR BEARS

WATER CONSERVATION

WELCOME TO THE BLUE WORLD

?

How much of the Earth's surface do you think is covered by water?



?

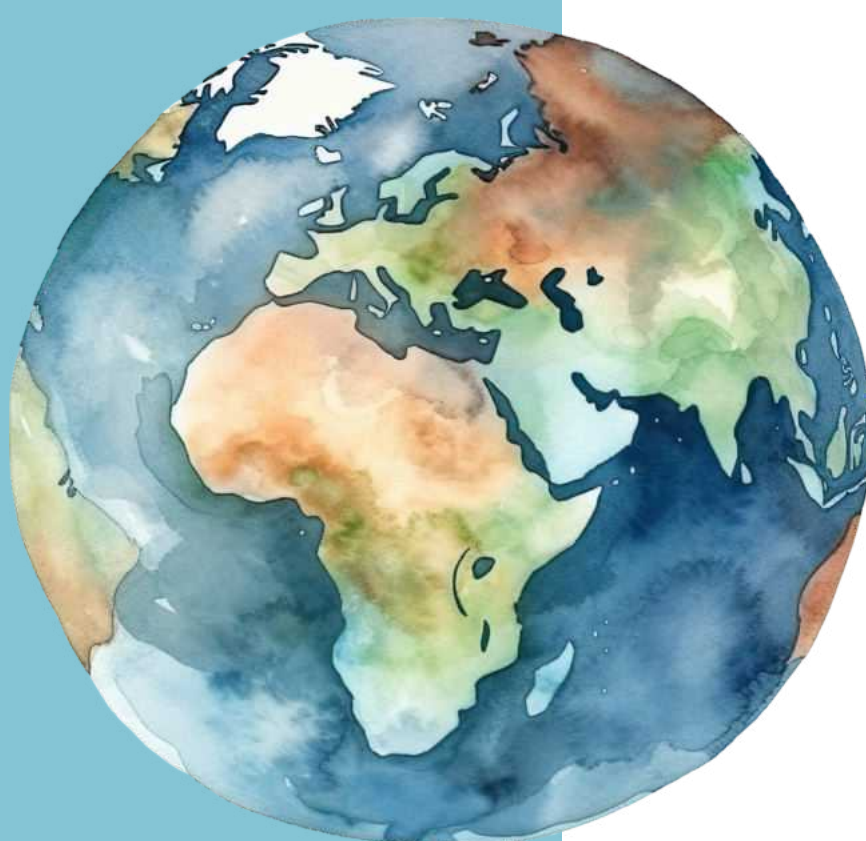
How does rain fall?



Of course! Let's talk about underwater creatures.

?

Seas, rivers, lakes, and oceans...



LET'S EXPLORE OUR
BLUE PLANET
TOGETHER!



WHY IS EARTH CALLED THE BLUE PLANET?

OUR WORLD IS LIKE A HUGE ADVENTURE PARK!

In this vast park where you live, you roam freely between lands and waters. Some of it is dry land, consisting of high mountains and wide plains. These places are home to trees, flowers, and various animals. Mountains stand tall as if they touch the sky. In the plains, colorful flowers bloom, and cute animals play.



AND THERE'S ALSO "WATER"!

Great oceans, rivers, lakes, and ponds... In the water, colorful fish swim, whales leap, and dolphins play games. There are also sea creatures living in colorful homes like coral reefs under the water. You can think of water, plants, and animals as one big family.



SO, IS THERE MORE LAND OR MORE WATER?

Three quarters of the Earth are covered by water.



There are many diverse and important treasures on Earth. One of these treasures is **WATER**, which we use every day for drinking and cleaning. Water is indispensable for the continuation of life. Today, we want to tell you how important water is.



WATER IS THE SOURCE OF OUR LIFE.

Every day, we use water to meet our vital needs.

We need water for drinking, cooking, playing, and cleaning.

Imagine a world without water, how difficult and boring it would be, right?



THE DANCE OF THE DROPLETS

MEET WATER IN ITS MOST CHARMING FORM:



DROPLETS!

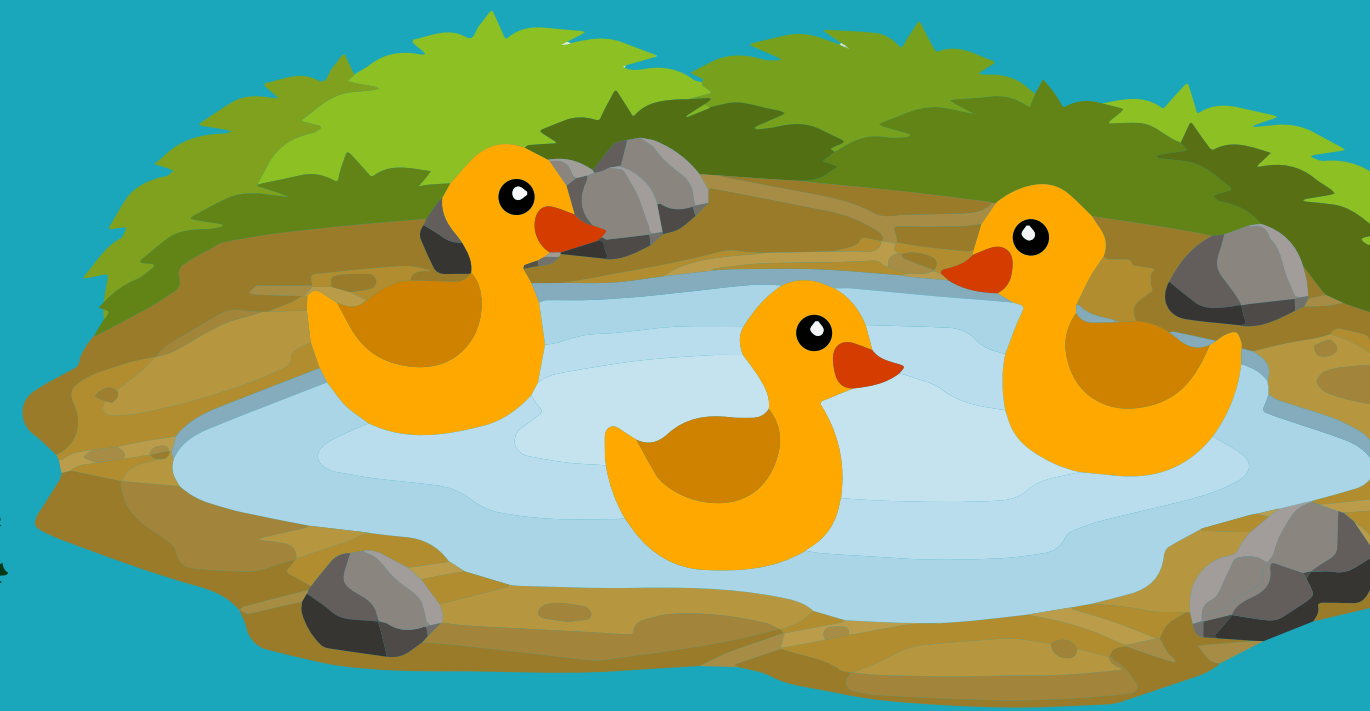
Water sometimes falls from the sky as rain and descends to the earth in the form of tiny droplets. These droplets delight the soil and plants.

WATER, A MIRACLE OF NATURE

Oceans, ponds, and seas are large bodies of water. Forests are a home and a source of food for animals. Imagine ducks swimming in ponds and fish dancing in the sea. All exist thanks to water!

WATER NOURISHES LIFE

Seas and rivers are the habitats for fish. As fish swim in the water, they also become a source of food for other animals. Therefore, water is essential for the survival of many creatures.



LET'S PROTECT WATER!

However, we must protect water well.

We should dispose of our trash properly to keep water sources clean, avoid wasting water, and not harm it. Thus, water remains clean and healthy.



LET'S GET TO KNOW THE WATER SOURCES ON EARTH...

OCEANS

They are the largest bodies of water on Earth. They are like big blue ponds and host many marine creatures such as fish, dolphins, and giant whales. Oceans cover the large water part of our world.



SEAS

Similar to oceans but slightly smaller. Seas also contain water and salt and include colorful fish, crustaceans, and fun beaches.

LET'S GET TO KNOW THE WATER SOURCES ON EARTH...

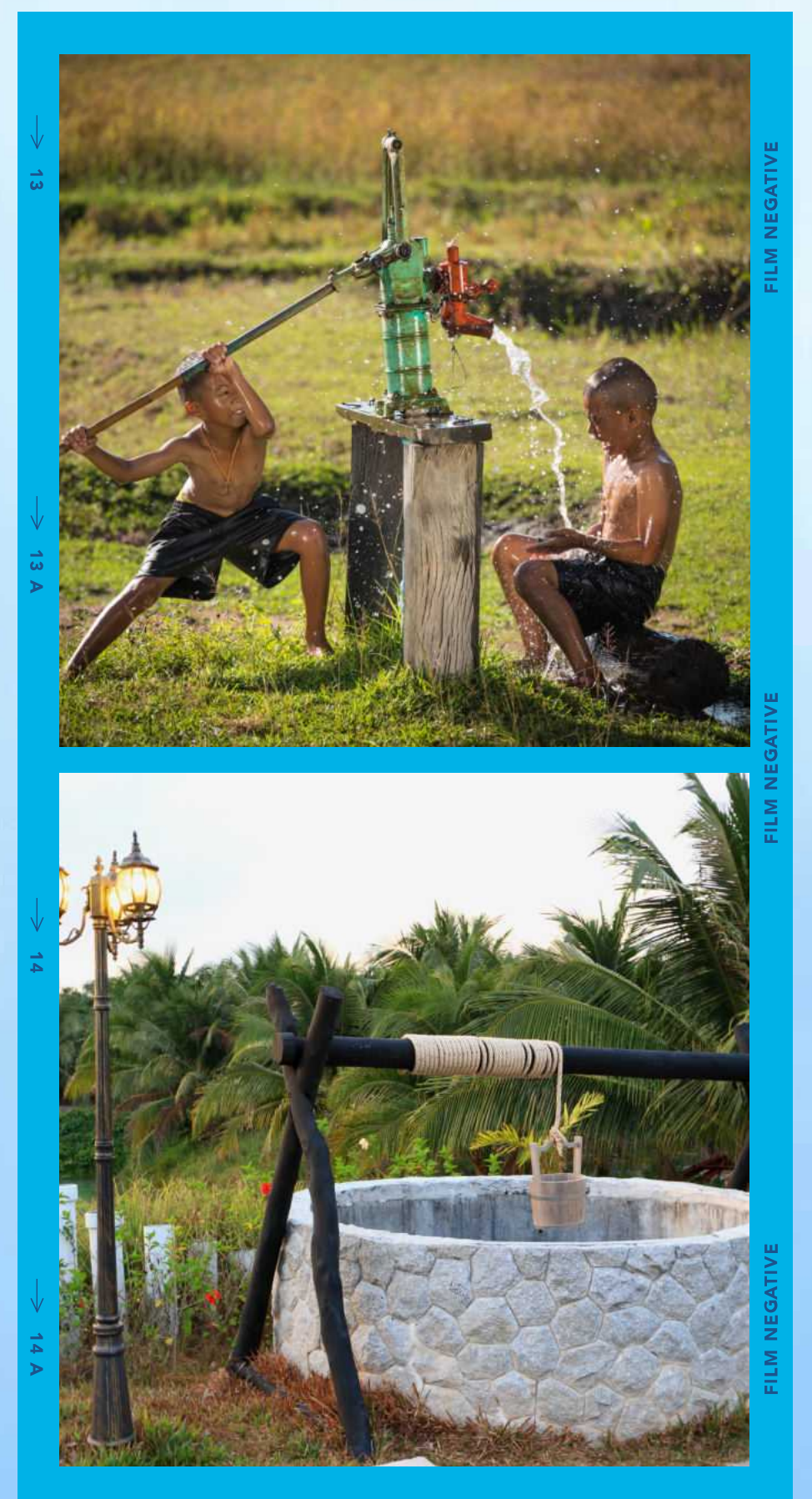


SURFACE WATERS

Ponds, lakes, rivers, and streams represent the waters we can see on the surface. For example, ducks swim in ponds, rivers flow, and ships sail on the water.

GROUND WATER

These are hidden water sources found beneath the earth's surface. This water can emerge to the surface through wells and fountains, providing us with drinking water.



LET'S GET TO KNOW THE WATER SOURCES ON EARTH...



SNOW AND GLACIERS

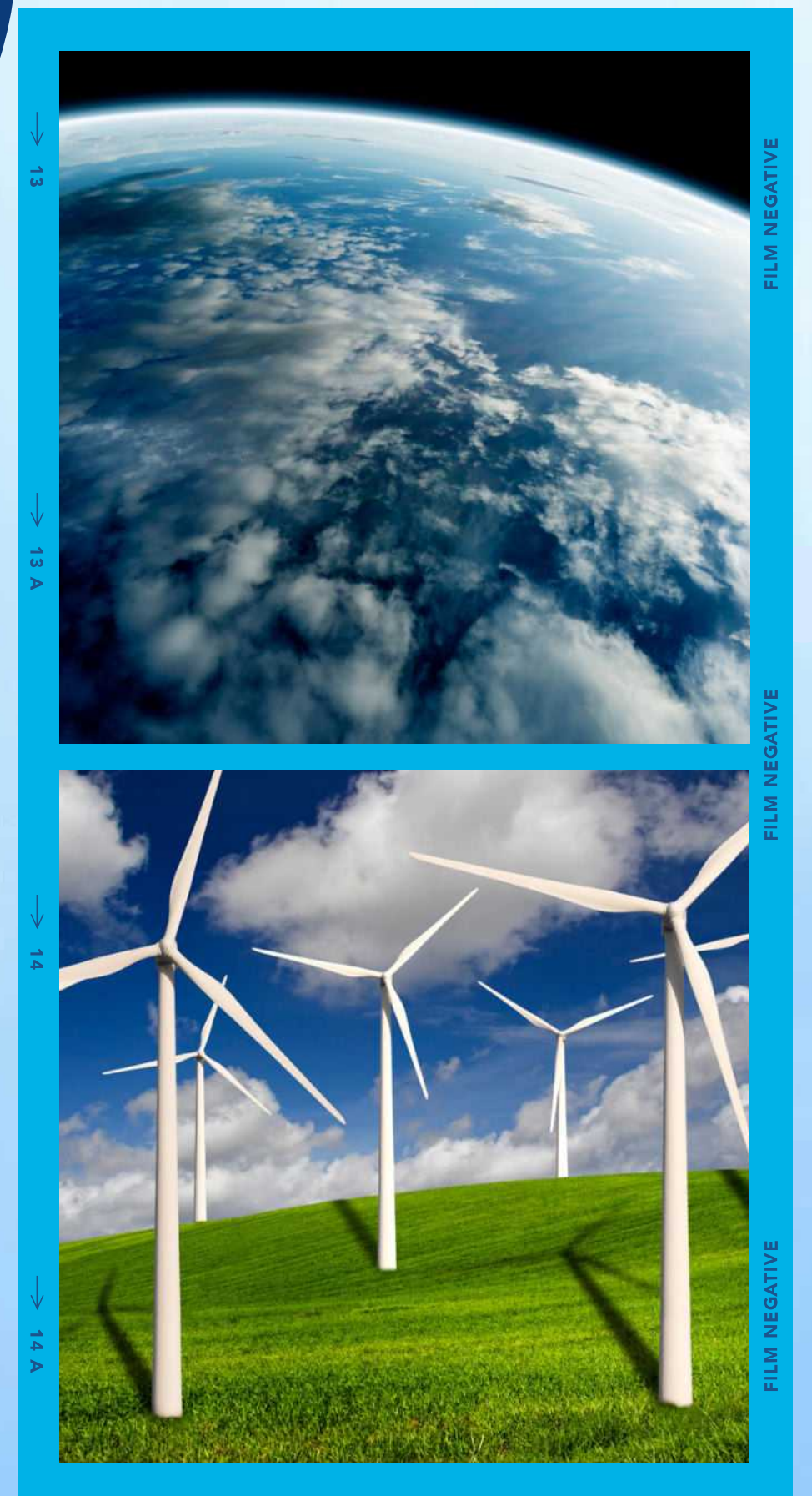
Snow consists of small ice crystals and forms from the freezing of falling rain during winter.

Glaciers are like massive mountains of ice, found in cold places, and adorn the oceans.

ATMOSPHERE

The atmosphere surrounds us. The blue color in the sky is an indication of the air, which is a part of the atmosphere.

The atmosphere helps us breathe and facilitates the blowing of winds.



OCEANS OF OUR WORLD

Oceans are an important part of our planet and host many different marine creatures. There are 5 oceans in our world.



PACIFIC OCEAN: A DREAMLIKE SEA

The largest ocean in the world! Here, there are giant waves, colorful fish, and coral reefs.

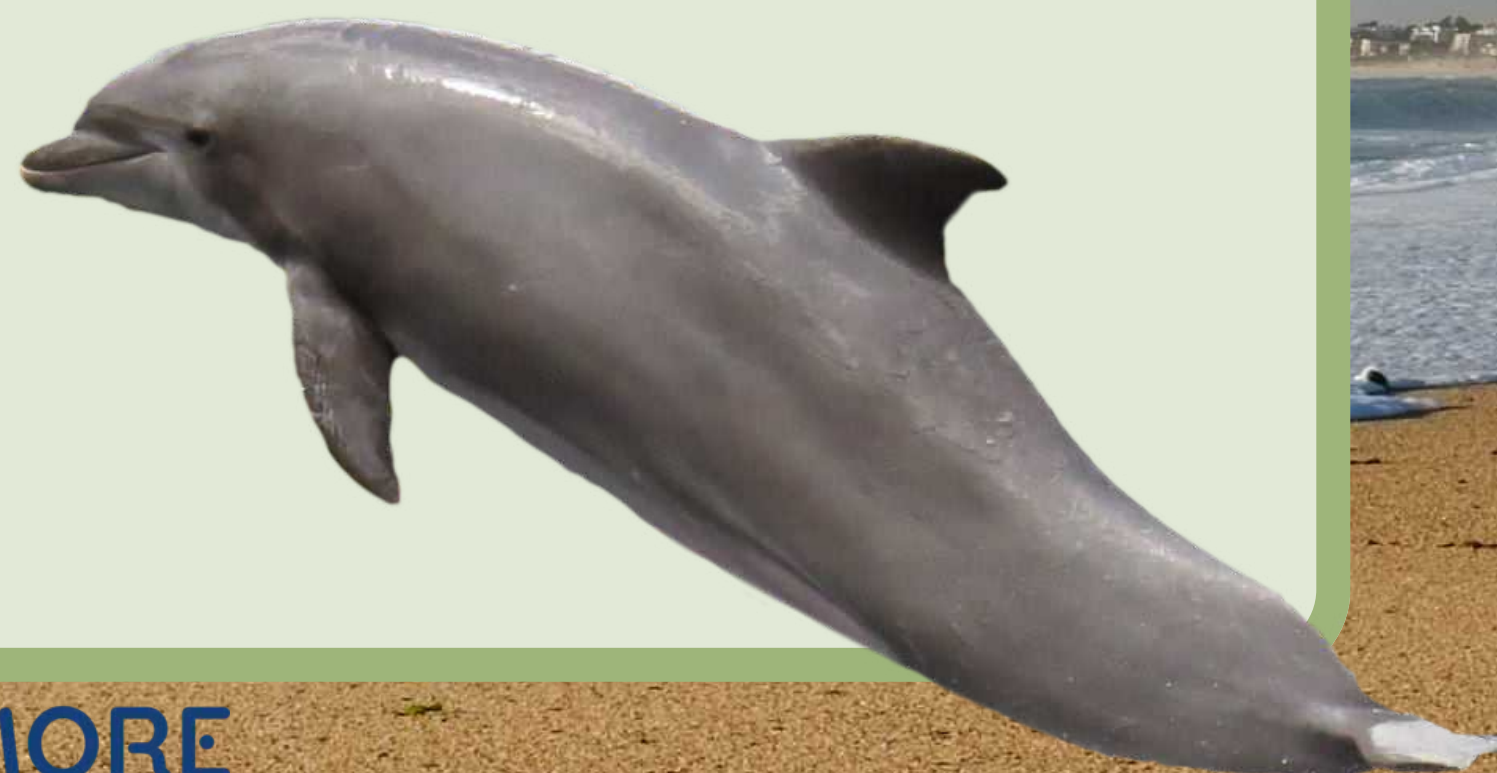
There are also some islands with palm trees and sweet fruits.



ATLANTIC OCEAN - PARTY OF FISHES

The second largest ocean in the world.

On one side, there are warm places, and on the other, cold. Fish, dolphins, and giant sea turtles live here. Its shores are long and sandy.

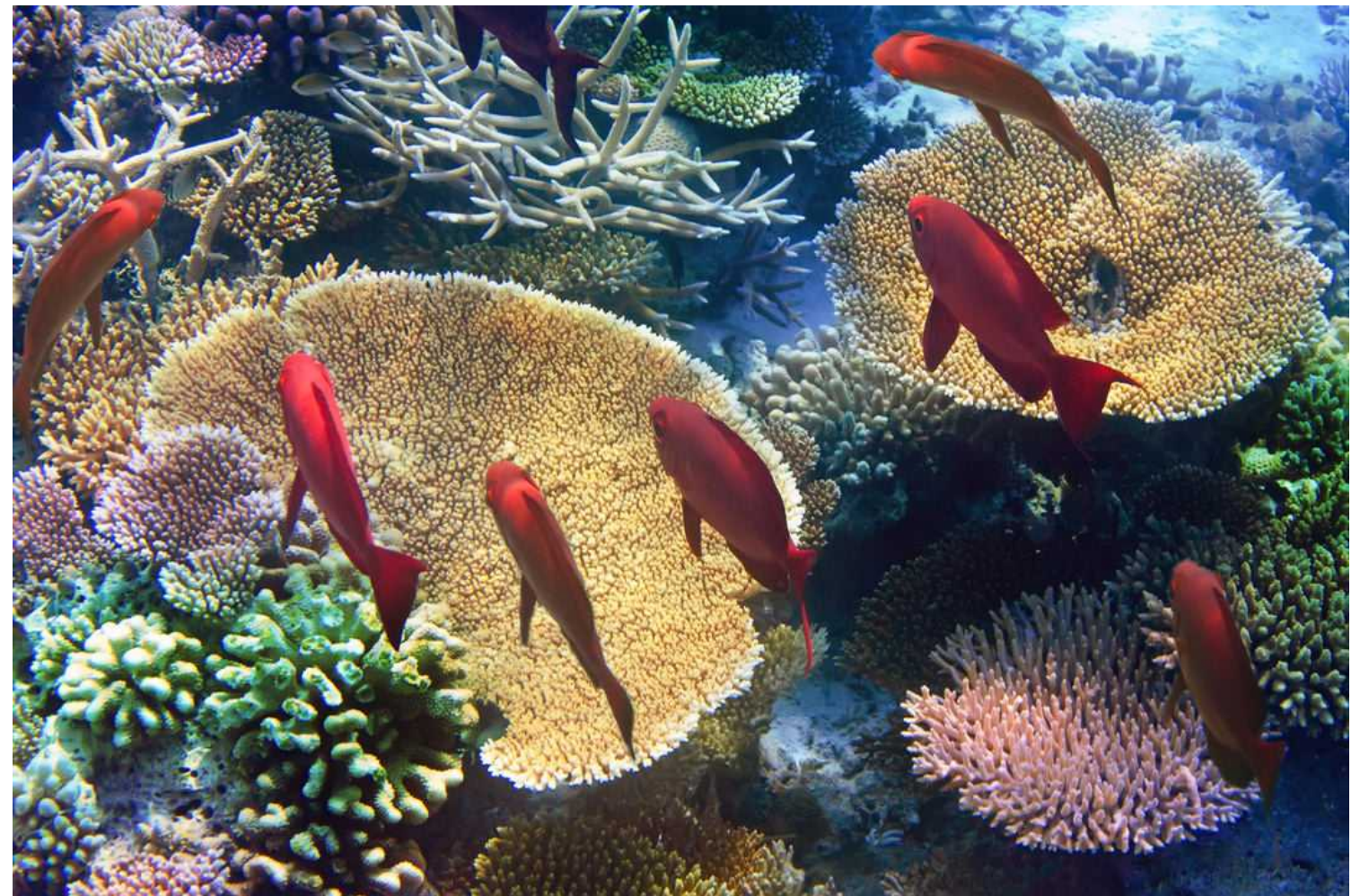


OCEANS OF OUR WORLD

Oceans are an important part of our planet and host many different marine creatures. There are 5 oceans in our world.

INDIAN OCEAN: A WARM, AZURE EXPANSE

A warm and azure ocean famous for its colorful fish, coral reefs, and white sandy beaches. You can dive into the colorful reefs at the bottom of the sea.



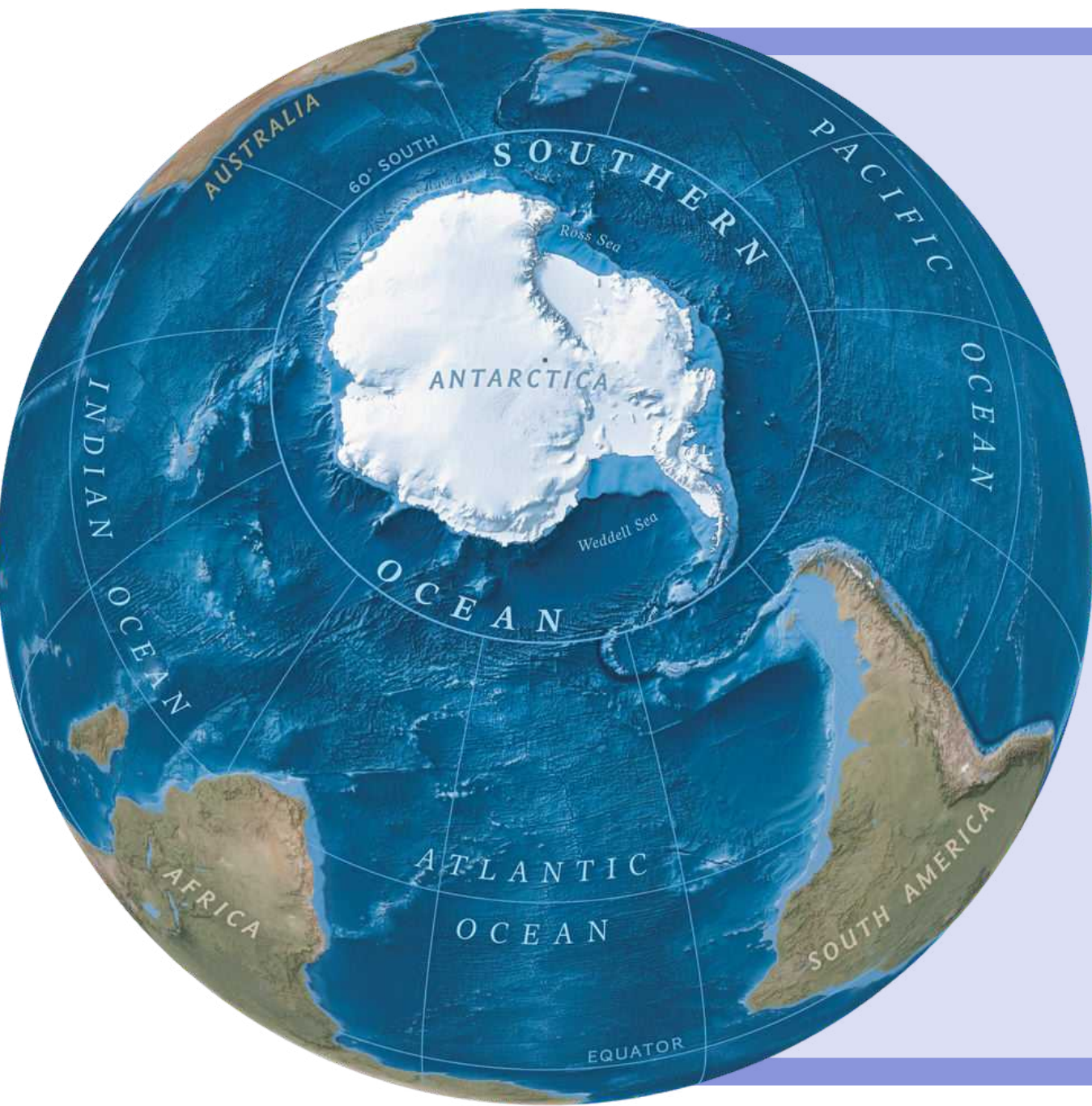
ARCTIC OCEAN: THE MAGICAL WORLD OF THE POLES

The northernmost and coldest ocean in the world. Large polar bears and icy seas live here. You can walk on glaciers and see reindeer.



OCEANS OF OUR WORLD

Oceans are an important part of our planet and host many different marine creatures. There are 5 oceans in our world.



SOUTHERN OCEAN: THE WORLD'S NEWEST OCEAN

This ocean, which unites the southern parts of the Pacific, Atlantic, and Indian oceans, was recognized in the year 2000. The Southern Ocean is the place of dancing winds in the southern hemisphere. Giant waves, colorful birds, and mysterious islands await you. Perhaps one day, you'll want to explore this ocean!



AQUATIC CREATURES

INVERTEBRATES

Marine animals that lack skeletons and typically have soft body structures.

1. OCTOPUS

- Very intelligent creatures that live in the depths of the seas.

THEIR BODIES

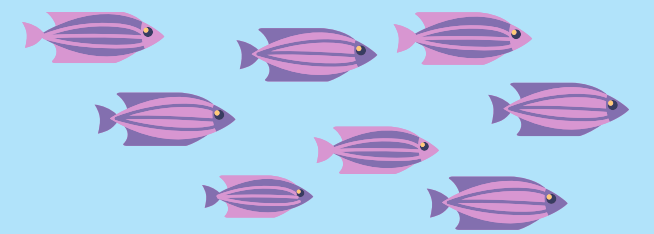
Consist of two main parts: the head and the arms.

Octopuses have 8 arms, and these arms are filled with suction cups at the tips, which they use to catch their prey.

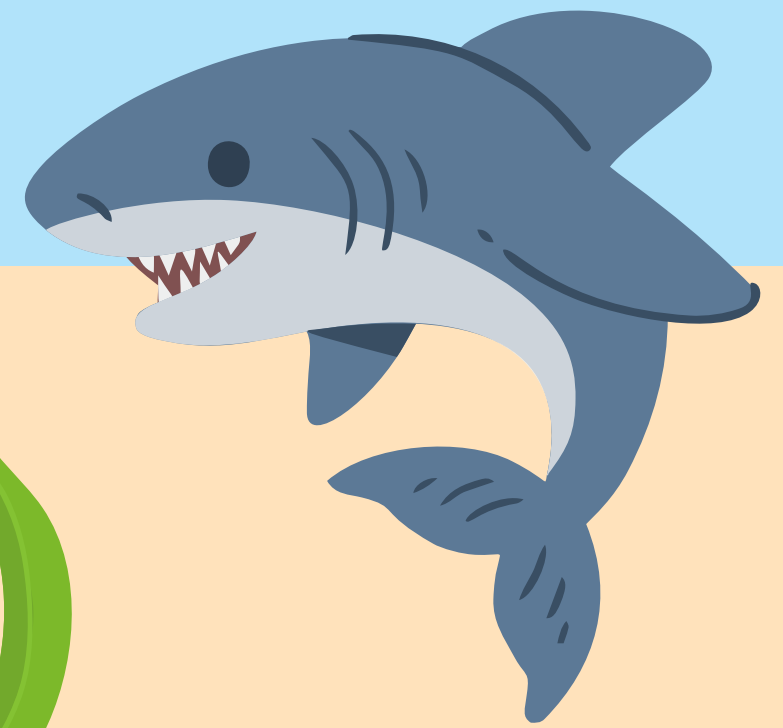
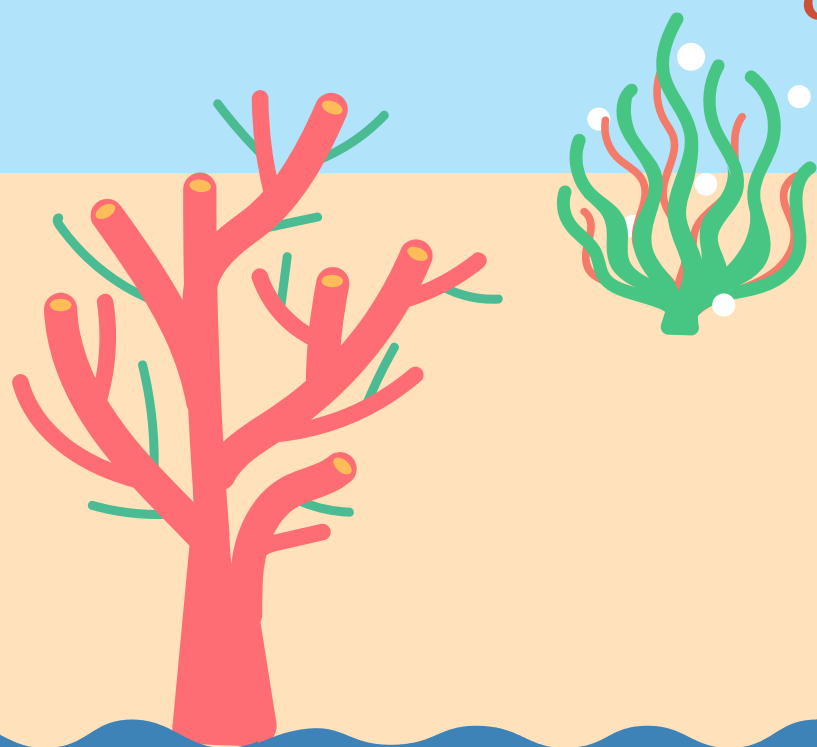


Additionally, octopuses escape by squirting water when they sense danger, protecting themselves.

One of their most interesting features is their ability to change color.



Octopuses, having colorful cells, camouflage by blending into their surroundings.



2. SQUID

They are fast and agile creatures of the seas.



Also, squids have the ability to change color. This ability helps them both to hide their prey and to escape from danger.

THEIR BODIES

They are notable for their fin-like structures and long arms. Squids' arms have suction cups and sharp beak-like teeth. They use these teeth to catch and eat their prey.



AQUATIC CREATURES

CRUSTACEANS

One of the colorful inhabitants of the ocean floor.

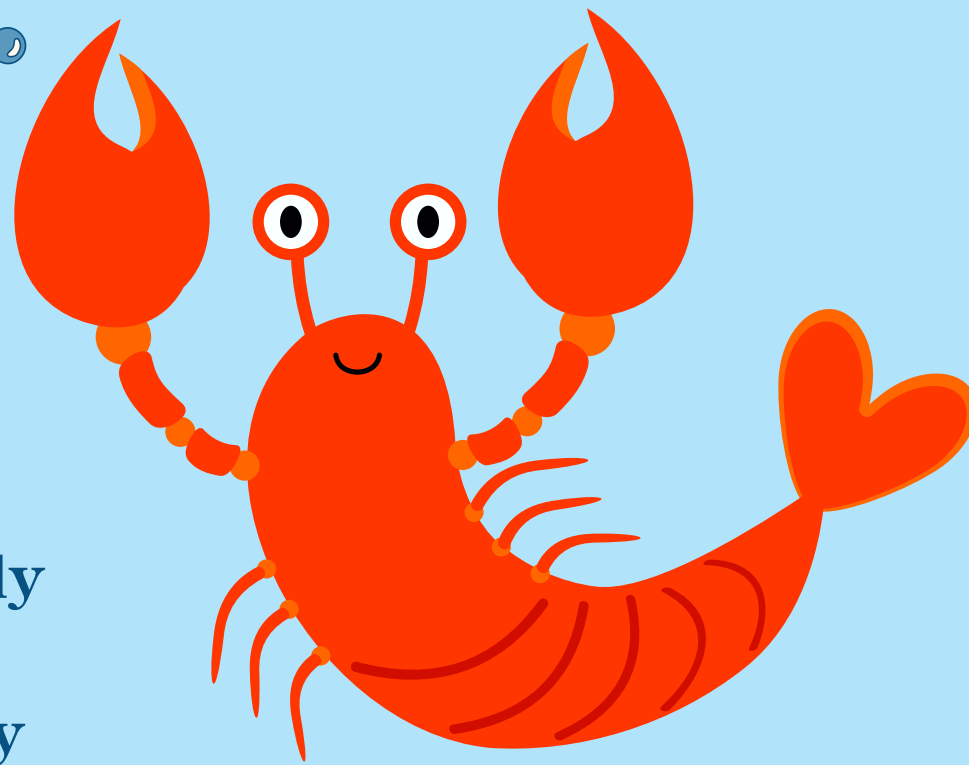
1. LOBSTER

Oceanic crustaceans are marine animals with hard external skeletons.

THEIR BODIES

Their bodies are covered with a thick armor, and they are notable for their large claws.

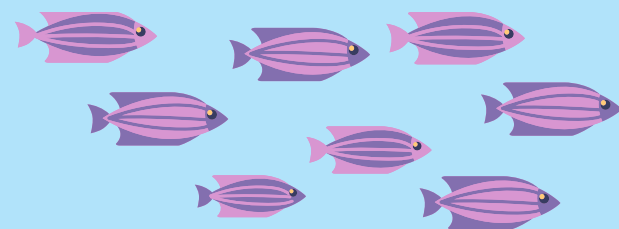
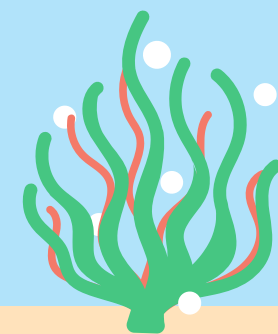
Lobsters can escape quickly thanks to their well-developed tails, which they use to dig nests on the sea floor.



It sounds like a true marvel of nature, doesn't it?

Moreover, they have the ability to change their armor for protection.

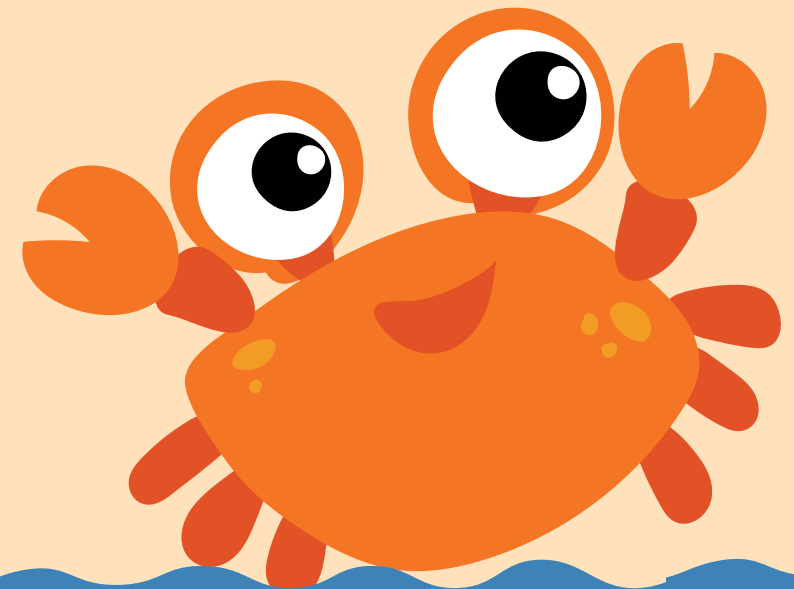
After a while, as they grow, they shed their old armor and replace it with a new, shiny one.



2. CRAB

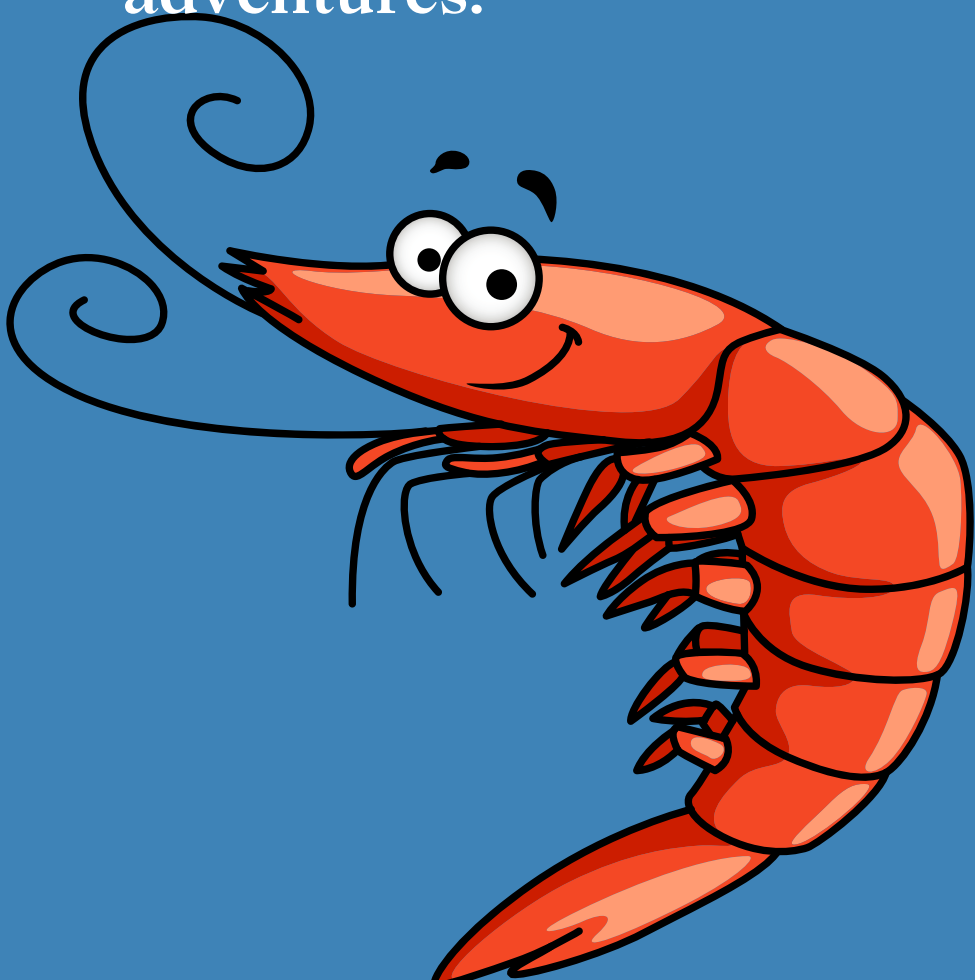
They are adorable creatures that roam the ocean floor like huge heroes.

Crabs' bodies are covered with a hard shell, and they typically hide under the sand. They continue their underwater adventures by walking slowly or moving sideways. Crabs also have large claws that they can use to grasp or pinch something.



3. SHRIMP

Shrimp are also colorful, tiny champions of underwater adventures.



Shrimp are also colorful, tiny champions of underwater adventures.

They are very skilled at changing color. Shrimp, by hiding in the sand or moving among rocks, act like enchanting sea dancers.

THEIR BODIES

Their bodies are covered with interlocking armor pieces. Shrimp move by swimming and darting through the water.

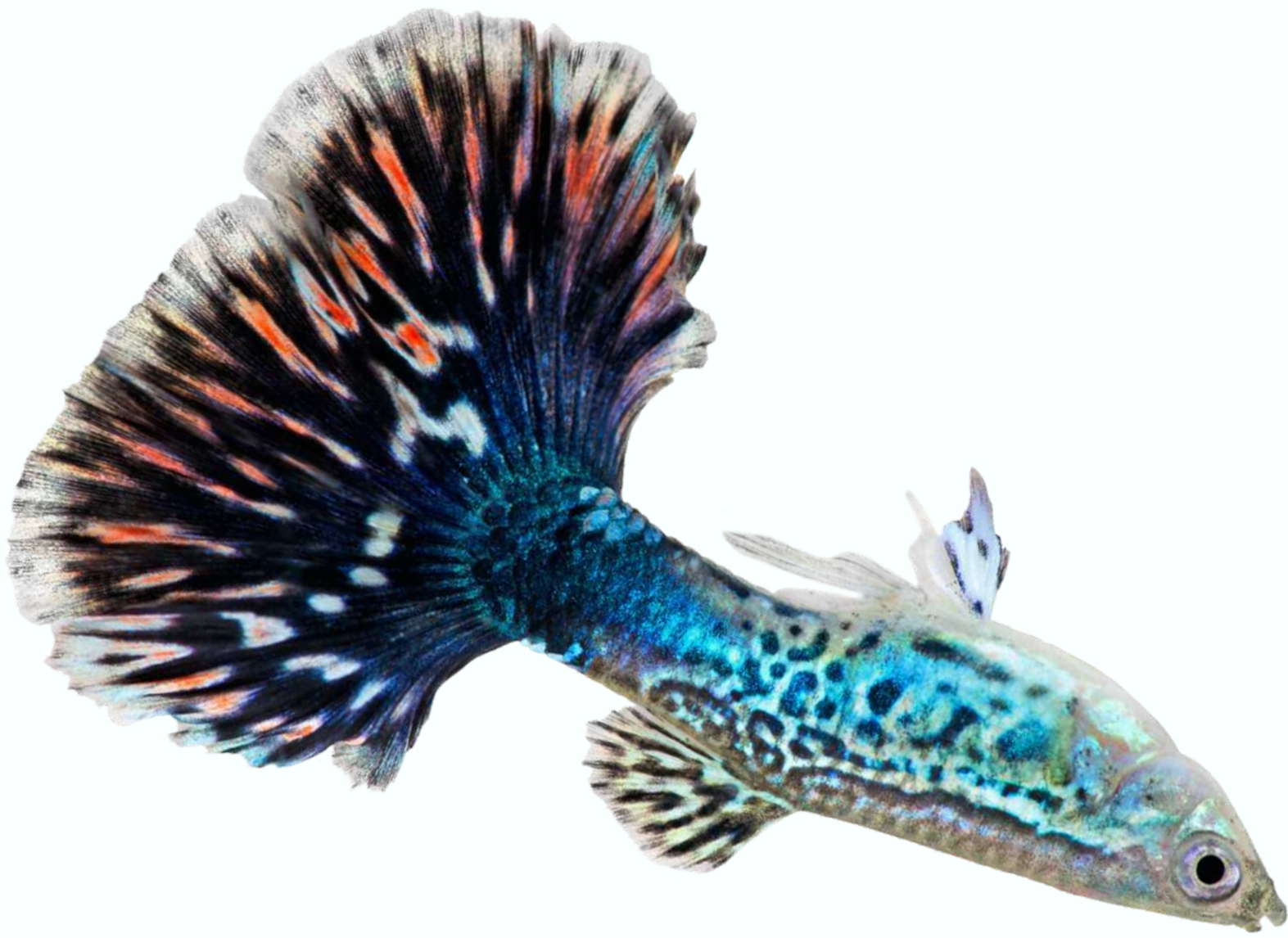


COLORFUL FISH



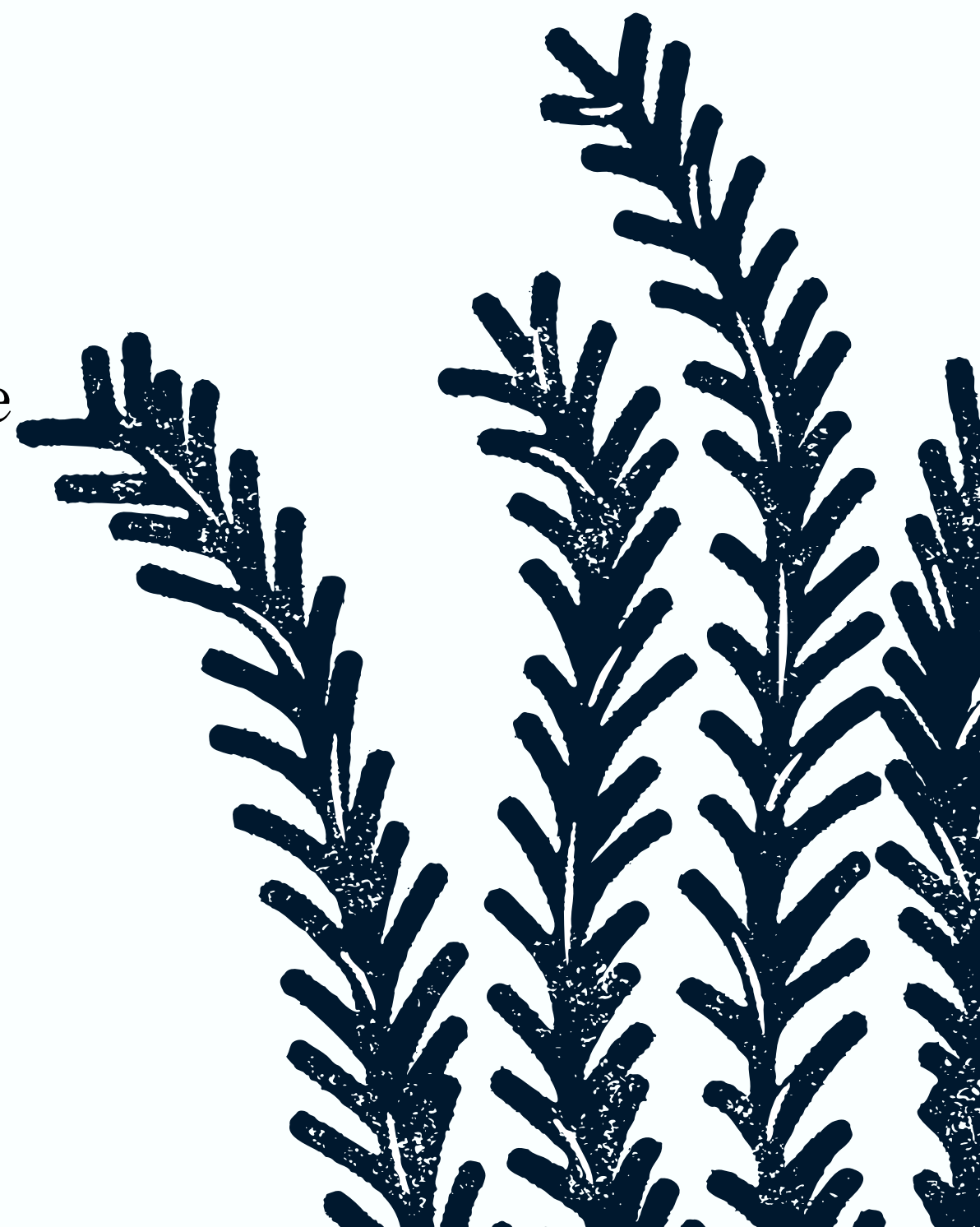
1. Neon Tetra:

Neon tetras are small fish with bright colors that contribute to the ocean's kaleidoscope of colors. They have a slender, long, and transparent structure. They get their name from the neon-like colors that shine on their sides. These tiny friends swim in schools, showcasing their collective swimming skills. Neon tetras eat small plants and insects, beautifying the underwater world with their colorful displays.

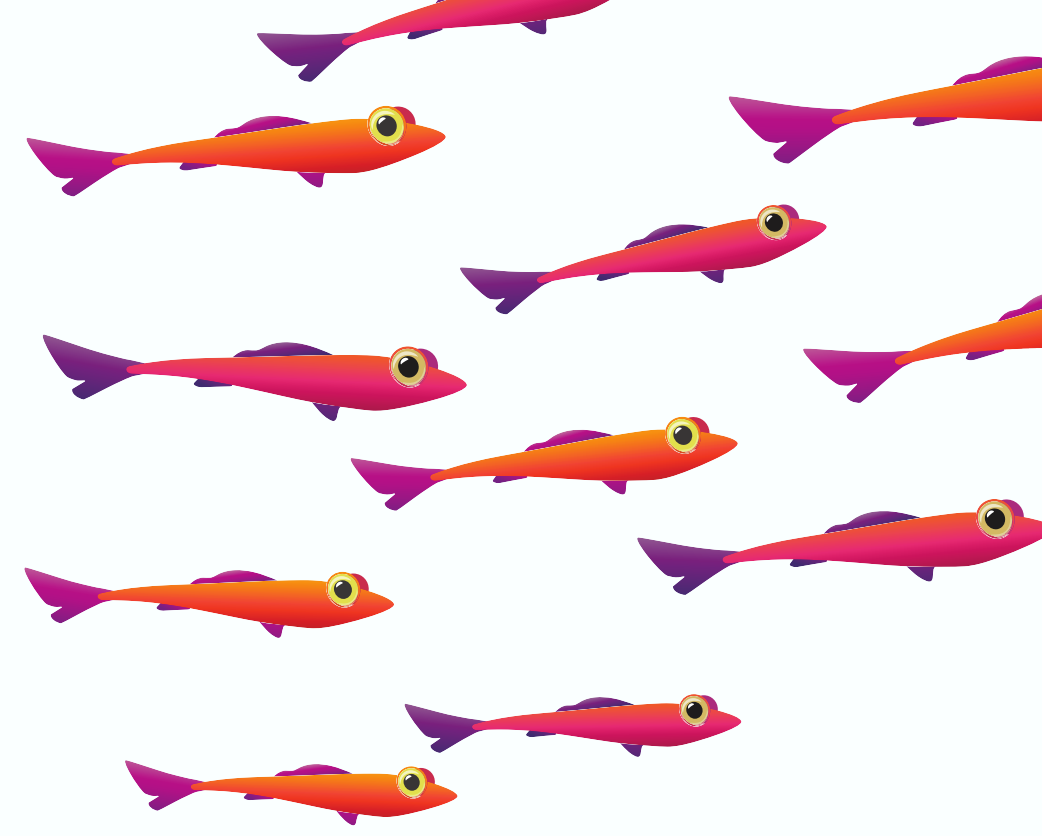


2. Guppy:

Guppy fish are creatures that stand out with their colorful tails and ornate fins. The color differences between females and males are quite pronounced. Male guppies are usually more colorful and ornate. These adorable fish use their swift swimming abilities to escape dangers underwater. Guppy fish add life to the ocean's color palette with their vibrant colors and impressive fins.



COLORFUL FISH

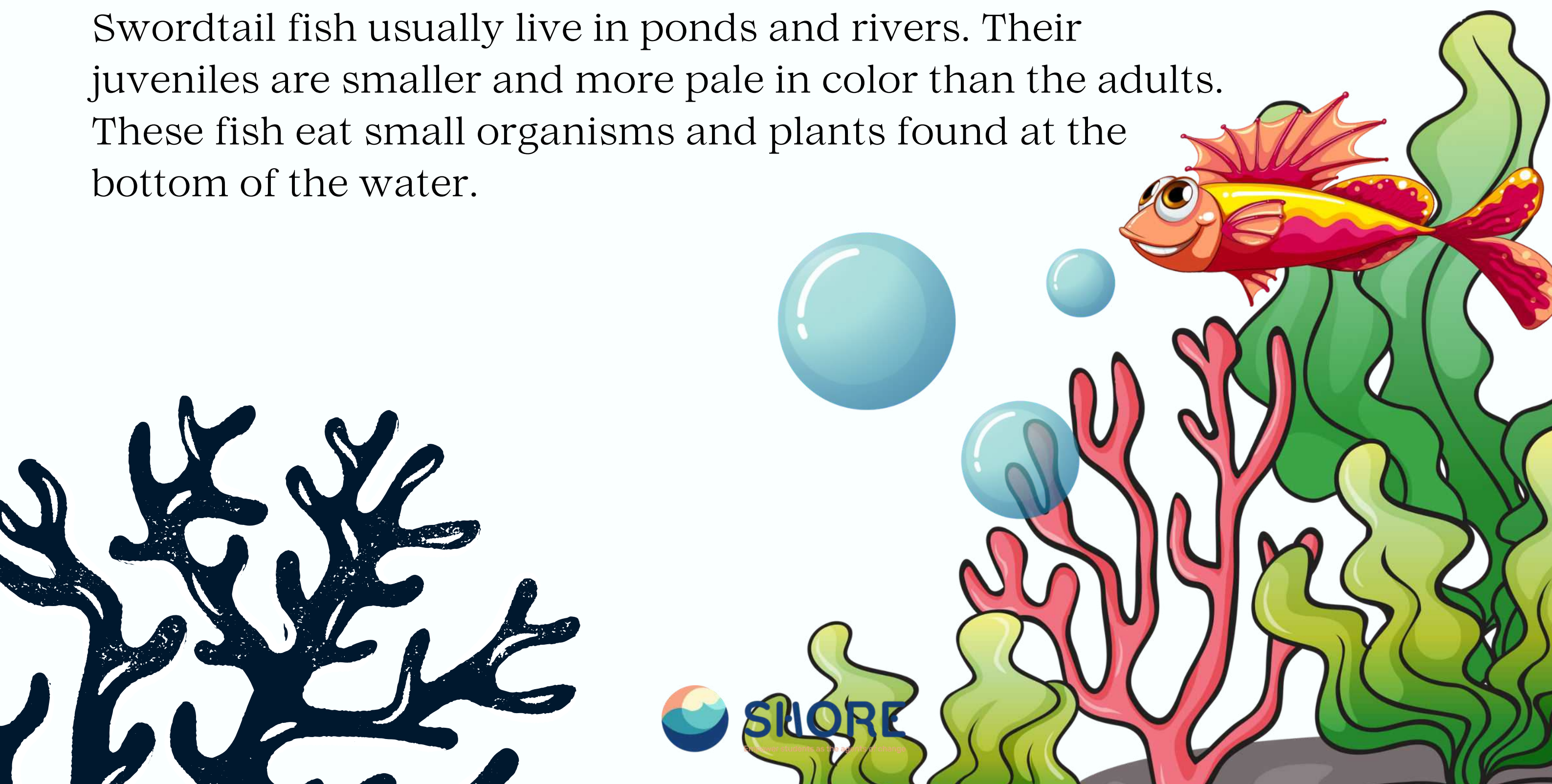


3. Swordtail:

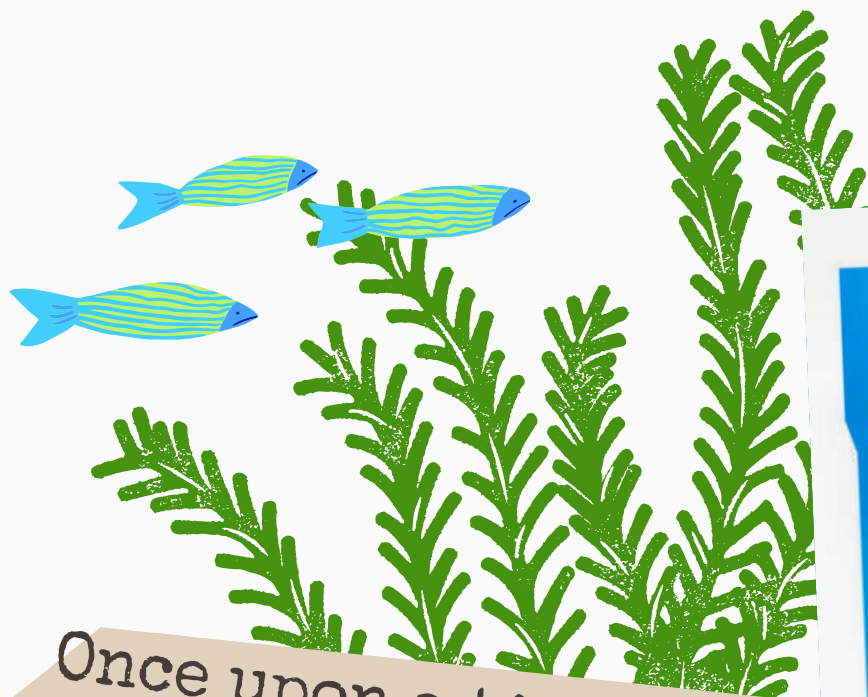
Swordtail fish get their name from their thin and long tails. These fish move in schools underwater, using their swift swimming abilities.



Swordtail fish usually live in ponds and rivers. Their juveniles are smaller and more pale in color than the adults. These fish eat small organisms and plants found at the bottom of the water.



PROTECTORS OF THE SEA SHARKS



Once upon a time, in the depths of the ocean, among colorful coral reefs and blue waters, there was a wonderful world.



Sharks were the kings and queens of their underwater kingdoms.

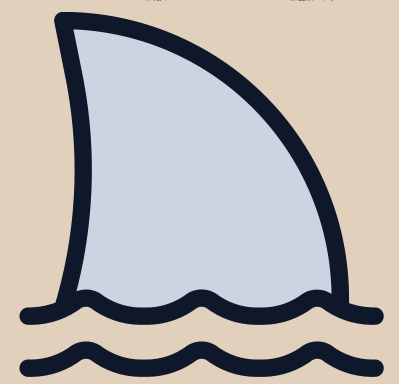
Their bodies were swift and powerful,



The most important inhabitants of this world were the sharks.



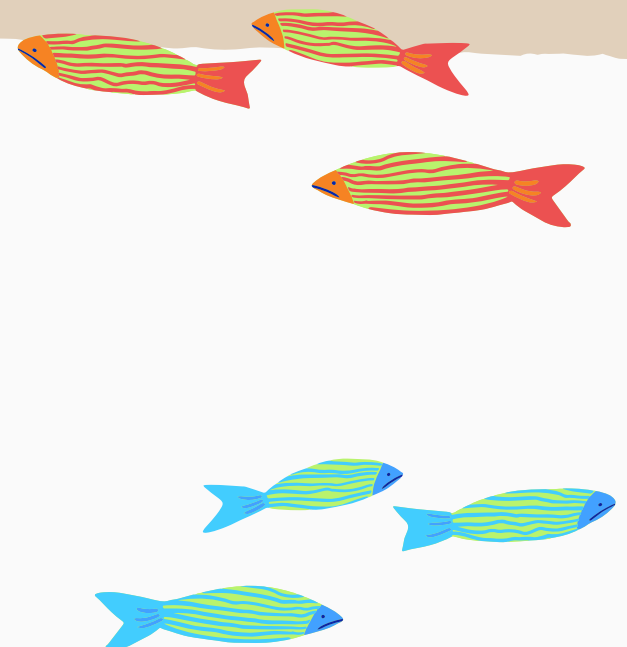
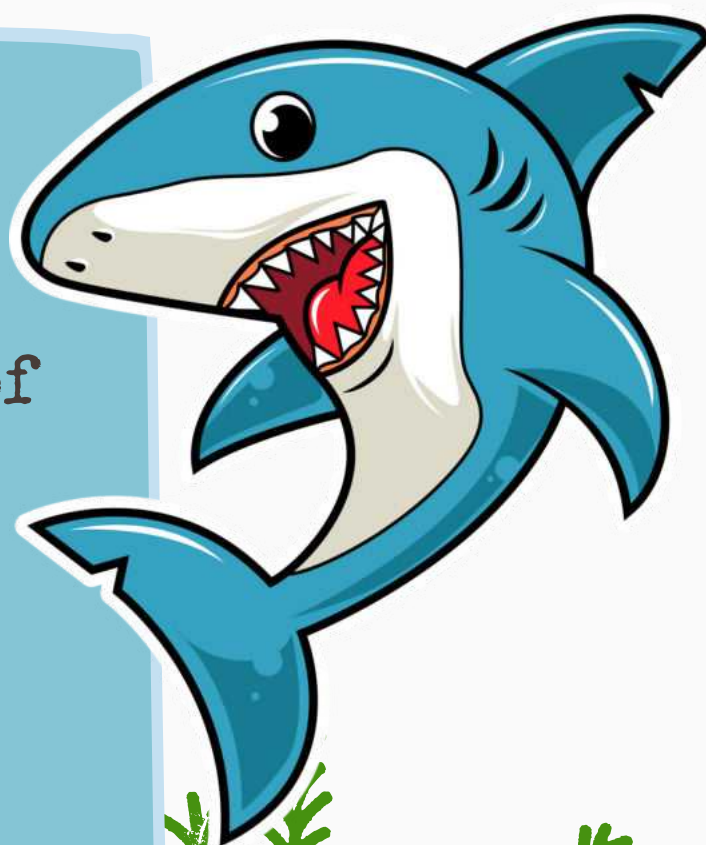
There were different types, some of massive size and others delicate and small. Each adapted to this vast aquatic world with their own special abilities.



With their fins, they could swim rapidly, performing extraordinary acrobatic movements in the water.

Protectors of the balance in the water

- They controlled the numbers of other fish, identified sick fish, and removed them.
- This way, the ocean's ecosystem remained healthy, and the balance among fish was maintained.



PROTECTORS OF THE SEA SHARKS

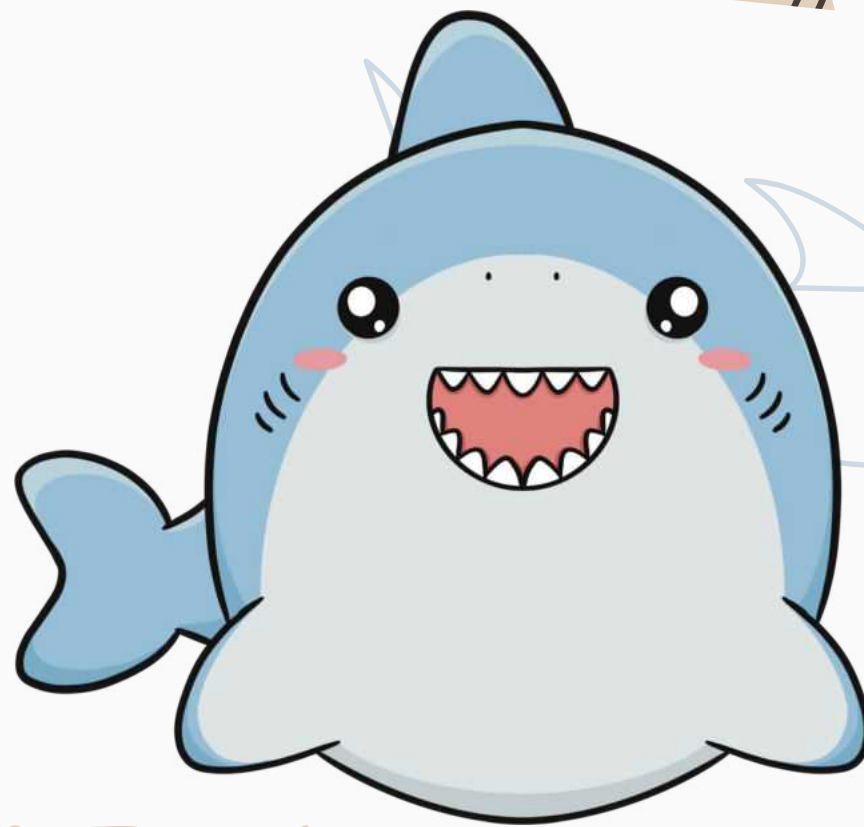
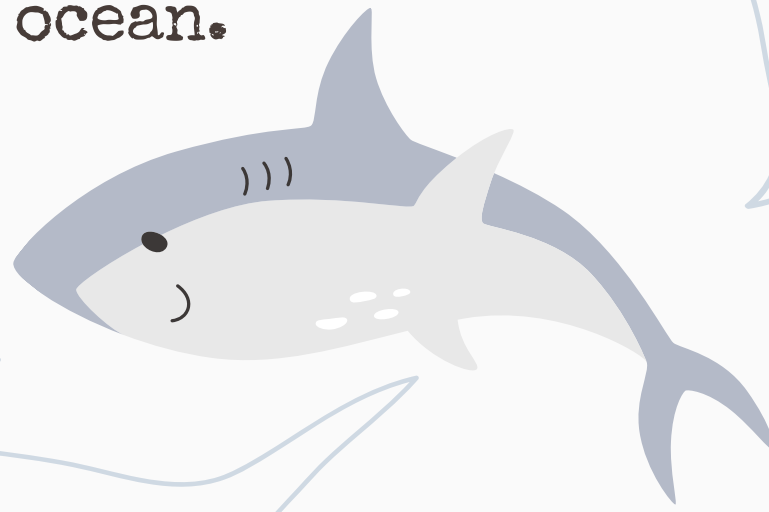
These powerful creatures were sometimes misunderstood by humans.

Yet, sharks were actually friendly beings and miracles in the mysterious world of the ocean.

They are among the oldest and most resilient creatures on Earth, having existed in the oceans for millions of years.

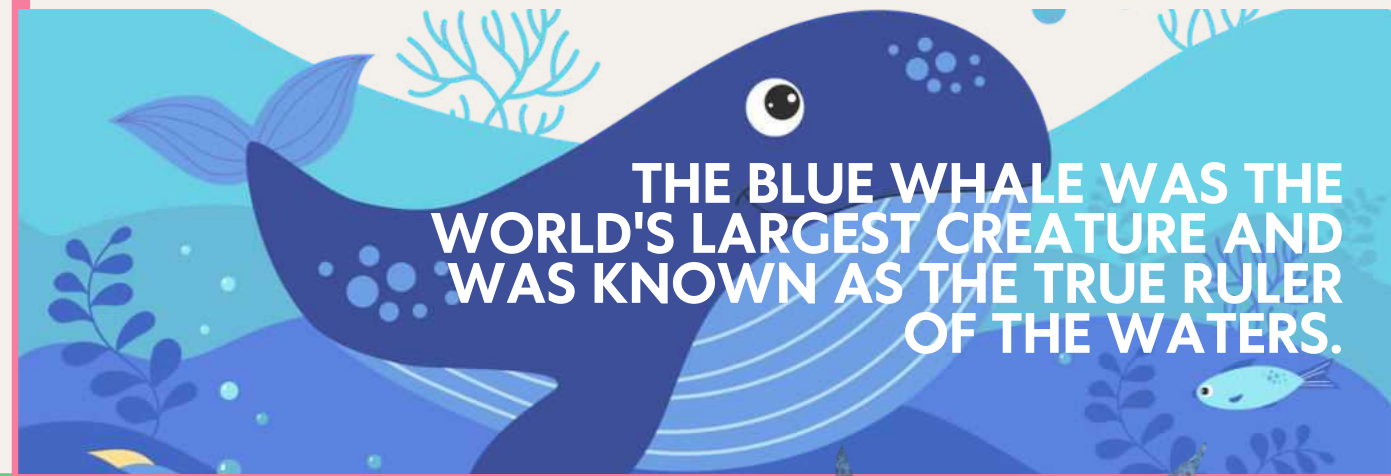
They were the heroes of the tremendous story under the water.

Perhaps one day, little explorers will embark on their own submarine adventures to discover more closely the mysterious world of these creatures!



THE WORLD'S LARGEST CREATURE *Blue Whale*

Once upon a time, in the depths of the ocean, there lived a massive king. His name was the Blue Whale.



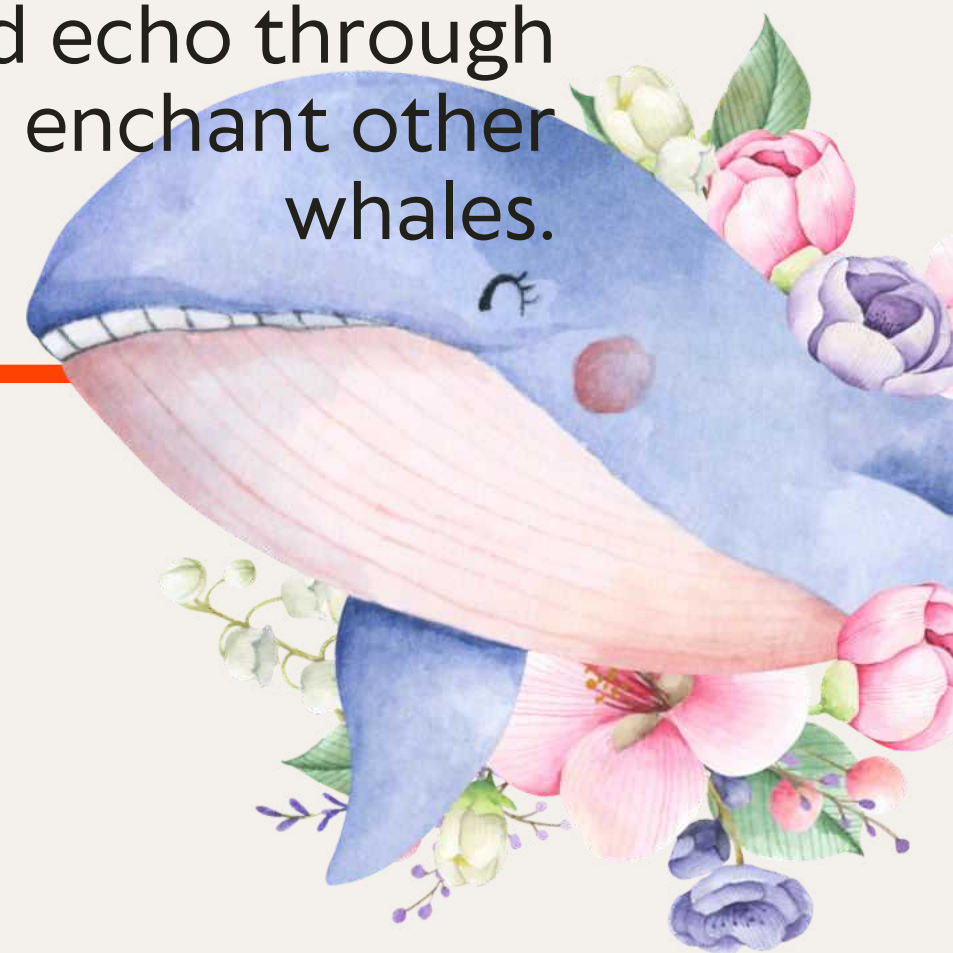
THE BLUE WHALE WAS THE WORLD'S LARGEST CREATURE AND WAS KNOWN AS THE TRUE RULER OF THE WATERS.

The body of the Blue Whale was as long as a giant sea bus and as heavy as many elephants. Yet, its immense size did not diminish its adorableness and grace. Its massive back fin appeared like a kite gliding through the ocean waves.



THE BLUE WHALE'S GREATEST FEATURE WAS ITS MAGNIFICENT SONGS IN THE WATER.

It used these songs to communicate with other whales underwater and to exchange messages. Each song would echo through the depths of the ocean and enchant other whales.



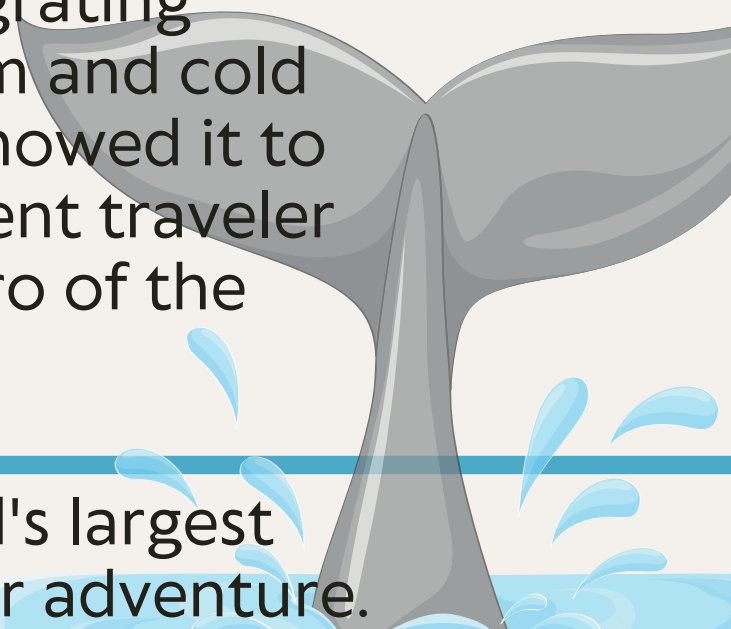
TO FEED ITSELF

The Blue Whale would swallow massive amounts of plankton for nourishment

BUT ONLY WITH A SMALL PART

Because this giant creature would help other marine animals live in balance and become the protector of the underwater ecosystem.

Mysteriously, the Blue Whale would travel thousands of kilometers each year, migrating between warm and cold waters. This showed it to be a magnificent traveler and a true hero of the seas.



Here, dear friends, is the tale of the Blue Whale! The story of the world's largest creature in the depths of the waters is just a part of the great underwater adventure. Remember, many more mysterious creatures await you in the depths of the seas!

THE CHEERFUL FACE OF THE UNDERWATER WORLD

Dolphins

Once upon a time, in the azure waters, lived joyful and adorable dolphins. They were known as the true cheerful inhabitants of the sea.

**SHALL WE TAKE A LOOK INTO THE
WORLD OF DOLPHINS?**



Dolphins are highly intelligent animals specially adapted to live underwater. They dance with their fins and swim at tremendous speeds in the water.

DOLPHINS ARE KNOWN FOR THEIR LARGE EYES AND FRIENDLY FACIAL EXPRESSIONS.

As the acrobats of the seas, dolphins enjoy jumping in the water, frolicking, and playing games with other dolphins.

Dolphins typically travel in pods and communicate with each other through special whistling sounds.

GRAY DOLPHINS

One of the most well-known species is the orca, recognized by their robust bodies and black-and-white colors. Another species is the gray dolphins, known for their gray colors and long beaks.

SMART AND CAPABLE OF LEARNING

Dolphins have another characteristic very similar to humans: They are smart! They can be trained and are capable of learning.

Additionally, dolphins get along well with other marine creatures. In some cases, they help fishermen by herding fish together.

Here are the adorable dolphins, the cheerful guardians of the ocean!

THE POLES

North Pole

The North Pole is like a place out of a fairy tale. It is known as the home of Santa Claus. This icy land is covered with snow for most of the year.

Polar bears, arctic hares, and reindeer roaming in its forests live together in harmony in this cold country.

The Northern Lights also shine in this region, performing colorful dances in the sky.



THE POLES


South Pole

The South Pole is an even colder, more mysterious land. It is famous for its massive glaciers and large colonies of penguins.


Penguins slide on their bellies and sing songs to each other. Giant icebergs sparkle in the sky as if they have come from distant lands. This is the coldest place on Earth.




THE POLES



The poles contribute significantly to our world's ecosystem. They affect ocean currents and the climate.



Additionally, glaciers regulate water levels on Earth and are a source of nutrition for many creatures.



Both poles experience periods during the year when they do not see the sun for 24 hours, known as the Polar Night. This envelops the icy lands in a mysterious atmosphere.



POLAR ANIMALS



PENGUINS

They usually live in icy regions and have a special adaptation to survive in these cold environments. Penguins come out of the water and walk on land to make their nests.

Penguins are adorable birds known for their black-and-white feathers and comical walk.



Penguins that dig their nests among rocks or into snow banks typically guard their reddish eggs there.



Penguins are also excellent swimmers and can dive into icy waters to hunt for delicious fish.



POLAR ANIMALS



Seals are marine mammals capable of swimming, known for their adorable faces and large, captivating eyes.

Seals living in polar regions can protect themselves from the effects of cold waters thanks to their thick layers of blubber.



Seals come out onto snowy land to bask in the sun and rest. They can breathe and hunt by making holes in the ice.



Seals can move quickly and agilely in the sea, making them excellent hunters for protecting themselves and feeding.





POLAR ANIMALS



POLAR BEARS

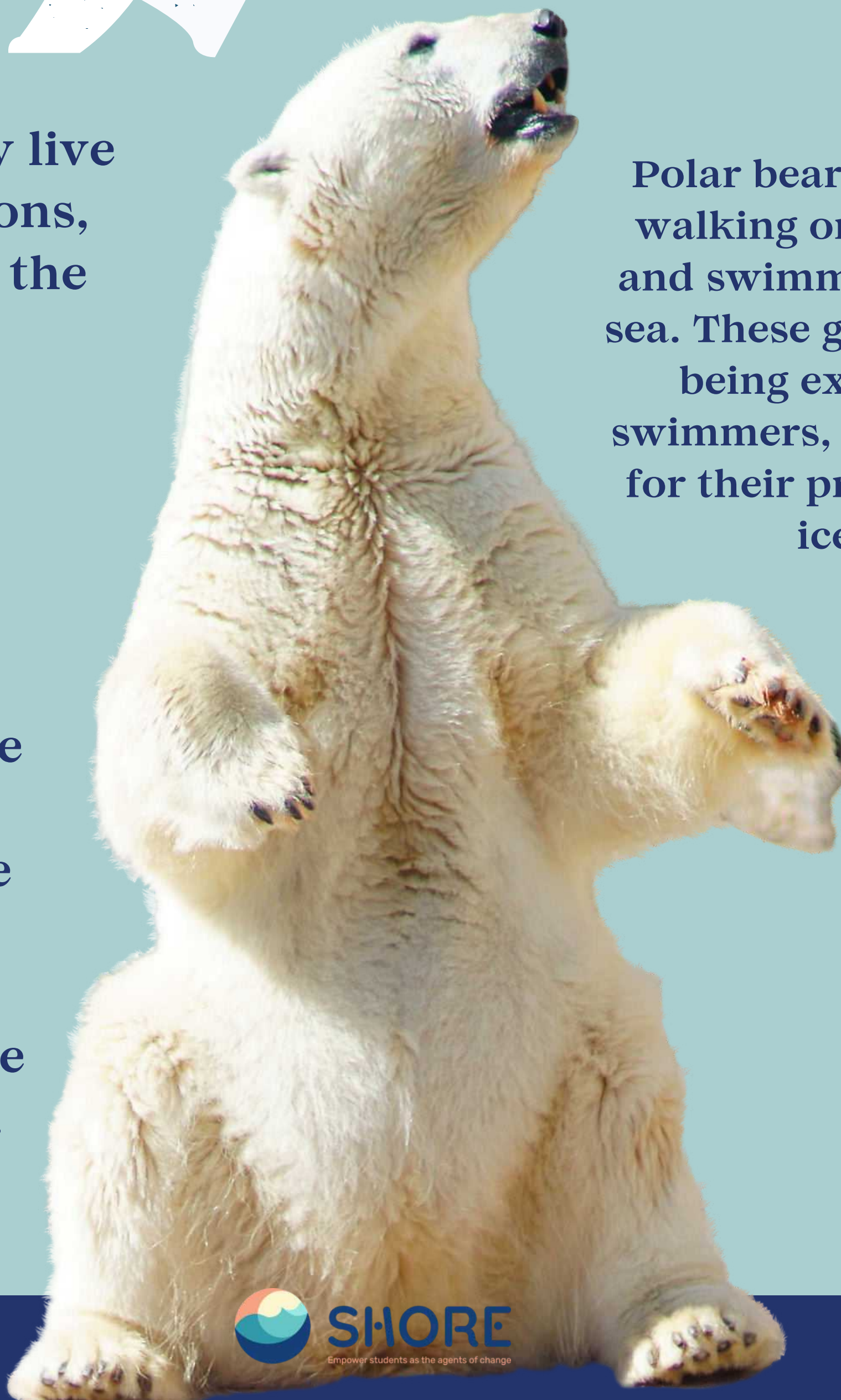


Polar bears are the world's largest land carnivores and are notable for their long, white fur.

They typically live in polar regions, especially in the Arctic.

Polar bears hunt by walking on glaciers and swimming in the sea. These giant bears, being excellent swimmers, often wait for their prey on sea ice.

Polar bears use their strong claws to chase their prey, making them the kings of the polar regions.



LET'S PROTECT THE POLES AND OCEANS

Unfortunately, polar animals and all these magnificent creatures living in the oceans are in danger due to the melting of the ice and the warming of the seas.



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OUR RESPONSIBILITIES

We need to protect them and fulfill our responsibilities towards nature. Here are some important steps we can take together to protect these wonderful creatures:



USE WATER SPARINGLY

Turn off the Taps!

Leaving the taps running while brushing our teeth or washing our hands can lead to water wastage. We should be careful when using taps and only use as much water as we need.

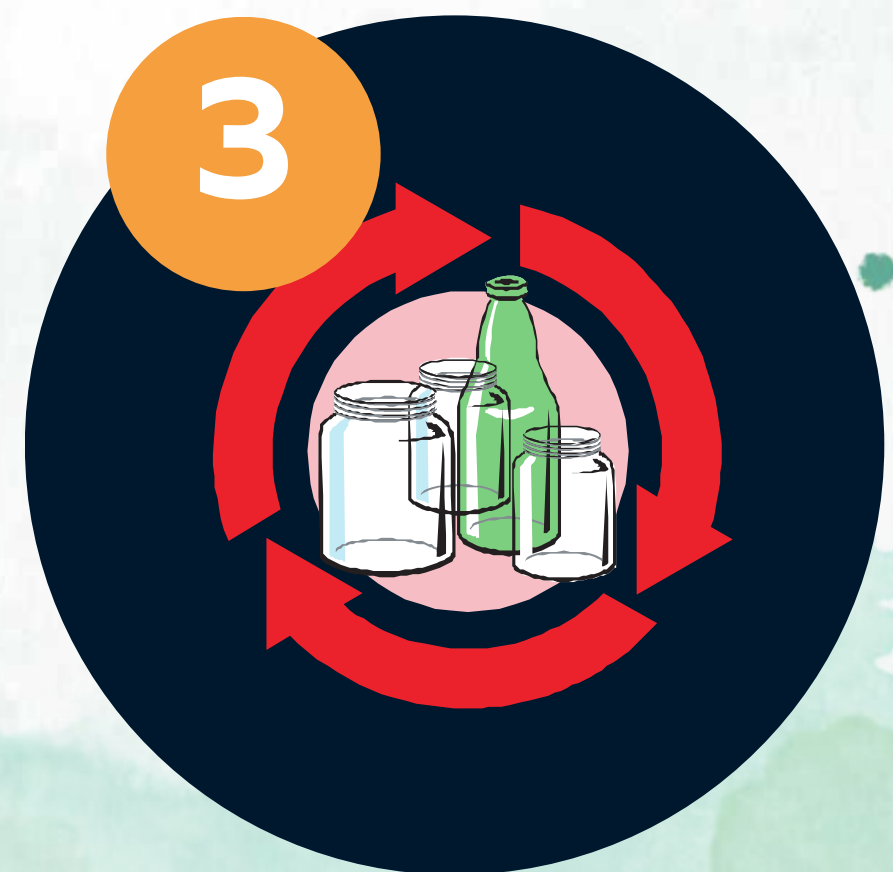


Take short showers!

We can enjoy the water while showering and bathing, but it's important to keep the duration short. Water is a limited resource on Earth, so taking short showers and quick baths helps in conserving water.

Reduce plastic use!

Plastic and other pollutants threaten the lives of ocean creatures. We should reduce our use of plastic and place greater emphasis on recycling.



Increase green spaces!

Plants absorb water from the soil and release it back into the atmosphere through evaporation, contributing to the natural water cycle. By planting more, we too can contribute to the water cycle.

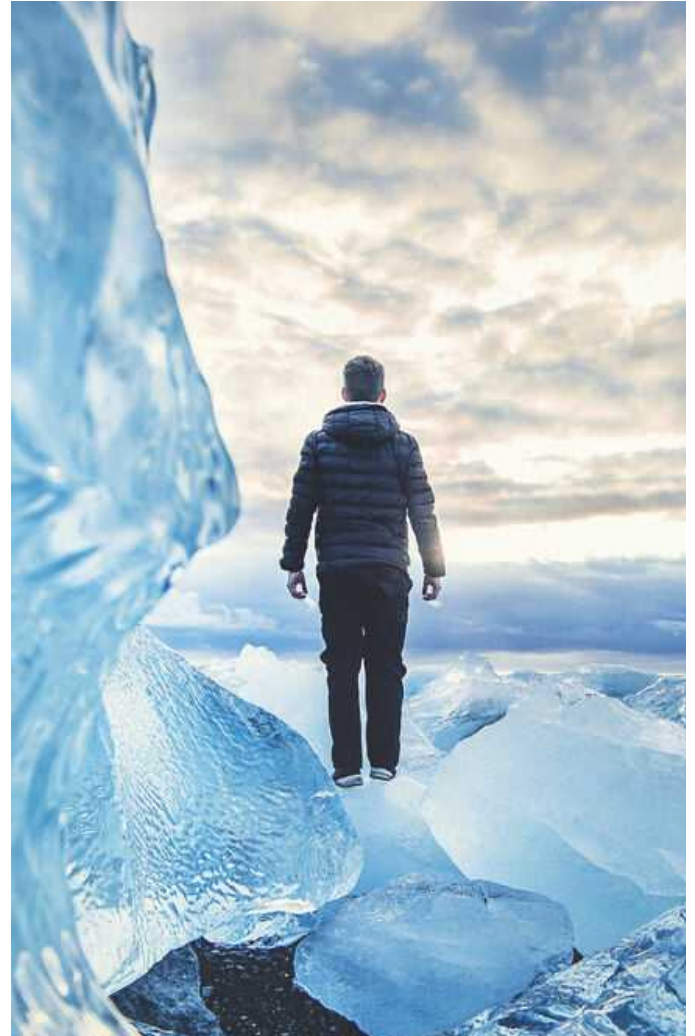


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HIGH SCHOOL

HANDBOOK



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Introduction

Dear Students

The oceans are one of the most mysterious and enchanting domains of our world. Their deep blues, unique marine life, and the mystical world beneath the waters... These unique ecosystems are not only important to explore but also to protect and understand. Ocean literacy means understanding the richness of our waters, protecting them, and being aware for a sustainable future. This guide invites you to the magical world of the oceans and aims to take steps together to explore, protect, and pass on the underwater life to future generations.

Are you ready? We are very excited to embark on this blue journey with you.

The world's water resources are a matter of global impact capacity, addressed across a broad spectrum from climate to economy, and from history to geography. This interdisciplinary approach suggests turning to scientific methods that can guide you on where to start in this seemingly boundless tableau to protect water resources. By doing so, you can tread a more concrete, reliable path while protecting these vast resources, and be more confident in your actions.



The scientific method acts like a guide in understanding situations that may appear complex. It begins with asking a question, which helps us identify a topic of curiosity about the world. We then conduct research to seek answers to our question, reviewing previous studies and existing knowledge. Next, we formulate a hypothesis; that is, we make a prediction about our question and design an experiment to test this prediction. By conducting the experiment, we gather data. We analyze the collected data to check whether it confirms or refutes our hypothesis and test the reliability of the results by repeating the experiment. Finally, we report our findings and the knowledge we have gained so that it can be shared with other scientists and the community. This process forms the foundation of knowledge creation in the scientific world and guides you in understanding how scientific discoveries are made.

In this guide, while explaining the importance of oceans for people and our planet, we aim to share significant information and discuss what can be done for the future.

The Place of Water in the World

The critical role of water in our lives signifies much more than just a drinkable liquid. The unique value of water is fundamental to life and plays an indispensable role across various domains.

1. Health

The critical role that water plays in sustaining a healthy life is related to a series of vital functions that support the complex structure of our body. Our cells, which are the building blocks of our body and fundamentally composed of water, absorb nutrients and use oxygen to produce energy through water. This energy is essential for our body to maintain its daily activities.

Water is crucial for the proper functioning of our organs; it carries nutrients and oxygen through the blood circulation system, thereby ensuring that body cells function healthily. Additionally, water helps maintain our internal balance by facilitating the removal of wastes through the kidneys. Water also plays a significant role in regulating our body's thermal balance and maintains heat equilibrium through perspiration. Hence, regular consumption of water supports health functions across a broad spectrum, from the cellular level to the organs.



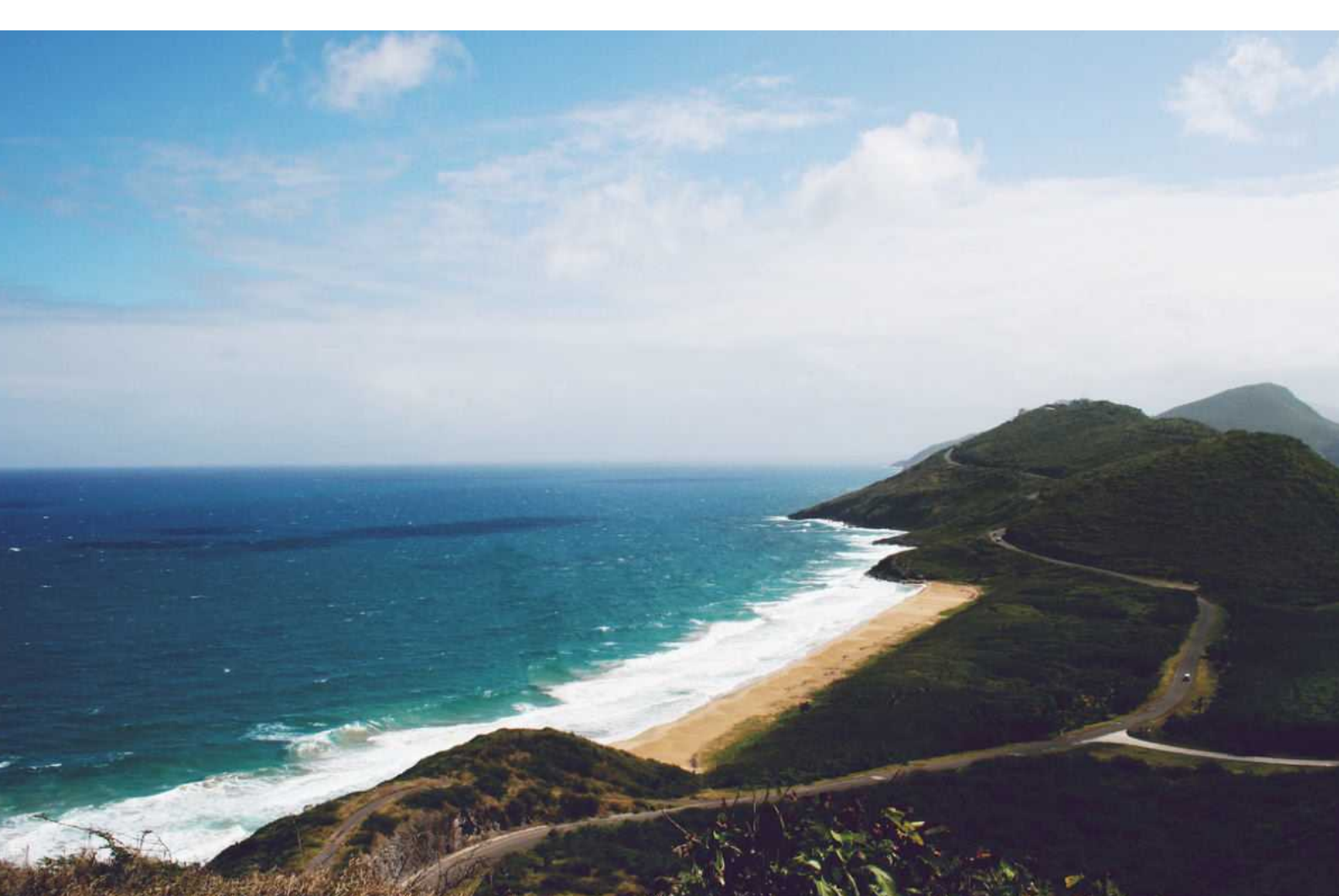


2. Agriculture and Food Security

Agriculture is one of the fundamental elements in feeding the global population. Water is an indispensable component of agriculture; its role in irrigating farmlands to support plant growth is of critical importance. Without water, productive agriculture cannot occur, and food production is severely impacted. The effect of agriculture on global food security is significant, as water resources are essential for efficient agricultural practices. The proper and sustainable management of water is vital for food security on a global scale; water stands as one of the foundational supports of agriculture, playing a significant role in ensuring the nutrition of the global population.

3. Ecosystem Balance

In terms of ecosystem balance, water plays a vital role in the continuity of natural life. Rivers, lakes, oceans, and other water bodies provide habitats for many different species and are critical in maintaining the balance and diversity of ecosystems. Water enables the survival and interaction of living organisms within these ecosystems. However, pollution or depletion of water resources can disrupt these balances and lead to a decrease in biodiversity. Therefore, the sustainable use and protection of water resources are of great importance in preserving ecosystem balance and diversity.



4. Industry and Energy Production

Industry, energy production, and numerous industrial processes highlight water as an indispensable element. Across a broad spectrum, from manufacturing facilities to power plants, water is used as a fundamental component in various sectors. During the production phase of products, water contributes to the smooth and efficient execution of processes. Similarly, water plays a significant role in energy production; hydroelectric power plants convert the kinetic energy of water into electrical energy, providing a sustainable source of energy. Industrial water use is widespread not only in production processes but also in cooling, cleaning, and many other areas. However, the effective and sustainable use of water is of great importance in ensuring the economic sustainability of industrial activities and in securing the protection of water resources. The conscious management of water resources is a critical factor for the future sustainability of industry and energy production.



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5. Economic and Social Development

Water resources play a vital role in the economic and social development of communities. First and foremost, the provision of potable water stands out as a fundamental element of human health and well-being. This improves access to healthcare services for communities and contributes to disease prevention. Moreover, water is indispensable for the agriculture sector; the productivity of agricultural lands is increased through irrigation systems, thus ensuring food production and security. Water also plays a critical role in industrial activities; water used in production processes supports the development of industrial sectors. When water resources are shared equitably, they maintain social balance among communities and aid in the more equitable distribution of development. However, the sustainable management and use of water resources are of critical importance for the continuity of economic and social development. This requires the adoption of sustainable development goals that include the efficient and fair use of water resources.



THEREFORE,

the value of water extends beyond its daily use as drinking water, holding significant importance on a global scale in terms of health, security, economic development, and ecosystem balance. Protecting water is key to a sustainable future, and it is crucial for every individual to use and preserve this natural resource conscientiously. Water is a treasure as valuable as life itself, and safeguarding this treasure is a responsibility that belongs to all of us.

Ocean literacy is understanding the ocean's influence on you and your impact on the ocean. An ocean-literate person:

- Understands the fundamental principles and concepts related to the ocean;
- Can communicate meaningfully about the ocean;
- Is able to make informed and responsible decisions regarding the ocean and its resources.



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WHAT IS THE OCEAN LITERACY?

Ocean literacy is about being knowledgeable about the seas and oceans, which are vast bodies of water; it also involves understanding their characteristics, ecosystems, and having the knowledge and skills to protect and sustain their continuity.

THE FUNDAMENTAL PRINCIPLES OF OCEAN LITERACY:

Principle 1: The Earth has one big ocean with many features.

Principle 2: The ocean and life in the ocean shape the features of the Earth.

Principle 3: The ocean has a major influence on weather and climate.

Principle 4: The ocean makes Earth habitable.

Principle 5: The ocean supports a great diversity of life and ecosystems.

Principle 6: The ocean and humans are inextricably interconnected.

Principle 7: The ocean is largely unexplored.

Oceans cover approximately 71% of the planet, equating to an area of 361 million square kilometers. Therefore, some argue that calling it "Earth" is misleading, suggesting that "ocean planet" or "blue planet" would be more appropriate.

The ocean is a crucial part of the Earth's system, interacting with other subsystems like the atmosphere, land, and life over various time scales. Through the concept of Earth systems, we now understand that human activities also affect this system, especially through pollution, extraction of raw materials such as wood, oil, gas, and fish, and the construction of infrastructures like dams. We are altering the world we live in, and now we are even threatening our own existence.



The current oceans contain 1.39 billion cubic kilometers of saltwater, surrounding the five continents. Throughout Earth's geological history, the shape and size of the ocean have constantly changed, sometimes covering up to 80% of the Earth's surface. For billions of years, water has been continuously circulating and recycling.

Due to anthropogenic climate change and population growth, freshwater is rapidly becoming a scarce resource. According to the 2018 edition of the United Nations (UN) World Water Development Report, global water demand is increasing at a rate of about 1% per year, driven by population growth, economic development, and changing consumption patterns.

Additionally, climate change is affecting the global water cycle, leading to increased rainfall in regions that already receive a lot, and making drier areas even drier. The impacts of a 1.5°C global warming since the pre-industrial era draw a comprehensive picture that necessitates changing our excessively consumptive Western lifestyle and living in harmony with nature, with changing climate features on land and oceans.

The ocean touches every part of our lives. With every breath you take, every drop of water you drink, and all the food you consume, the ocean makes its presence felt. It is our life support system, and it's beginning to falter due to human activities on land. We need to let go of the longstanding perception that the ocean is too vast and resilient to be affected by human activities. It's crucial to recognize the myriad of free ecosystem services the ocean provides, such as regulating climate and weather, providing food and recreation, absorbing 93% of the excess heat produced by human activities over the last 50 years, and 30% of the CO₂ we produce. However, this heat and CO₂ are not absorbed evenly. The most significant changes vary both spatially and temporally, with the greatest changes occurring in polar regions. The ocean plays a vital role in sustaining our economies, with over 90% of all transportation occurring on its surface.



UNDERSTANDING THE OCEAN

From space, the ocean is a striking feature of the planet. NASA's Cassini spacecraft captured Earth on July 19, 2013, from a distance of 1.45 billion kilometers beneath the majestic rings of Saturn, as a pale blue dot in the vast darkness of space. The Earth possesses a unique characteristic within the solar system.



The coastal zone of the ocean, which is up to 20 meters deep and easily accessible near the shore, forms an interface with the land. It is the most extensively studied area of the ocean. Yet, even here, we do not fully know how many species exist right on our doorstep. Estimates range from 178,000 to more than ten million species. The coastal zone is home to numerous ecosystems, focusing on rocky bottoms dominated by kelp forests and other seaweeds, and soft-bottom areas covered with seagrass. Both exhibit a global distribution, possess high biological diversity, and are among the most productive ecosystems on Earth. They also provide a range of ecosystem goods and services on which human populations depend.

The ocean may seem featureless to us, but it is not so for the organisms that live within it. The Census has revealed that many predators such as sharks, sea turtles, and whales congregate off the California coast, in the California Current. Here, cold and nutrient-rich water moves from the depths of the ocean towards the surface. This upwelling brings with it explosions of phytoplankton and foods like squid, sardines, and krill.



Looking into the ocean waters, it is estimated that only 0.0001% of the deep sea, meaning waters below 200 meters, has been explored. Even today, the ocean remains largely unknown. It is the last frontier on Earth that needs to be explored in the twenty-first century.

Approximately one hundred scientists have analyzed historical population data of marine species to learn how the number of animals has changed over time and how characteristics such as the size of the fish caught have varied. This research has been conducted through archaeological excavations and examination of waste pits, reading historical documents and ancient menus, and reviewing trophy fishing photographs. All these are vital indicators for understanding how human activities have impacted marine populations over the last 500-2000 years.



Therefore, among other things, they provide a foundation that can be used for future conservation efforts. As we begin to understand the complex system of the ocean, we are also carelessly and irreparably damaging its ecosystems through mining, oil and gas extraction, and fishing. We now know there are limits to the amount of heat, CO₂, and plastic waste we can dump into the ocean without altering its balance. In fact, due to our polluting activities in a consumption-driven and disposable society, which we seem unwilling to change, we are already altering the ocean on an unprecedented scale. The Corona crisis has starkly revealed our vulnerability and offered significant insights into how our lives could change. A less polluted world could be characterized by roads traveled without traffic congestion, clear blue skies without polluting white trails, and reduced nitrogen pollution. This period highlights the urgency of transitioning to a sustainable world. It is imperative that we now take more conscious steps towards protecting nature and the environment.

The ocean, the largest biome on Earth, is under threat due to the continuously increasing human population and rapidly diversifying human activities, as well as the Western lifestyle. Together, these factors exert tremendous pressure on the goods and services of marine ecosystems, which are fundamental to our well-being. The revenues derived from the ocean make it indispensable. However, it indicates that the carrying capacity of the oceans is near or at its limit.



OBSERVING THE OCEAN

Most of the significant discoveries in ocean sciences have occurred in the last 50 years. The ocean has been shaped by tectonic processes over hundreds of millions of years, and its size has changed throughout the planet's geological history. Discoveries and technological innovations, such as the development of satellites and modeling, go hand in hand. Finally, with the rapid increase in computing power, discoveries are progressing in a coherent and escalating manner.

The satellite revolution began on October 4, 1957, with the launch of Sputnik by the former Soviet Union, followed by the United States' Explorer I on January 2, 1958. Advances in computer and space technology in the late 1950s and early 1960s led to this revolution, facilitating progress in everything from telecommunications to atmospheric sciences. Today, a fleet of satellites provides data to various user communities in meteorology, oceanography, and climate science. Space-based observations have significantly contributed to understanding how human activities damage the environment.

Space-based observations lack the capability to look into the depths of the ocean. As a result, there is a need for the development of new observation systems. Today, a wide variety of underwater robots and drones are available for monitoring oceanic areas. Autonomous underwater drones have become a common feature in ocean research and monitoring. Another future perspective includes the development of wave-powered surface robots that can deploy and retrieve gliders, and the creation of autonomous networks on the ocean floor to explore the oceanic realm. These developments should be an attractive component of future ocean literacy activities.

Challenges

The global ocean literacy community faces numerous challenges. Ensuring that all voices are heard and included in developing a forward-looking roadmap and making ocean literacy initiatives culturally appropriate and locally implementable is difficult. The amount of research conducted on ocean literacy is limited because the definition of ocean literacy complicates its measurement. Key challenges for the long-term success of the ocean literacy campaign include the need for centralized communication, incorporation of cultural appropriateness, a solid assessment and educational research foundation, recognition of the nuances of formal and informal education, and adequate and consistent funding sources.

CLIMATE AND OCEAN

Our global climate has changed significantly and frequently over the lifespan of our planet. Some global climate fluctuations occur on a human timescale. So, what does the ocean have to do with climate? A lot! Oceans and the atmosphere form a closely linked "dynamic duo." The energy from the sun, distributions of plants, and greenhouse gases in the atmosphere can influence the temperature and circulation patterns of this ocean-atmosphere system.

The sun is the primary source of energy for the Earth. Solar energy is absorbed by both oceans and continents. Since oceans cover more than 70% of the Earth's surface and are darker than continents, they absorb more of the sun's energy. Oceans not only absorb a great deal of solar energy but can also store a significant amount of this energy in the form of heat. And they can do so with minimal changes in temperature. Scientists believe that the way oceans store and transport heat is related to climate.

The arrows you see in this imagery represent the amounts of incoming and outgoing solar radiation and how the energy interacts with different regions of the Earth and its atmosphere. As you can see from this scheme, roughly half of the incoming solar radiation is absorbed by the ocean. In turn, this heat energy is stored in the water while being collected by winds blowing across the ocean surface. When the wind releases water as precipitation, the water's heat energy is released into the atmosphere, causing an increase in temperature.



The water cycle is driven by the sun. Water evaporates from the ocean, moves through the atmosphere, and precipitates as rain and snow, temporarily borrowed from the ocean expanse. Freshwater flows across the land and is stored in glaciers, ice caps, lakes, rivers, and soil. Only a tiny fraction, about one-tenth of a percent, can be used directly as drinking water. We must share this resource with all other living beings. Moreover, this resource is unevenly distributed across land surfaces.

The waters of the oceans are always in motion, driven by powerful currents powered by wind. The rotation of the Earth and the continents plus "things" inside the ocean can create water currents or movement.

However, deep ocean currents are created by density. Density is defined as the mass of a substance per unit volume and is measured in grams per cubic centimeter (g/cm^3). To put it simply:

- The density of seawater (ocean water) is greater than that of pure water at the same temperature because seawater contains salt.
- Cold seawater (ocean water) is denser than warm seawater because the molecules of cold seawater are closer together than those of warm seawater.
- Less dense substances will float on more dense substances.

FIVE OCEAN



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The Pacific Ocean

The Pacific Ocean, also known as the Great Ocean, spans an area of approximately 165 million square kilometers, making it the world's largest ocean. Its vastness is not only in terms of surface area but also depth. With an average depth of around 4,000 meters, certain areas like the Mariana Trench reach depths of up to 10,994 meters, the deepest point on Earth. This deep body of water contributes to the thermohaline circulation system, which results in varying temperatures and salinity levels in different regions of the ocean. The Pacific Ocean's extensive surface area and impressive depths play a crucial role in understanding climate and marine biology, offering scientists the opportunity to explore the complex dynamics of our planet's water masses. The Pacific Ocean is recognized as one of the largest and deepest oceans in the world.

These vast bodies of water are incredibly rich in biodiversity, containing countless islands, coral atolls, and diverse ecosystems. The Pacific Ocean is home to many unique marine species, such as the blue whale, polar bear, sea turtle, and colorful coral reefs. Additionally, this ocean is the site of the Pacific Ring of Fire, an area of frequent earthquakes and volcanic activity. These dynamic characteristics of the ocean offer high school students an in-depth exploration in the fields of geology, biology, and climate sciences. The Pacific Ocean serves as a tremendous laboratory for natural processes and biological interactions on Earth, while also providing important lessons on the conservation and sustainable use of oceans.



The Atlantic Ocean

The Atlantic Ocean, the world's second-largest ocean, is notable for its vast area and diverse climatic features. This ocean, named after the Atlas Mountains, is bordered by the Arctic Ocean to the north and Antarctica to the south. The Atlantic Ocean is divided into two main parts: the North Atlantic and the South Atlantic, each exhibiting different climate conditions and marine life. The Atlantic Ocean has been a hub for significant trade routes and has been central to explorations, explorers, and commerce throughout history. Additionally, due to its position transitioning between tropical and temperate climate zones, this region of the ocean hosts a variety of plant and animal species.

The Atlantic Ocean's rich geological structure offers high school students exciting research topics in geography, climate science, and biology. With an area of approximately 106 million square kilometers, it is the world's second-largest ocean. Its average depth is around 3,314 meters. The deepest point in the Atlantic Ocean is found in the Puerto Rico Trench, reaching depths of up to 8,376 meters. The Atlantic Ocean, with its vast surface area and varied depths, provides scientists with opportunities to research various topics such as climate change, ocean currents, and marine biology. Moreover, this ocean plays a significant role in economic activities as it hosts major trade routes across the world, underscoring its importance in global commerce and navigation.

The Indian Ocean

The Indian Ocean, the world's third-largest ocean, is notable for its vast area and diverse characteristics. Bordered by Asia to the north, Australia to the east, Africa to the west, and Antarctica to the south, this ocean covers a total area of 73.4 million square kilometers. The islands, reefs, and coastal regions of the Indian Ocean host unique biodiversity. Islands such as the Maldives, Seychelles, and Mauritius in the Indian Ocean are famous for their turquoise waters and white sandy beaches. Additionally, the Indian Ocean is economically significant due to trade routes, oil, and natural gas reserves. The various climatic zones within the Indian Ocean offer high school students exciting research areas in climate science, marine biology, and geography. Its depth and temperature variations, ocean currents, and salinity are dynamic features that play a crucial role in understanding natural processes on Earth. The Indian Ocean spans approximately 73.4 million square kilometers, making it the world's third-largest ocean, surrounded by Asia, Australia, Africa, and Antarctica. The average depth of the Indian Ocean is about 3,840 meters, characterizing the ocean's general feature, with the deepest point, the Sunda Trench in the Java Sea, reaching up to 7,450 meters. These diverse depths influence the ocean's dynamic features like currents, temperature differences, and salinity, significantly impacting the overall climate and biological diversity of the ocean. Moreover, this vast body of water hosts various climatic zones, highlighting the Indian Ocean's distinctive geographical and climatic features.

-
- **The equatorial zone** is characterized by a hot and humid climate and is covered with tropical forests."
 - **Tropical and subtropical regions** generally have warm and temperate climate characteristics and are famous for their turquoise waters and white sandy beaches.
 - **Some regions** along the West African coasts and in certain areas of Southeast Asia are influenced by the monsoon climate, with heavy rains in the summer and drier conditions in the winter.
 - **Some areas** in the south of the Indian Ocean exhibit temperate climate features, with milder temperatures and distinct seasonal changes.





The Arctic Ocean

The Arctic Ocean is a limited sea that is the northernmost part of the world and is commonly referred to as the polar region, despite its vast surface area, a significant portion of the Arctic Ocean is covered by a permanent ice sheet. This ocean includes the territories of countries such as Canada, Russia, Greenland, Norway, and the United States, including the state of Alaska. The Arctic region is renowned for its unique climate, glaciers, and distinctive marine life, including polar bears, walruses, and seals. Additionally, the Arctic Ocean is a crucial component of the world's climate system and can contribute to changes in global sea levels through the melting of ice caps. The Arctic region also harbors strategically important resources such as energy reserves and the opening of maritime routes, making it a focal point of international interest. The Arctic Ocean offers high school students an opportunity for in-depth exploration in fields such as climate science, environmental conservation, and international relations.

The Arctic Ocean has an approximate surface area of around 14 million square kilometers, making it one of the smallest oceans in the world in terms of size. It is characterized by its width and geographical location. The Arctic Ocean is covered by a continuous ice sheet and is typically covered by a vast ice cap. While this ice cap partially melts during the summer months, it expands again during the winter. In terms of depth, the Arctic Ocean is generally shallow, with an average depth of about 1,205 meters and its deepest point being in the Fram Strait at 4,665 meters. This shallow depth means that many coastal areas of the Arctic Ocean have relatively shallow waters. With these geographical features, the Arctic Ocean is home to unique climate conditions and distinctive marine life, including polar bears, walruses, seals, and various species adapted to extreme cold. Additionally, the presence of the ice cover makes it a significant region concerning climate change and global sea level changes. Therefore, the geographical characteristics of the Arctic Ocean offer high school students an interesting and important research topic in fields such as climate science, environmental conservation, and geopolitics.

The Southern Ocean

The Southern Ocean, located at the southernmost part of the world and often associated with the Antarctic region, is a vast ocean covering a total area of approximately 71 million square kilometers. It is the second-largest ocean in the world. One of the most distinctive features of the Southern Ocean is the absence of three major land masses surrounding it, namely South America, Africa, and Australia, which creates a wide expanse of open water and free circulation. This ocean is renowned for its extensive marine biology and unique ecosystems, hosting marine life in polar regions as well as powerful and turbulent ocean currents.

Furthermore, due to the remote and challenging-to-reach areas between the land masses surrounding the Southern Ocean, it has become an important area for exploration and scientific research. The Southern Ocean offers high school students an interesting and educational learning opportunity in fields such as climate science, marine biology, and geology.



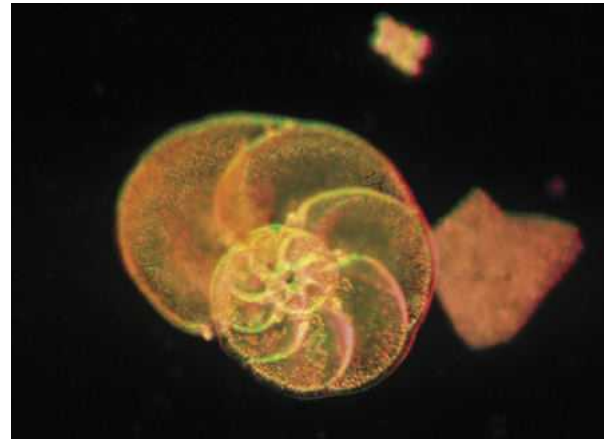
The Southern Ocean, known for its rich depth, has an average depth of 3,682 meters and reaches a depth exceeding 7,235 meters at its deepest point, surpassing the Puerto Rico Trench.

The geographical features of the Southern Ocean result in hosting various climate zones, ranging from polar regions to temperate latitudes. This ocean also features massive ocean currents that circulate around the Antarctic Ice Sheet. These currents play a significant role in influencing both the biological diversity and climate systems of the Southern Ocean. Additionally, the rich marine life in the Southern Ocean includes unique species such as whales, seals, penguins, and various seabirds. With these characteristics, the Southern Ocean offers high school students an opportunity for in-depth exploration in various subjects.

AN INTERESTING LEARNING EXPERIENCE:

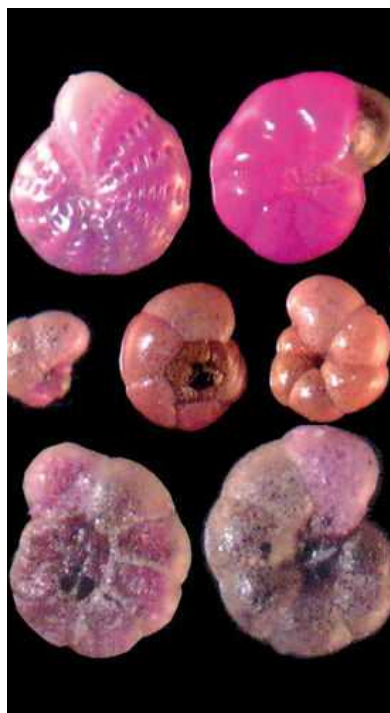
Foraminifera

Foraminifera, typically single-celled organisms that reside in the ocean, are known for their ability to produce mineralized shells. These microscopic marine creatures construct their shells primarily from secreted calcium carbonate (CaCO_3), a process that is quite common among them.



Foraminifera produce shells in a wide range of shapes and sizes. They are typically microscopic, with dimensions ranging from 0.1 to 1 mm (approximately the size of a grain of sand or smaller). However, in the geological past, foraminifera with test diameters exceeding 10 cm (4 inches) were not uncommon.

Foraminifera consume various types of food present in seawater, including dissolved organic matter, algae, bacteria, and small animals like zooplankton and fish larvae. Some species of foraminifera even host symbiotic algae that provide a constant food source to organisms living in nutrient-poor waters where other food sources may be limited. Foraminifera hosting symbiotic algae are most commonly found in equatorial regions.



Foraminifera are distributed across the world's oceans, ranging from the North Pole to the South Pole. They can be found at various depths and are capable of tolerating differences in salinity, temperature, and light conditions. With few exceptions, almost all foraminiferal species prefer marine environments.



There are two main classes of foraminifera: benthic, which live on or within the seafloor, and planktonic, which float freely in shallow, sunlit waters. The majority of modern foraminiferal species are benthic.

Foraminifera are of significant importance to scientists due to six key characteristics.

01 Small size

Foraminiferal shells are typically the size of a grain of sand or smaller. Since marine geological studies often involve small material samples, the probability of finding small shells is higher compared to larger shells.

02 Abundance and Wide Geographic Distribution

Foraminiferal shells are a common component of marine sediments and have been widely distributed over a large geographic area for a long time. In some cases, shells can accumulate in such large numbers that (sometimes up to 1 km thick!), a phenomenon known as "foraminiferal ooze" can be observed in marine rocks. Even if not present in such abundance, a few shells collected in a single sample can still provide guidance for scientists in their research.

03 Changes in Shell Shape and Size Over Time

Foraminiferal shells have undergone various changes in shape and size over time. Scientists have learned to associate specific shell shapes with specific time intervals by studying these changes. This knowledge helps them estimate the geological age of a sample, avoiding the need for expensive and time-consuming absolute age determination analyses. Additionally, scientists have correlated specific shell shapes with water depth. Some shells are found only in shallow-water environments, while others are found at moderate depths, and some are exclusive to deep-sea environments.





There are two primary classes of foraminifera: benthic, which live either on or within the seafloor, and planktonic, which freely float in shallow, sunlit waters. The majority of modern foraminifera species are benthic.

Foraminifera possess six key characteristics that make them important for scientists.

04 Exist for Over 500 Million Years

Foraminifera first appeared in the geological period of the Cambrian according to records, and they have continued to exist since then. This long record provides an easier understanding of changes in shell shapes, species diversity, and species distribution over time.

05 Short Reproduction Cycles

The reproductive cycle of modern foraminifera is typically short, ranging from 6 months to 1 year. This is particularly advantageous for scientists as it provides a short time frame for researchers interested in studying growth deformities associated with pollution.

06 Preserved Trace Element Chemistry in Shells

Foraminifera can incorporate trace elements from the water column into their shells. These elements provide valuable information to scientists about the chemistry and temperature of the ocean water during the time when the shell was formed.



DANGEROUS FACTORS

There are significant threat factors to the sustainability of oceans and all water resources. These pose a potential cause for future adverse consequences for both humanity and the planet. Ocean conservation plays a dual role in mitigating well-known issues such as global climate change, water scarcity, and the warming of the Earth. Taking a close look at these factors will serve in taking necessary actions and implementing measures for solutions.

Below are the primary factors contributing to ocean pollution.



Plastic Pollution

Plastic waste is one of the major sources of pollution in the seas. Due to the use of plastic products and low recycling rates, tons of plastic waste are discharged into the oceans. These plastic wastes can harm marine life and cause significant damage to ecosystems.

Industrial Waste

Wastes discharged into the sea by industrial facilities can contain chemicals and pollutants. These wastes negatively impact marine life by reducing water quality.

Agricultural Pollution

Fertilizers and pesticides used in agriculture can be carried from agricultural areas to the seas. These chemicals can disrupt marine ecosystems and decrease water quality.



Oil Spills

Oil spills can cause serious pollution in the seas. Accidents or leaks from ships or oil platforms can impact marine life and lead to long-term ecosystem damage.

Urban Pollution

Pollution from urban areas plays a significant role in the flow of waters into the seas. Sewage waters, garbage, and industrial waste from cities can pollute sea waters.





Marine Transportation

Pollution from ships is a significant issue in the seas. The waste discharged by ships, leaks, and ship accidents can contribute to sea pollution.

Deep-Sea Mining

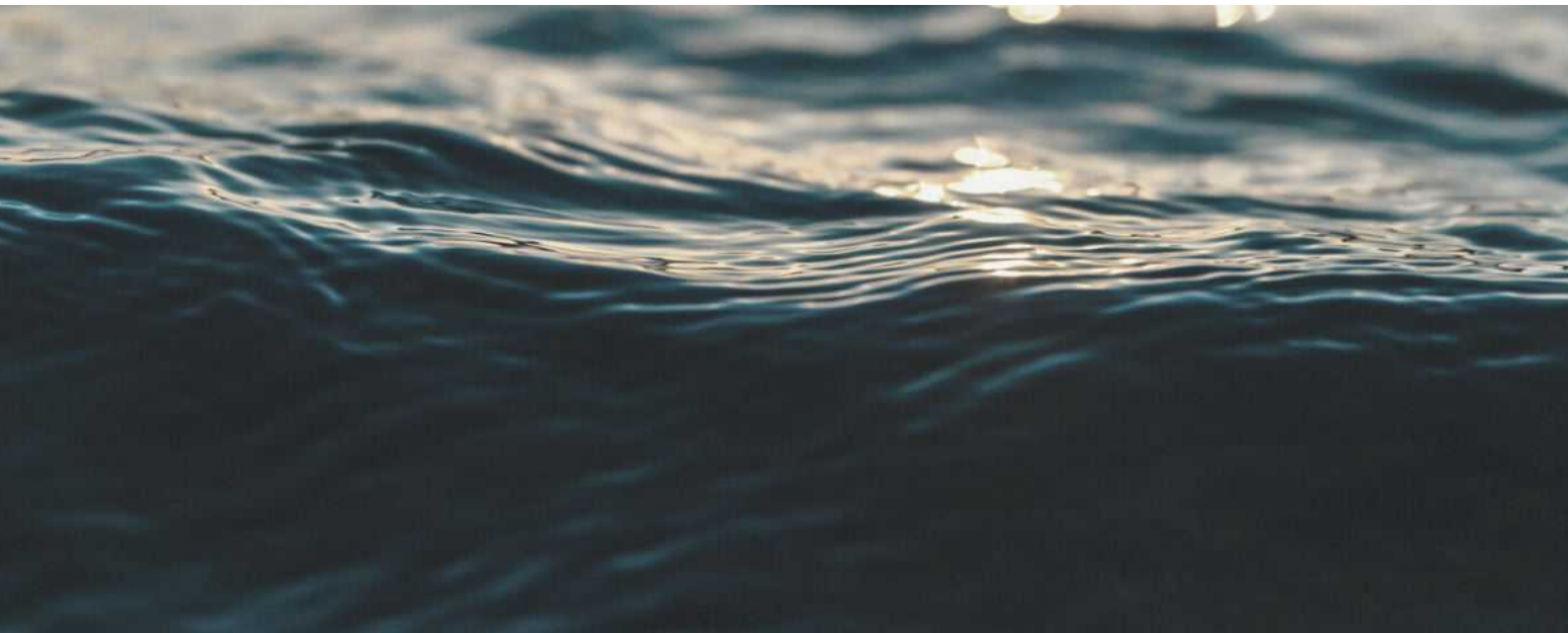
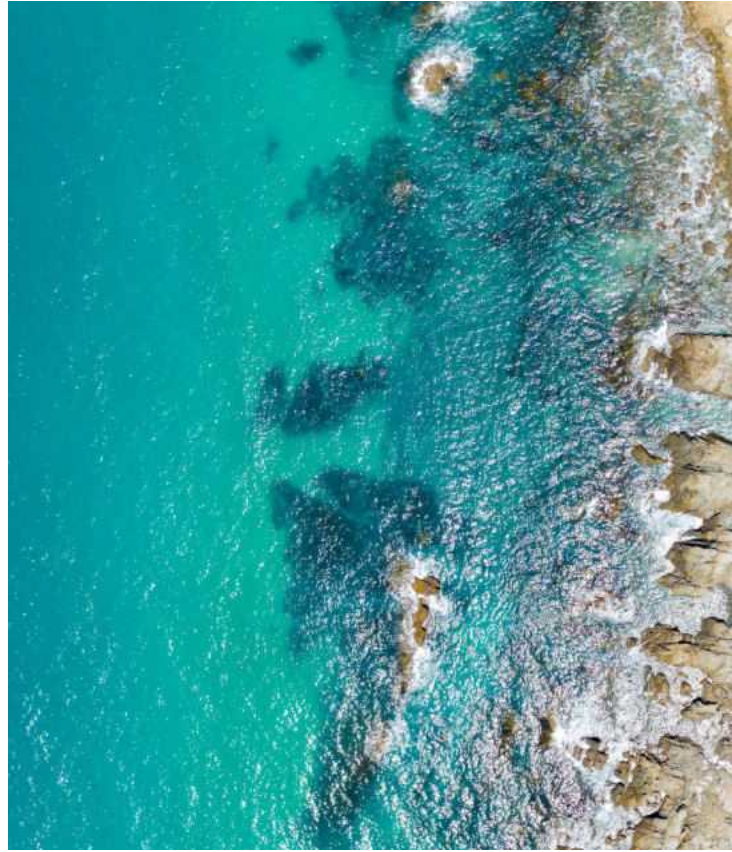
This relatively new field of mining involves extracting minerals from the sea, posing a risk to both the ocean itself and the habitats of marine life on the seabed.



WHAT CAN BE DONE?

Sustainability involves managing and conserving resources in a way that meets current needs while allowing future generations to meet their own needs. This concept encompasses economic, social, and environmental dimensions and adopts a balanced approach.

In other words, sustainability aims to improve the quality of life for current generations while ensuring that future generations have the same opportunities.



SUSTAIN ability

Economic Sustainability

This refers to a society's capacity to sustain its economic system in the long term. It involves efficient resource utilization, fair trade, and stable economic growth.

Social Sustainability

This pertains to a society's ability to protect its social structure and human rights. It includes factors such as equality, justice, health, education, and social cohesion.

Environmental Sustainability

This is concerned with the conservation of natural resources and the maintenance of ecosystems in balance. Topics such as energy efficiency, waste management, and biodiversity conservation are part of this dimension for a sustainable future.

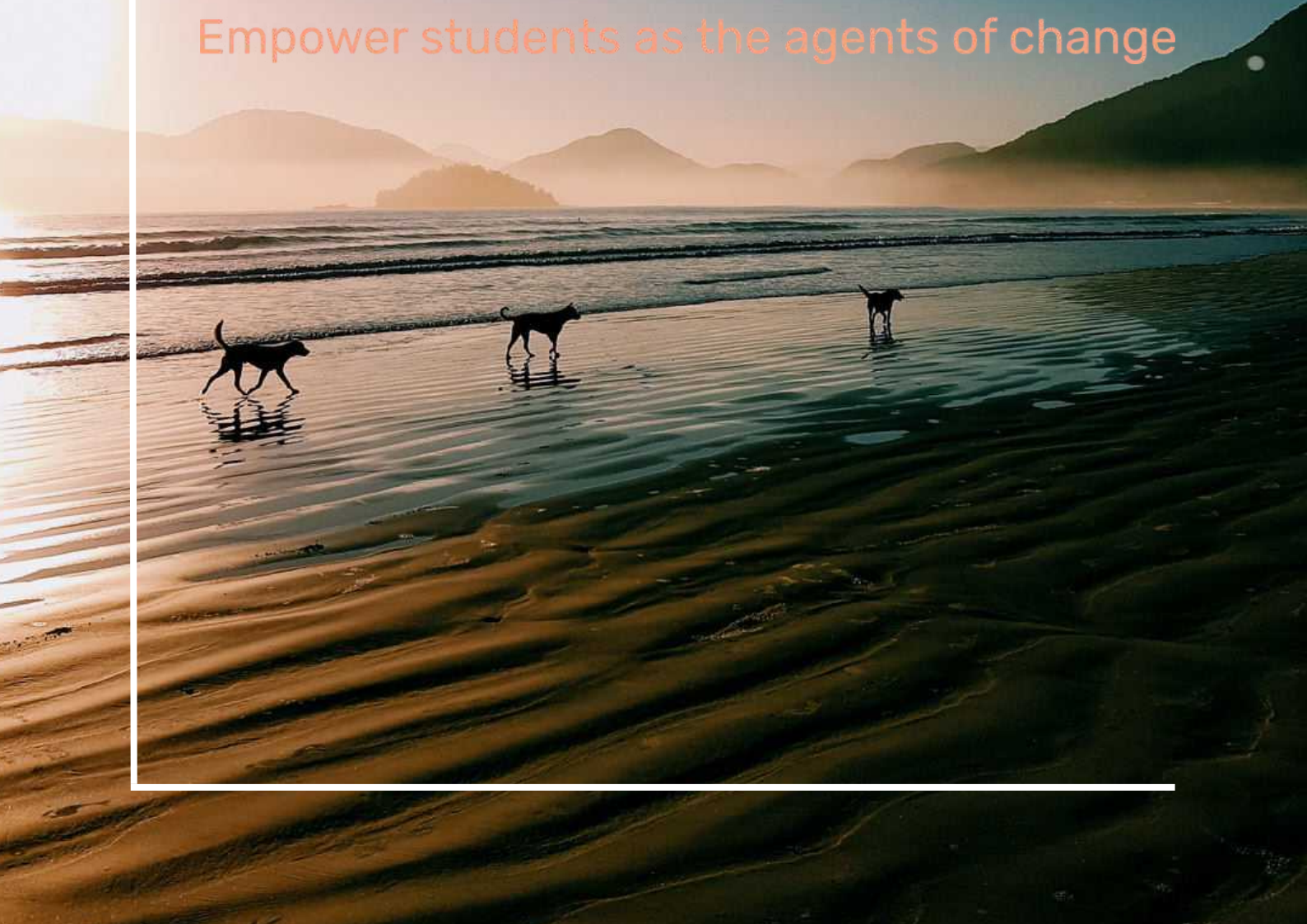
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Primary School



**BLUE HEROES ARE
COMING**

Explore the Oceans and Protect the World

Planet Earth: The Blue Planet
Land and Water
The Importance of Water
Let's Get to Know the Major Bodies of Water
Ecosystem
Let's Meet Aquatic Life
Wouldn't You Like to Explore the Poles?
Protecting the Waters from Threats!



Let's Get to Know the Water Resources on Earth

Oceans

Oceans are the largest bodies of water on Earth. They are like vast blue pools and host many marine creatures such as fish, dolphins, and giant whales. Oceans cover a significant portion of our planet's surface.

SEAS

Seas, similar to oceans but slightly smaller, also contain water and salt, and are home to colorful fish, shellfish, and fun beaches.

Groundwaters

Groundwater is the hidden water source found beneath the Earth's surface. These waters can come to the surface through wells and springs, providing us with drinking water.



Surface Waters

These waters represent surface waters that we can see, such as ponds, lakes, rivers, and streams. For example, ducks swim in ponds, rivers have currents, and boats sail on the water's surface.

Snow and Glaciers

Snow is made up of tiny ice crystals and forms when winter rain freezes. Glaciers, on the other hand, are massive ice mountains found in cold regions and adorn the oceans.

Atmosphere

The atmosphere is the layer of air that surrounds our planet. The blue color of the sky is an indication of the air, which is part of the atmosphere. The atmosphere plays a crucial role in allowing us to breathe and in the movement of the winds.



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LET'S EXPLORE the Ecosystem!

All living things in water and on land There is a magical system where everything on Earth is connected: the Ecosystem. Ecosystems are marvelous self-regulating systems where plants, animals, water, air, and soil coexist. In this system, plants use solar energy to produce food.

Animals that eat these foods create an interconnected food chain. The ecosystem works in harmony with the elements of nature like water, air, and soil. Plants produce oxygen, animals release carbon dioxide, and this cycle continues.



An ecosystem, every component within it collaborates to create a balanced order. For example, in a forest, trees utilize sunlight to perform photosynthesis, thereby producing oxygen. Animals that breathe this oxygen also eat the fallen leaves of trees. This way, a balance is maintained in nature. Ecosystems exist not only on land but also underwater. Marine creatures like fish, coral reefs, and jellyfish are parts of ecosystems in the oceans. Additionally, water, air, and soil are crucial components of ecosystems. Water serves as the habitat for fish and is essential for plant growth. Air enables birds to fly, plants to respire, and animals to sustain life. Soil allows plants to root and serves as a home for many organisms. We humans are also part of ecosystems, and it is our responsibility to preserve nature and maintain a sustainable balance.



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Exactly, let's consider a forest ecosystem as an example. In this ecosystem, various organisms such as trees, birds, insects, deer, and bears coexist. Trees perform photosynthesis, producing oxygen while absorbing carbon dioxide. During this process, they provide oxygen for other organisms.

Additionally, the branches of trees serve as nesting sites for birds. Birds, in turn, catch insects, serving as a food source for themselves and their offspring. Insects feed on the leaves of trees and play a role in forming humus in the soil. Deer, living under the trees, graze on the plants in the area, contributing to the circulation of the ecosystem. Bears, being both herbivores and carnivores, are the top predators in the ecosystem. This way, different organisms within the forest ecosystem interact with each other, forming the ecosystem. It's a unique balance in nature.



The ocean ecosystem is a vast world underwater where various organisms coexist. Let's consider a coral reef ecosystem as an example. In this ecosystem, colorful corals form the main structure. Corals are protected by their hard skeletons and provide a home for many marine creatures. Colorful and diverse corals create a visual spectacle in the ecosystem. Among the corals, colorful fish swim, and they are an important part of the coral reef ecosystem. These fish clean the algae that can harm the corals and seek refuge among the corals to protect themselves from predators.

Creatures like jellyfish can also be found in the coral reef ecosystem. Some fish clean harmful jellyfish, contributing to the balance of this ecosystem. Additionally, there can be sea turtles, whales, and dolphins in the ecosystem. Sea turtles search for food in coral reefs and lay their eggs on beaches, while whales and dolphins roam the ocean waters, hunting for prey and living with their offspring. The ocean ecosystem hosts incredible biological diversity underwater and maintains a balance through complex interactions among these organisms.





The polar ecosystem, recognized for its frigid and harsh conditions, hosts a complex food chain among its inhabitants. For instance, within the icy waters of the Arctic region, a food chain may look as follows:



Phytoplankton

Phytoplankton living in icy seas perform photosynthesis in the upper part of the water, harnessing sunlight. These tiny plants serve as the primary source of energy.



Zooplankton

Organisms that feed on phytoplankton, such as zooplankton, make up the second link in the food chain. Creatures like krill can be part of this group.

Seals and Arctic cod

Seals and Arctic cod are among the specific creatures in the polar region that prey on fish. These animals form the fourth link in the food chain.



Whales and Fish

Whales that consume zooplankton form the third link in the food chain in polar seas. Meanwhile, fish in this region prey on both zooplankton and other fish.



Polar bears

Polar bears hunt seals and other prey, forming the fifth link in the food chain. Polar bears rely on this food chain to survive in their cold environment.



Biodiversity



Ecosystem

An ecosystem is like a vast playground where every living thing in nature, including plants, animals, and microorganisms, coexists. Forests, oceans, meadows, and ponds are all examples of different ecosystems. In these places, every organism is interconnected and plays together. For example, in a forest, trees produce oxygen, birds build nests in these trees, squirrels eat the seeds that fall from the trees, and this way, the balance of nature is maintained.



Biodiversity

Biodiversity, on the other hand, refers to the diversity of different species of living organisms in this playground. In other words, in this playground, there are colorful birds, different flowers, giant turtles, and even colorful fish! This diversity makes the ecosystem strong and healthy.

For example, imagine if there was only one species of tree in the forest, and birds were all the same color, then our playground would be very boring, wouldn't it? But right now, we have a lot of different living things in various colors, shapes, and sizes, which makes our playground much more fun and beautiful.

So, little explorers, ecosystems and biodiversity are inseparable. Each living organism plays a unique role in this big game in our playground, and together we create an amazing world. That's why it's everyone's responsibility to protect nature and keep this big playground

clear and beautiful!



Now, let's explore one of these ecosystems, which is the oceans, and get to know the ecosystems and various species within the oceans.

Oceans cover approximately three-quarters of the planet, which is why some people argue that calling it Earth is a misnomer, and it would be more appropriate to refer to it as the Ocean Planet or the Blue Planet.

It's the task of young explorers like you to get to know our vast oceans. Would you like to start learning more about why oceans are so important and what lives within them?





PRINCIPLES OF OCEAN LITERACY

Principle 1: The Earth has a vast ocean with many characteristics.

Principle 2: The ocean and life within it shape the features of the Earth.

Principle 3: The ocean has a significant impact on the atmosphere and climate.

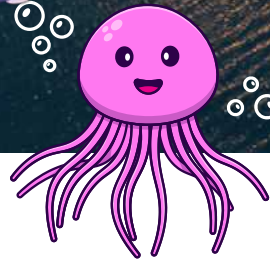
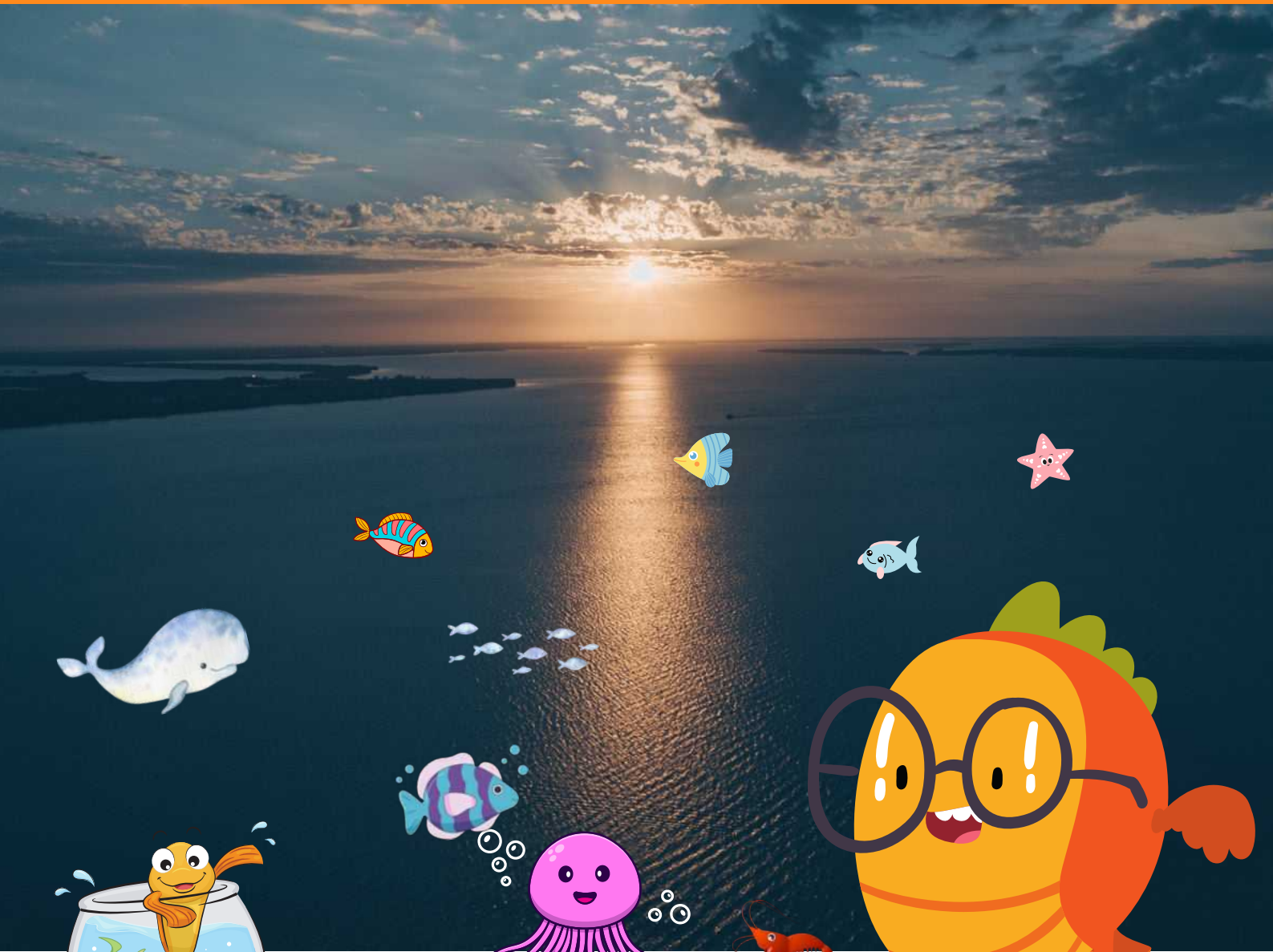
Principle 4: The ocean makes Earth habitable.

Principle 5: The ocean supports a wide variety of life and ecosystems.

Principle 6: The ocean and humans are inseparably connected.

Principle 7: The ocean remains largely unexplored.

GET TO KNOW THE BIG FIVE



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THE PACIFIC OCEAN - THE GREAT OCEAN

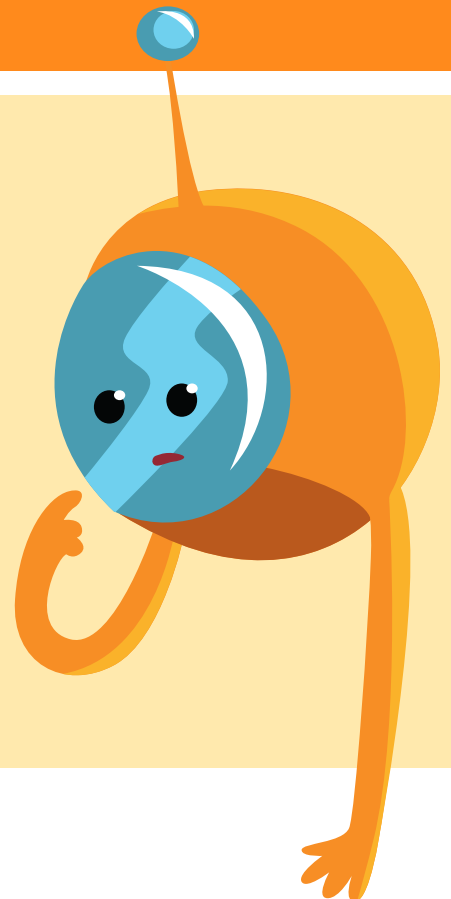
The Pacific Ocean, also known as the Great Ocean, is the world's largest and deepest ocean. It stretches around the continents of Asia, Australia, South America, and North America. Its maximum depth is 11,022 meters (Mariana Trench). It is the largest, widest, warmest, and deepest ocean. It is surrounded by five major landmasses and spans four hemispheres.





THE ATLANTIC OCEAN

The Atlantic Ocean is the second-largest ocean in the world, following the Pacific Ocean. It surrounds the continents of North America, South America, Africa, Europe, and Antarctica.





THE INDIAN OCEAN

The Indian Ocean, which covers much of South Asia, Southeast Asia, the Middle East, and most of Africa, ranks as the third-largest ocean among the world's oceans.





THE ARCTIC OCEAN

The Arctic Ocean, located around the North Pole of the Earth, is the smallest and coldest ocean.





THE SOUTHERN OCEAN

The Southern Ocean, located around the continent of Antarctica, is a recognized region among the world's oceans.



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THREE VAST SEAS



THE BLACKSEA

The Black Sea, also known as the Karadeniz, is an enclosed inland sea in Eastern Europe.

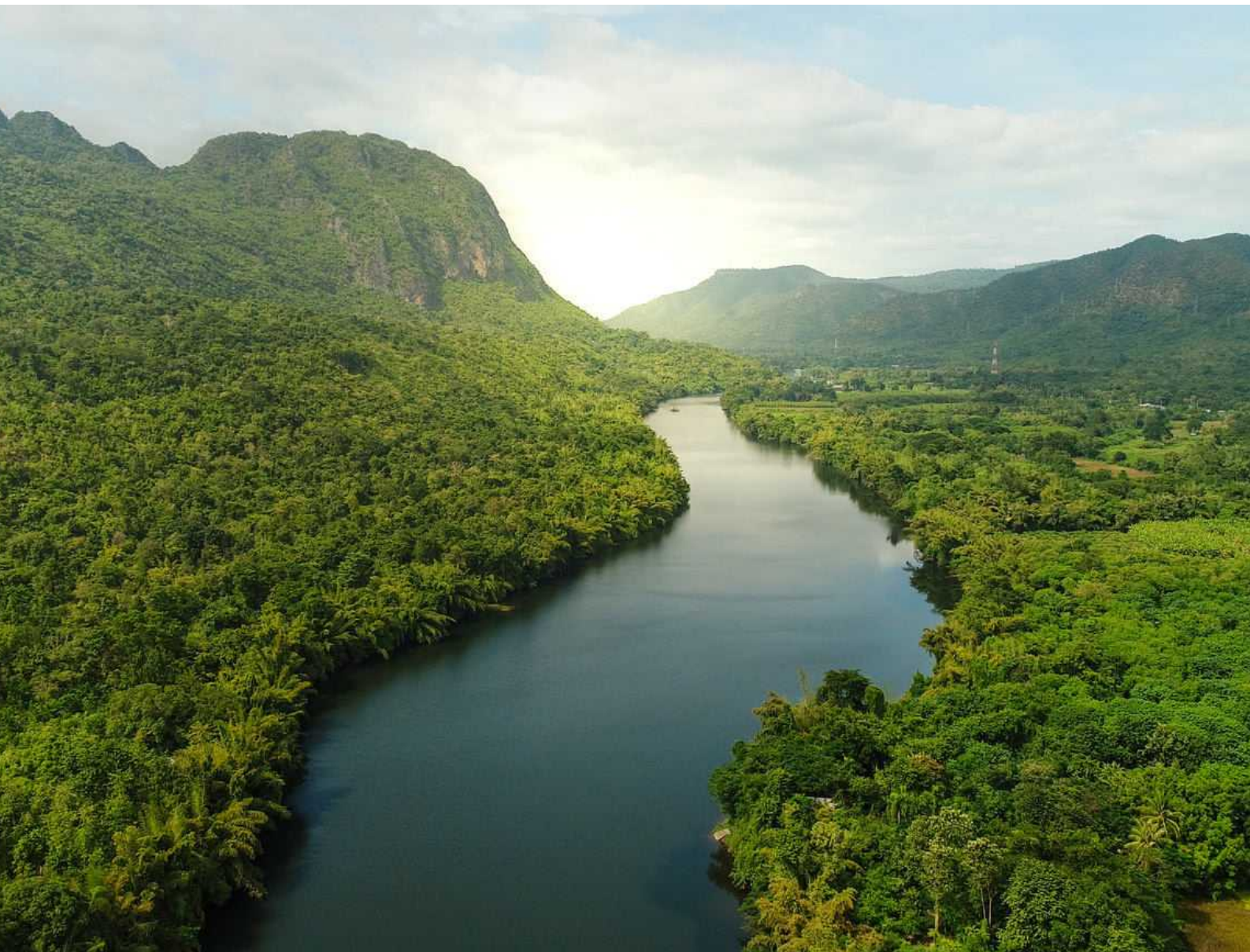
THE RED SEA

The Red Sea, located in the Middle East, stretches between Africa and the Arabian Peninsula.

THE CASPIAN SEA

The Caspian Sea, an inland sea, is located in Central Asia and is situated among the surrounding countries.

These seas and oceans make up the bodies of water on Earth and host various ecosystems. Each of them has different climates, species, and geographical features.



GROUNDWATER

Groundwater, underground water layers such as wells and artesian wells, is an important source of water in many regions.



SURFACE WATERS

Surface waters such as rivers, lakes, streams, and marshes are among the water resources. These waters are used for purposes like irrigation, providing drinking water, and generating energy.

Pacific Ocean: *Colorful Underwater World*



"Hello adventurous friends!"

Today, we are going to explore the world's largest ocean, the Pacific Ocean. This immense ocean is famous not only for its giant waves but also for its colorful underwater world. So, let's get to know a few amazing marine creatures that live in the Pacific Ocean!



COLORFUL FISH



In the Pacific Ocean, a vibrant ensemble of colorful fish thrives in its waters. Fish in shades of blue, yellow, orange, and green shimmer as they dance around coral reefs.



"You might remember among the most famous ones, Nemo; a little, orange fish!"



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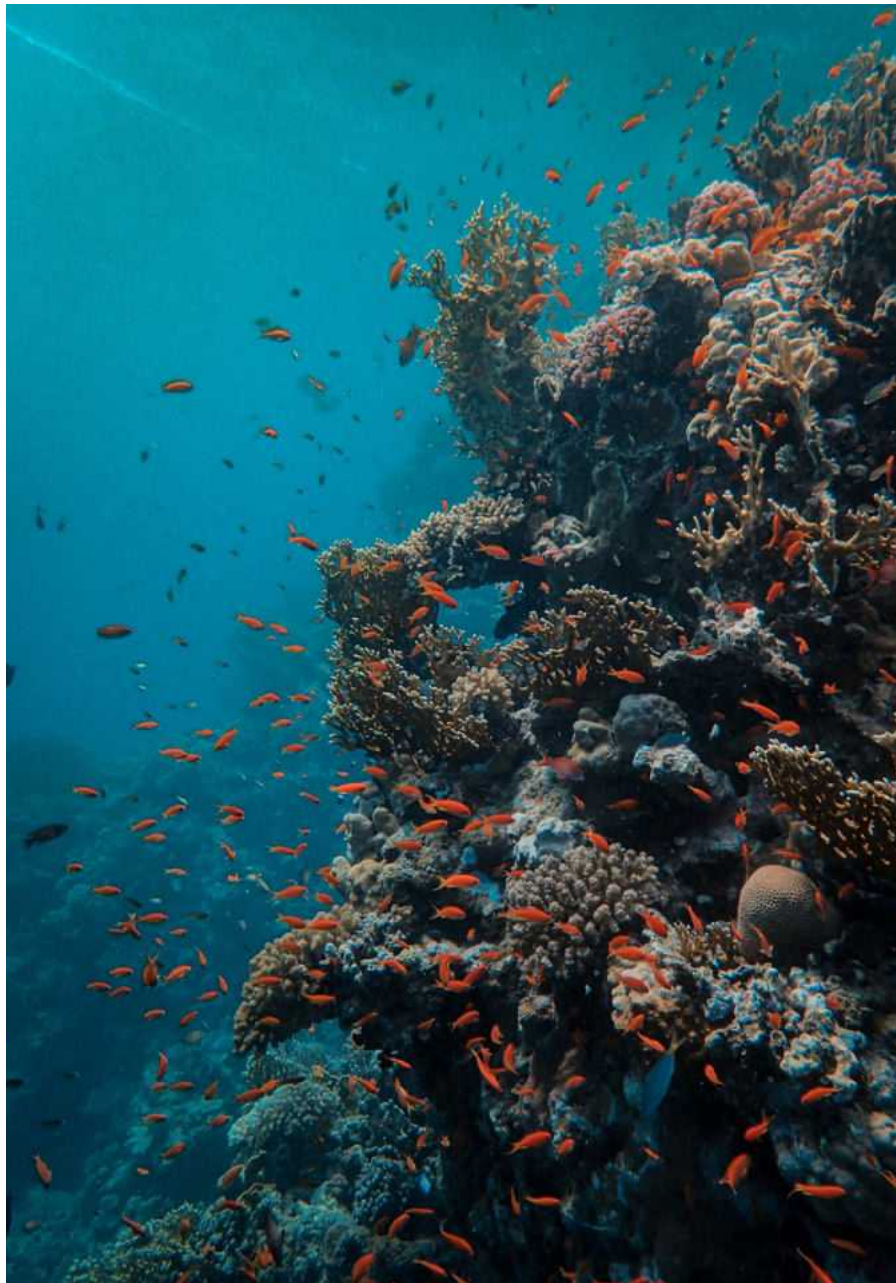
CORAL REEFS



This vast ocean is home to magnificent coral reefs. Corals adorn the ocean floor with their colorful and diverse-shaped homes.



These reefs provide a home to many marine creatures and fish.



SEA TURTLES



Another special creature living in the Pacific Ocean is the sea turtles. These large and gentle turtles prefer shallow waters and beaches.



They lay their eggs on sandy beaches, and create a magnificent sight as they swim in the sea.



DOLPHINS WHALES



In this vast ocean, dolphins and whales swim freely. Jumping dolphins play games above the water, and whales glide through the water with their enormous tails.



Various species such as beluga whales, orcas, and blue whales live here.



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JELLYFISH

SEA ANEMONES



In the Pacific Ocean, you can find other interesting marine creatures such as jellyfish and colorful sea anemones.



These graceful creatures create a colorful display as they gracefully swim through the water.

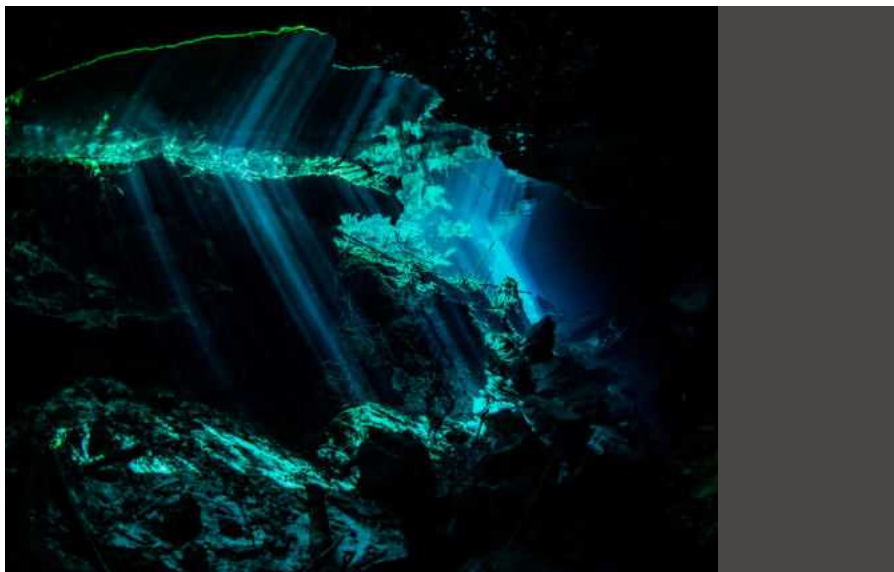
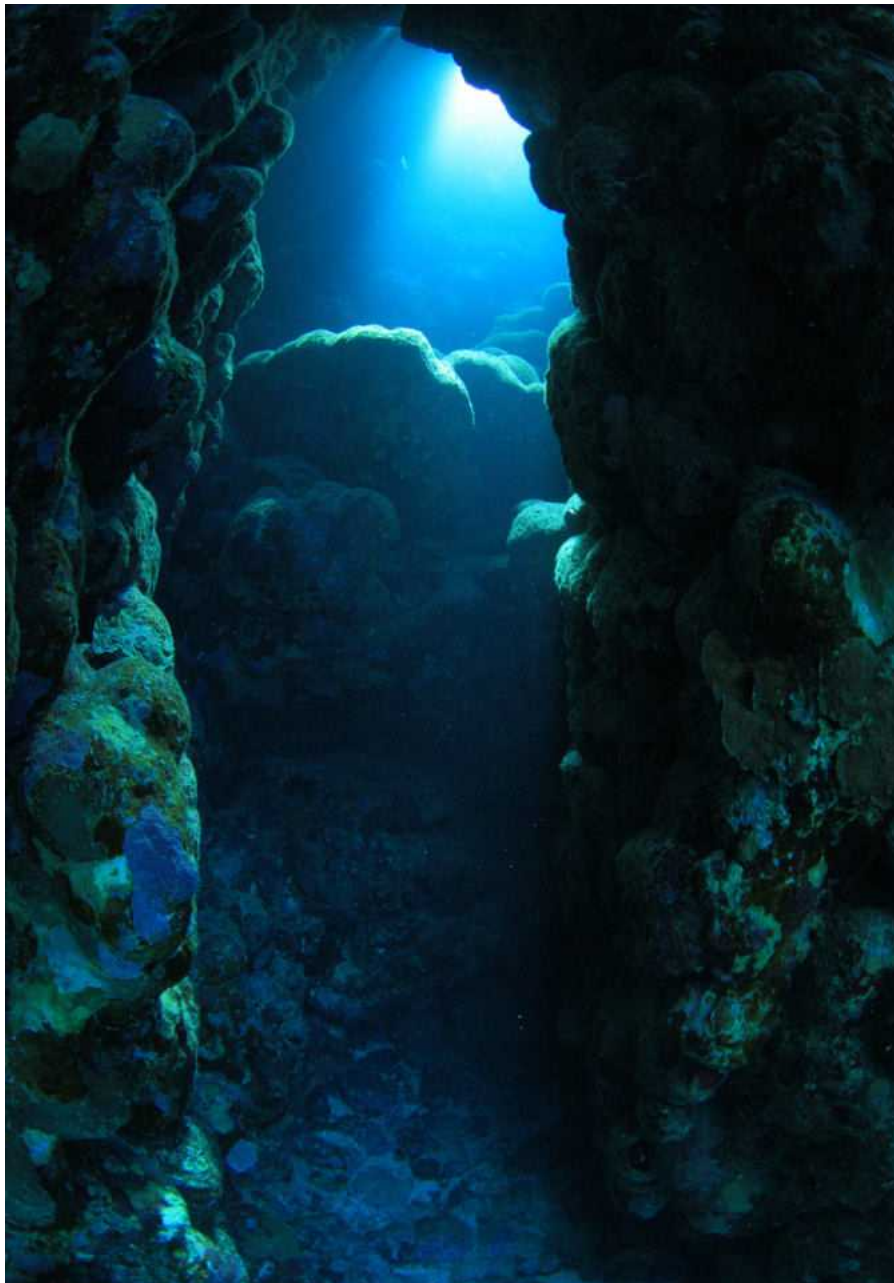
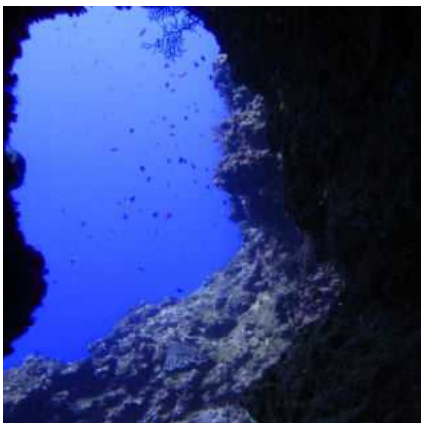


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UNDERWATER CAVES



In the depths of the Pacific Ocean, there are also mysterious underwater caves. The creatures living in these caves create a captivating atmosphere with their beauty.



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ATLANTIC OCEAN: STARS OF THE UNDERWATER TALE

Hello adventurous
friends!

Today, we will embark on a journey to the Atlantic Ocean, the second-largest ocean in the world. This ocean is famous not only for its giant waves and long beaches but also for its magnificent underwater life.

Let's get to know some special marine animals that inhabit the Atlantic Ocean up close!





SEAHORSES

In the Atlantic Ocean, colorful and graceful seahorses swim in the cool depths of the waters. These unique creatures captivate with their long tails and stunning colors.

Their dazzling dances provide a real spectacle beneath the ocean.





BLUE CRABS

In the shallow areas of the Atlantic Ocean, blue crabs bustlingly roam. These colorful creatures swiftly swim through the water, emerging from the sand.

They add color to the Atlantic shores and create a delightful sight for beachgoers as well.



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CORAL REEFS

The Atlantic Ocean is adorned with magnificent coral reefs. Colorful corals find their homes beneath the waters.

These reefs host beautiful fish, jellyfish, and starfish, among others.





GIANT FISH

In the Atlantic Ocean, giant sharks also inhabit. Great white sharks, mako sharks, and tunas are known as the rulers of these waters.

These giant fish are mysterious predators in the depths of the ocean.





DOLPHINS FAMILIES

In the warm waters of the Atlantic, families of dolphins swim joyfully. Dolphins, known as the friendliest creatures of the ocean, interact with humans as well.

Leaping dolphins play games with the ocean waves and accompany sailors by jumping in front of ships.





GIANT TURTLES

Giant turtles also inhabit the waters of the Atlantic Ocean. These gentle creatures come to the shallow waters' beaches to lay their eggs.

After hatching, baby turtles set out on a journey towards the ocean. Once each baby turtle has taken a dive into the ocean, it tirelessly swims to create its own magical world.





INDIAN OCEAN: COLORFUL WORLD OF WARM SEAS

The Indian Ocean is famous for its rich biological diversity, hosting a wide variety of plant and animal species in its waters. Here are some examples unique to the Indian Ocean:

- **Coral Reefs:** The Indian Ocean is famous for its colorful coral reefs. These reefs are formed by various species of coral polyps in different colors and shapes. Colorful corals create vibrant and unique ecosystems on the ocean floor.
- **Jellyfish:** There are many different species of jellyfish in the Indian Ocean. These graceful and transparent creatures freely float in the water and can come in various colors and patterns.
- **Sea Turtles:** The Indian Ocean is home to species like green sea turtles and loggerhead turtles. These turtles visit the shores to lay their eggs on sandy beaches.





- **Whale Sharks:** The waters of the Indian Ocean are home to impressive creatures like whale sharks. These whale sharks are known to hunt in the deep waters of the ocean.
- **Dugongs:** The coasts of the Indian Ocean are inhabited by dugongs, which are the largest marine mammals in the sea. These massive animals enter shallow waters to feed and swim.
- **Algae Varieties:** There are many different types of algae in the Indian Ocean. Algae play a significant role in the ocean's ecosystem by producing oxygen and affecting the food chain.



ARCTIC OCEAN'S COLD WATERS

The Arctic Ocean is famous for its cold climate, icy waters, and unique ecosystems. This ocean is home to many interesting plant and animal species. Here are some examples specific to the Arctic Ocean:



Polar Bears: One of the most famous residents of the Arctic Ocean is the polar bear. These massive animals have adapted to life by hunting on icy waters and living on sea ice.



Arctic Seabirds: The Arctic Ocean is home to many seabird species. Albatrosses, seagulls, puffins, and ducks are commonly observed bird species in these cold waters.

Reindeer: Reindeer that inhabit the land areas around the Arctic Ocean are known for their thick fur and antlers, which help them survive in the cold climate. They live in large herds and migrate in the northern polar regions.



Arctic Sea Ice Algae: This type of algae is a plant that can survive on sea ice, adapting to the harsh conditions of the Arctic Ocean.

Narwhal: The narwhal is one of the whale species with long, spiral tusks. This interesting tooth resembles a long horn and is unique to these animals that live in Arctic waters.



THE COLORFUL CREATURES OF THE SOUTHERN OCEAN

The Southern Ocean is known for its rich biodiversity, climate, and unique creatures. This vast ocean is home to many interesting plant and animal species. Here are some examples specific to the Southern Ocean:



Penguins: Penguins, inhabitants of the icy shores of the Southern Ocean, are one of the symbols of this region. Emperor Penguins, in particular, are known as masters of cold waters. **Southern Sea Lions:** Southern Sea Lions, found in large colonies along the coasts of the Southern Ocean, are an essential part of marine life. They are often seen basking on the shores and hunting.



Kuka Tree: The Kuka Tree, commonly found in the Southern Ocean, is an important tree species that makes up the region's vegetation. It is known for its large leaves and resilience.



Southern Queen Bee: With its colorful and large wings, the Southern Queen Bee is an endemic insect of the Southern Ocean, representing a unique example in the region's ecosystem.

Sea Turtles: Sea turtles that swim in the waters of the Southern Ocean and lay eggs on the beaches are an important part of the region's marine life.



WE NEED TO PROTECT OUR WATERS!



Plastic Waste

Plastic is found in colorful and variously shaped packaging. However, plastic can take years to break down in nature. Oceans and seas are rapidly becoming polluted due to irresponsible waste disposal.



Excessive Water Consumption

Unfortunately, leaving the taps running while brushing our teeth and washing our hands leads to excessive water usage and poses a threat of water scarcity.



Global Warming

When sunlight enters our atmosphere, some of it is reflected back, and some of it heats our planet. However, when greenhouse gases accumulate in the atmosphere, some of this heat cannot escape, leading to global warming. The excessive use of fossil fuels, energy-inefficient devices, and the reduction of green spaces contribute to increased greenhouse gas emissions.



Use Water Consciously

Children should learn to use water consciously and review their water usage. Simple habits like turning off the tap while brushing their teeth, shortening bath times, and promptly reporting dripping faucets contribute to water conservation.

Let's take a look at what we can do to protect our oceans and our planet against all these risks and dangers.

Young water heroes!

Water is one of the most precious treasures of our world, and it is our duty to protect it. Water literacy means understanding the importance of water and knowing how to preserve it.

Remember, small actions can make a big difference, and you can be a valuable drop for this world. By taking steps today to become a water hero, you can protect the waters of tomorrow!



Properly Managing Waste

It's important for children to understand that plastic and other waste can harm water sources. Children should recycle plastic waste and make an effort to clean up waste that harms their environment.



Education to protect water resources

Children should be educated about the conservation and sustainable management of water resources. By participating in activities organized at schools and homes, they learn about the importance of water and the need to protect it.

Contributing to the Water Cycle by Planting Trees

Children can contribute to the water cycle by planting trees. Plants absorb water from the soil and release it back into the atmosphere through evaporation, thus contributing to the natural water cycle.



Awareness for Water Conservation

Children can raise awareness about water conservation with their families and friends. They can create informative posters and share water-saving tips to spread awareness about the importance of water conservation.



Keeping the Water Sources Clean

While playing by the pond or having a picnic in the park, children should keep the surrounding water sources clean. They can help keep the water clean by properly disposing of their trash and avoiding behaviors that harm the environment.

Contributing to Water Cleanliness

Children can participate in water purification projects or make donations to help areas facing water cleanliness issues in some regions.

The sources used in the preparation of the handbook

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