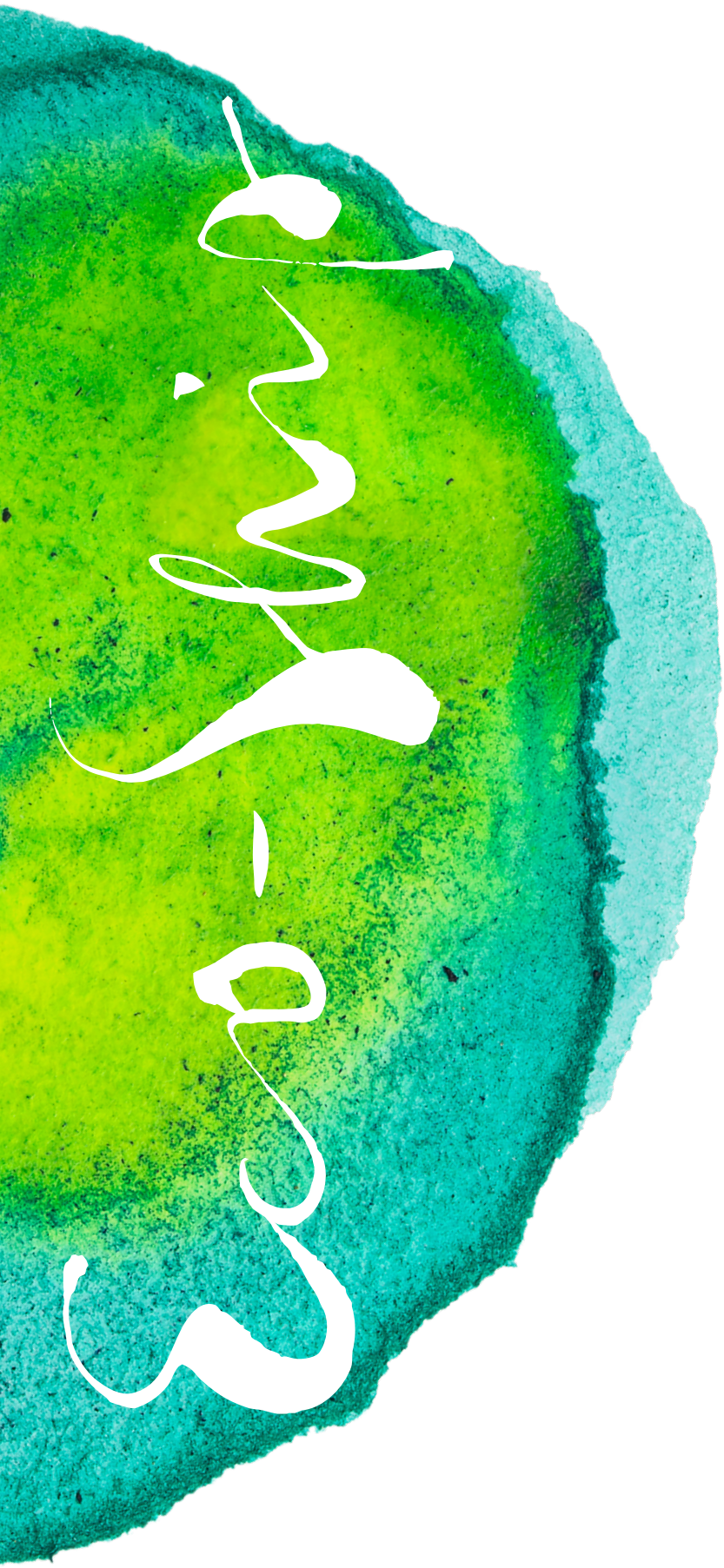


BALTIC SAILOR CATALOG

Created within the project
„ECO-SHIP – environmental and maritime education of youth”
Project no. 2021-1-PL01-KA220-YOU-000029718

ECOSHIP

Co-funded by the European Union

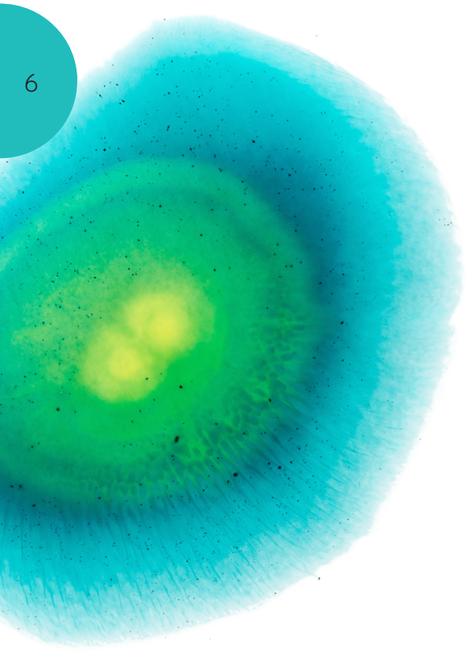
PREFACE

The Baltic Sailor Catalog is a free of charge script for self-study, source of information on problems, challenges and solutions related to the environment of the Baltic Sea. Each sailor should be aware of these issues to minimize negative impact on natural maritime heritage.

The catalog is divided into four chapters based on knowledge and experience of each project partner.
Chapter 1 describes relations between sailing and ecology with practical tips based on sailing experience and latest environmental knowledge.
Chapter 2 provides a basic oceanological background needed to understand natural processes and their importance both in oceanic and Baltic Sea scale.
Chapter 3 presents the greatest challenges of the XXI century such as rapid climate change, biodiversity loss and pollution.
Chapter 4 encourages users of the catalog to take action in a field of environmental education, proposing drafts of workshops prepared and tested within the Eco-Ship project.

Target group of the Baltic Sailor Catalog should be as diverse as possible. It is addressed to the people involved in watersports activities, sailing schools, crews of sailing ships, marine scouts, representatives of marinas and boat clubs, teachers, educators, organizations dedicated to maritime and environmental education and to anyone who would like to widen knowledge and be more eco-aware.

1. SAILING AND ECOLOGY



1.1. Introduction

Sailing had been a way of carrying goods and humans for ages until the era of steam came. Can we say that sailing ships driven by wind were neutral for the natural environment? Most probably not, as we take into consideration that huge amounts of wood needed to build ships were one of the causes of deforestation until the late XIX century. Yet still the impact was marginal compared to the next generation of power-driven vessels consuming fossil fuels, using paints and other chemicals, emitting noxious gasses, polluting waters by oils, sewage and garbage. What is more, maritime traffic provides transportation of over 80% of traded goods (UNCTAD[1]), so the scale of this occurrence is alarming. We can state that the present global economy relies on shipping and is far from being environmentally neutral. It needs to be added that not the ships as such are to be blamed, but the enormous volume of carried cargo, resulting from the increasing level of consumption.

Back to sailing, it changed totally from a means of transport to leisure activity. How is it related to the natural environment today? Can we rest assured that sailing is as "eco-friendly" as it is often presented? The answer is not so simple and requires further reflection. On one hand, we know exactly that sailing relies on technical equipment. Sailors need yachts to sail, materials for maintenance and repairs, marinas to berth. They use fuel, oil and grease, antifouling paint and varnish. They replace broken parts, produce sewage and garbage. This is hard to avoid.
On the other hand, sailors love to spend time in nature, admire unspoiled landscapes, sail clean seas and breathe fresh air. Moreover, they depend on nature – mostly weather (atmosphere) and water (hydrosphere). Sailors also learn about the relationship between the sea and land.

[1] https://unctad.org/webflyer/review-maritime-transport-2021

To act wisely and safely, they need to understand how the environment works.

One more connection between environmental awareness and sailing can be seen. It is often called "sail training" and states a pedagogical process of shaping key competences of trainees in mental, physical and emotional spheres through participation in sailing trips. During such voyages an educational program should be implemented, encouraging participants to gain knowledge, skills and experience in the field of broadly understood maritime issues and environmental protection, with a perspective to become mentors, instructors or educators in the future. This is a perfect instrument for non-formal education.

1.2. How to plan a sustainable sailing trip

Meaning of the expression "sustainable sailing trip" is not easy to explain in one fundamental way. It definitely has to fit into Sustainable Development Goals (see subchapter 3.1.) which are complex and multifaced. For the purposes of the Baltic Sailor Catalog, it is proposed to define "sustainable sailing trip" as a yacht-based journey giving joy of being close to nature, causing least damage to the natural environment and involving sailors to gain environmental knowledge.
Below you can find some practical proposals.
Firstly, it is not allowed to navigate wherever sailors want. In the area of the Baltic Sea, very vulnerable marine and shore ecosystems exist. They are protected and therefore restricted for sailing, mooring, anchoring, diving or any other leisure. Respect it.

Secondly, if you moor or anchor:
- do it in designated places;
- choose certified marinas (Blue flag, Roope-harbour program in Finland);
- remember that mooring and anchoring is forbidden in protected areas;
- avoid sensitive seabed areas i.e. seagrass;
- use existing moorings if possible.

Thirdly, small decisions make a difference:
- use shared / chartered boat or yacht;
- during a trip, use as much sails as possible;
- prepare a weather routing to avoid proceeding against the wind or windless areas;
- avoid unsafe and doubtful sounding (unknown depth) areas;
- avoid making noise in specific areas;
- keep distance from fragile places (natural reserves, breeding areas etc.);
- keep the boat (dinghy, anchor, anchor chain) clean to avoid spreading invasive species.

1.3. Technical issues and maintenance

Sailing is a very technical activity, therefore a way to operate a boat may differ in terms of sailor's attitude and materials or technology used. Please read what can make a difference.
Antifouling - an important element of keeping the underwater part of a boat clean and fast. In subchapter 3.4.1. You can read what is the environmental impact of antifouling paints and what are alternatives for it.
Chemicals - try to use washing agents which are: plant-based, biodegradable, non-harmful, phosphate free, non-toxic, non-corrosive. Choose those in recyclable packaging. The choice on the market is increasing.
Electric power supply - consider renewable energy sources like photovoltaic panels and wind turbine generators. For smaller yachts they can provide energetic self-sufficiency for a long time. Prices of those devices are slowly

becoming competitive. Remember to decrease your power consumption by using LED lights and other energy-saving devices. Reduce the number of electrical appliances. Quality of boat batteries matters. Turn off equipment you are not using.
Engine - the less you use it, the better. Regularly check: leaks, oil consumption, cooling system, exhaust, fuel. Replace parts and fluids according to the engine manual. Consider electric engines, especially for smaller boats. Try “eco-driving” regardless of the engine type.
Repairs - sooner or later device breaks. Learn how to fix it or ask professionals for help. Replace only if necessary. Take care of things and they will last longer.
Yacht type - if you have a choice, buy or rent light, durable, high quality boats with timeless design to avoid buying new ones too often.
Bilge - be sure it’s clean and dry. In case of pollution (oil, fuel etc.) never pump it out into the water. Use special absorbent and dedicated cleaning chemicals. Throw out polluted materials to dedicated containers onshore.
Garbage - reduce non-recyclable packaging, segregate garbage, follow MARPOL rules (subchapter 1.6.).
To ensure safe traveling, the boat should be checked and maintained regularly. Some maintenance can be done by the boat owner, but professional checks should be considered especially if the boater has no previous experience. When the boating season begins, it is good to do a yearly check-up before heading to the sea.

Maintenance checklist to do during spring (source: Finnish Sailing and Boating Federation):
- Boat hull: rudder, propeller, anodes;
- Rig and mast;
- Engine: oils, fuels, possible leaks;
- Batteries and their charging;
- Electronic devices, electricity;
- Navigation equipment: maps and compass;
- Boating equipment: lines, anchor;
- Safety equipment: life jackets, life buoy, distress rockets, lights, fire extinguisher and fire alarm;
- First aid equipment: bandages, band aids, safety tarpaulin, cleansing wipes, painkillers, scissors, and others.

1.3.1. Waste management en route

In the 1970s, marine littering in the Baltic Sea was a significant problem. People shamelessly buried their rubbish or added stones to litter bags and tossed them overboard into the water because the waste management was not always sufficient in the archipelagos and rural areas. Fortunately, things have changed especially concerning the general waste disposal instructions. Waste management for boaters is quite comprehensive in many areas, and attitudes concerning littering have changed.

When planning a boat trip, it is important to prevent the production of unnecessary waste. Reduce the amount of litter to minimum beforehand: remove the unnecessary materials some food might be packed in. Pack food supplies in reusable and washable packages, avoid single-use packages and cutlery. When shopping for groceries, use a reusable shopping bag or reuse your plastic bag.

Make sure there are sufficient disposal stations and recycling bins at your destinations. This can usually be checked on marinas’ or service providers’ websites. Segregating trash on your boat is easy and simple and requires no complicated installations. In addition to a mixed waste bin, insert recycling bins or bags, at least for recyclable glass and metal waste, underneath the boat seats or in the anchor box.

Remember to keep hazardous waste separated from other waste. Hazardous waste, such as oily waste, batteries, boat bilge water, paints, solvents, varnishes, distress rockets, medication, and electronic scrap, is often the product of boat overhauls typically carried out in the spring and autumn. Store them in their original packaging and take them to the appropriate collection or recycling station.

Fig. 1: During the most popular boating season some recycling stations may get filled up very quickly. Be patient, especially when the collection station is in a remote area where the bins do not get emptied that often. / Keep the Archipelago Tidy Association

1.4. Balanced cooking - how to eat responsibly during sailing cruises

According to the United Nations Environment Programme Food Waste Index in 2019, every year 931 million tonnes of food is wasted in the world, from which 570 million tonnes of waste happens at the household level. Data on the subject vary from source to source, mostly because of methodology applied and insufficient information, depending on the country. No matter the approach, though; the numbers are overwhelming, and probably each and every one of us can plead guilty of wasting food from time to time, and eventually our little sins add up globally to inconceivable amounts. How about we take sailing trips as workshops on provisions management? It seems like a perfect opportunity to do so: we ought to plan ahead, and get big but reasonable shopping done before we head off. Finally, there is usually someone responsible for feeding the rest of the crew, so they can devote their time and energy to keeping the galley running.

Before you go:

- **Plan ahead** - spend a moment getting to know your crew's culinary preferences before you go shopping. If nobody likes certain products, don't buy them. Try to calculate estimated amounts of food needed for the particular trip, and make a list to follow, rather just roam the aisles of the supermarket.

- **Buy in bulk…** whenever possible to reduce the amount of packaging. Certain goods can last for a long time when stored properly. Rice, pasta, dried vegetables, legumes, cereal should be kept in tightly closed containers to keep them dry. You can buy containers that fit your storage spaces perfectly, and then label them with the date of opening.

- **Go local** – local products tend to make a better choice for various reasons. In the first place, locally produced food means a shorter supply chain, therefore smaller environmental impact. However, there are products which cannot be replaced with local substitutes. If you buy coffee, tea, cocoa or sugar, make sure to find a certified product. "Fair trade" label is good to begin with.

- **Reduce meat** – there are many reasons to do so, including health and environment, but we may as well approach the case practically. Meat requires specific storage conditions – it needs to be either frozen or refrigerated, and still can spoil pretty fast. There are plenty of alternative plant protein sources, such as legumes (beans, soy, chickpeas, lentils), nuts and seeds, that are far easier to store and last much longer, thus less demanding to handle.

- **Make sure to have spices** – even the most basic meal may turn into an interesting experience when the dish is seasoned. This matters even more if you decide to cut down on meat consumption. Experiment with soy sauce (preferably low-sodium), different types of vinegar and sweeteners, get creative with cinnamon, smoked paprika, jeera powder, nutritional yeast and whatnot. Most spices (not herbs, though) taste much better when fried first with some vegetable oil.

Fig. 2: Healthy, nutritious and environmentally friendly dishes can be prepared even in uncomfortable sailing conditions.
/ Photo: Miika Karppinen, www.zaruski.pl

Underway:

- FIFO: stands for first in, first out, which means that whatever has been purchased first, should be the first to consume as well. Whenever you add something to your stock, make sure to put it in the back of the cabinet, so that items that need to be eaten in the first place, are also the first ones to reach for. This rule applies especially to refrigerated food, as well as fresh fruit and vegetables.

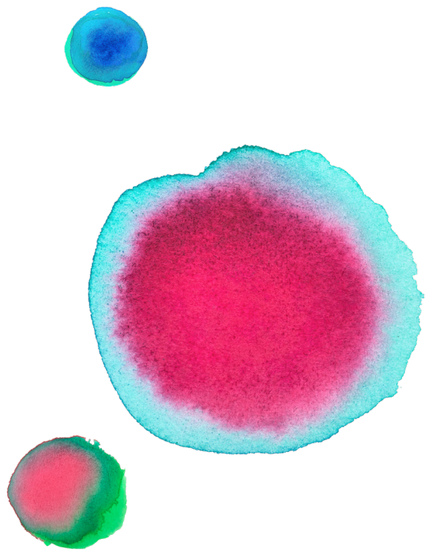
- Know your labels. Check the counterparts of "use by" (sometimes referred to as "expiry date") and "best before" in your language, and make sure to differentiate: "use by" usually appears on easily perishable foods, such as yogurts or fresh, unpasteurized juice. It is not safe to eat or drink products past their "use by" date as they may be dangerous to health. "Best before" however, refers to the quality of food – it can still be eaten and will do no harm, although the taste or smell may have deteriorated[2].

[2] https://food.ec.europa.eu/safety/food-waste/eu-actions-against-food-waste/date-marking-and-food-waste-prevention_en

- Know your portions: measurements can be tricky, especially if you normally only prepare food for yourself and then suddenly end up cooking for ten people.
- If there are leftovers, though, no worries; food can always be upcycled. Yesterday's rice is the best base for stir-frying or risotto, mashed potatoes only need some flour to turn into gnocchi. It takes a little mind-shift, though – leftover does not mean worse or spoiled. It just means ready beforehand, so you have less work to do.

LEARN MORE:

https://savethefood.com/storage



1.5. Good sailing practices in a field of environmental protection

The environmental impact of leisure boating is minor when compared to the impact made by industries, agriculture, or societies. However, leisure boating in the Baltic Sea takes place during a rather short period in the summer and the most popular routes are general waterways, which causes the impacts to be concentrated on certain places with uneven loads. This means that even small environmental acts matter. For example, a narrow bay with a high biodiversity but low water exchange may be damaged easily if boaters discharge their wastewaters or dump litter there.

Below there is a list of the most important environmental acts a boater should pay attention to. More detailed information and explanations for these acts can be found further in section 3.4 in this catalog.

- Be sure that your litter is disposed of properly. Recycle and reuse whenever possible.
- Do not discharge lavatory wastewaters into the sea. Use pumpout stations.
- Keep your boat hull clean of biofouling by preferring biocide-free methods.
- Use environmentally friendly detergents, but do not discharge them into the sea.
- Respect nature and leave places in the state like you were never there. In the Nordic countries, explore everyman's rights and act according to them.

Fig. 3: If we want to enjoy the beautiful Baltic Sea in the future, we must respect it and take care of it. /Keep the Archipelago Tidy Association

1.6. MARPOL convention

According to IMO (International Maritime Organization), “the International Convention for the Prevention of Pollution from Ships (MARPOL) is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes”. MARPOL has been valid for almost fifty years as it was adopted in 1973, but there have been several updates and improvements since then. The convention is divided into six annexes:

- Annex I Regulations for the Prevention of Pollution by Oil
- Annex II Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk
- Annex III Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form
- Annex IV Prevention of Pollution by Sewage from Ships
- Annex V Prevention of Pollution by Garbage from Ships
- Annex VI Prevention of Air Pollution from Ships

MARPOL rules are detailed and can be seen as complicated, especially for sailors. The question is: how does the convention affect yachtsmen?

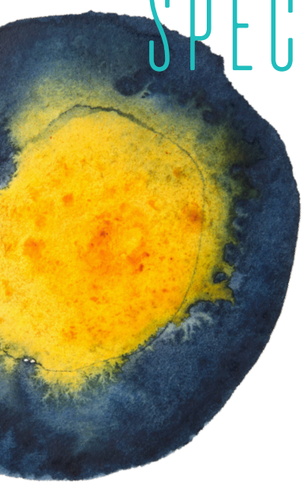
- All yachts of **400GT (Gross Tonnage) and above** must carry out surveys, maintain certificates and records for MARPOL **Annex I**
- Yachts of **400GT and above** and those certified to carry **more than 15 persons**, regardless of tonnage, must carry out surveys and maintain certificates for MARPOL **Annex IV** (see note 1)
- **All yachts** must maintain compliance with MARPOL **Annex V**
- Those of **400GT and above** and those certified to carry **15 or more persons**, regardless of tonnage, shall maintain a **Garbage Record Book**.
- Those of **100GT and above** and those certified to carry **15 or more persons**, regardless of tonnage, shall maintain a **Garbage Management Plan**.
- All yachts of **12 meters in length and above** are obliged to display placards notifying passengers and crew of the garbage disposal requirements according to MARPOL **Annex V**
- All yachts of **400GT and above** must carry out surveys and maintain certificates and records for MARPOL **Annex VI**

According to MARPOL Annex IV, the discharge of sewage into the sea is prohibited, except when the ship has sewage treatment plant approved and in operation or when the ship is discharging comminuted and disinfected sewage using an approved system at a distance of more than three nautical miles from the nearest land. Sewage which is not comminuted (fragmented) or disinfected may be discharged at a distance of more than 12 nautical miles from the nearest land when the ship is en route and proceeding at not less than 4 knots, and the rate of discharge of untreated sewage shall be approved by the Administration.
It seems to be oversized for sailors, especially those who sail small boats, but remember the effect of scale. In the high season, some spots on the Baltic Sea are really crowded. Hundreds of boaters can generate thousands of liters of sewage and tons of garbage during a single sailing trip. Please, use a shore based facility to dispose of this extra load.

LEARN MORE:

https://maddenmaritime.files.wordpress.com/2015/08/marpol-practical-guide.pdf

2. MARINE EDUCATION – BASICS OF OCEANOLOGY AND THE BALTIC SEA SPECIFICS



2.1. General view on marine environment

When Norwegian explorer Thor Heyerdahl launched a voyage across the Pacific Ocean by raft in 1947, the world's oceans seemed vast and limitless. Just 25 years later, the world's first global environment conference in Stockholm urgently flagged the damage people were causing to the seas through marine pollution (Paul, 2021). Throughout history, the seas have served mankind as a medium of communication, trade and livelihood. With regard to the historical background of marine pollution, it is obvious that marine pollution is a phenomenon that has been steadily growing over the centuries, brought about by man's uncontrolled exploitation of the sea and its ecological resources. The oceans are also polluted by various types of human activities. Currently marine pollution is an increasing threat to a healthy marine environment. Indeed, marine pollution may severely damage the environment, including ecosystems and human health (Tanaka, 2019).
Marine waters cover more than 70% of the surface of the Earth and account for more than 97% of Earth's water supply and 90% of habitable space on Earth. Seawater has an average salinity of 35 parts per thousand parts of water. Actual salinity varies among different marine ecosystems. Marine ecosystems can be divided into many zones depending on water depth and shoreline features. The oceanic zone is the vast open part of the ocean where animals such as whales, sharks, and tuna live. The benthic zone consists of substrates below water where many invertebrates live. Marine ecosystems are important sources of ecosystem services, food, and jobs for a significant part of the global population. Human uses of marine ecosystems and pollution in marine ecosystems are significant threats to the stability.

2.2. Role of the Ocean

Ocean is affecting us on a daily basis and we do not even realize that. All the sunny days, warm breeze in our hair, light rain on our skin or a heavy storm on a hot summer day, all are thanks to the Ocean. As it covers 70% of the Earth's surface it also regulates the climate and distributes the heat from the equator to the poles. The majority of radiation from the sun is absorbed and stored during the day or in the summer and released during the night or in the winter. The Ocean reaches the highest temperatures on the equator, where the water is constantly evaporating, which increases the temperature and humidity. This causes rains and storms. Further from the equator the Ocean currents transport warm water and the precipitation toward poles and back to the tropics. This conveyor belt regulates the temperature throughout the Earth.
More than half the world's oxygen is produced by the Ocean and at the same time it can absorb up to 30% of the carbon dioxide which was released into the atmosphere. The carbon dioxide absorption increases every year due to human impact. By dissolving in seawater, CO_2 is formed into carbonic acid, which is removed from the marine system through the calcium carbonate formation processes. These reactions help calcifying organisms (clams, oysters, shallow and deep-water corals, etc.) to build and maintain their shells. However, higher rates of carbon dioxide absorption can also cause ocean acidification which can lower the pH of the Ocean and harm biodiversity.
Speaking of biodiversity, the Ocean sustains 50% of global primary production. In the Ocean we can find much more biodiversity, and a greater number of organisms than on land. Half of the population lives in coastal zones and depends on it. Ocean provides not only food that we consume directly but also biological systems or living organisms that are used in medicine, beauty and health products.
There are way more benefits to our relationship with the Ocean. Today it builds the economy by providing goods, trade routes, cultural heritage, tourism and so on. For more information check the figure below.

Fig. 4: Why should we care about the ocean? (NOAA)

LEARN MORE:

https://oceanexplorer.noaa.gov/facts/climate.html

https://oceanexplorer.noaa.gov/facts/acidification.html

https://www.noaa.gov/education/resource-collections/ocean-coasts/ocean-acidification

https://www.marinebio.org/conservation/marine-conservation-biology/biodiversity/

2.3. Natural resources of the Baltic Sea

In the Middle Ages Baltic Sea was one of the major trade routes, from fish and oils to timber and honey or amber.
The region is rich in herring, sprat, cod, and flatfishes which together constitute about 95% of the total catch (ICES, 2019). Other target fish species having local economic importance are salmon, plaice, dab, brill, turbot, flounder, pikeperch, pike, perch, whitefish, eel, and sea trout. Since regulations on caged fish have been implemented, it is now more popular for the open cage fish farms like rainbow trout. The farms are located in the Åland and Åbo Archipelago (Finland), the Danish straits, and some other scattered locations.

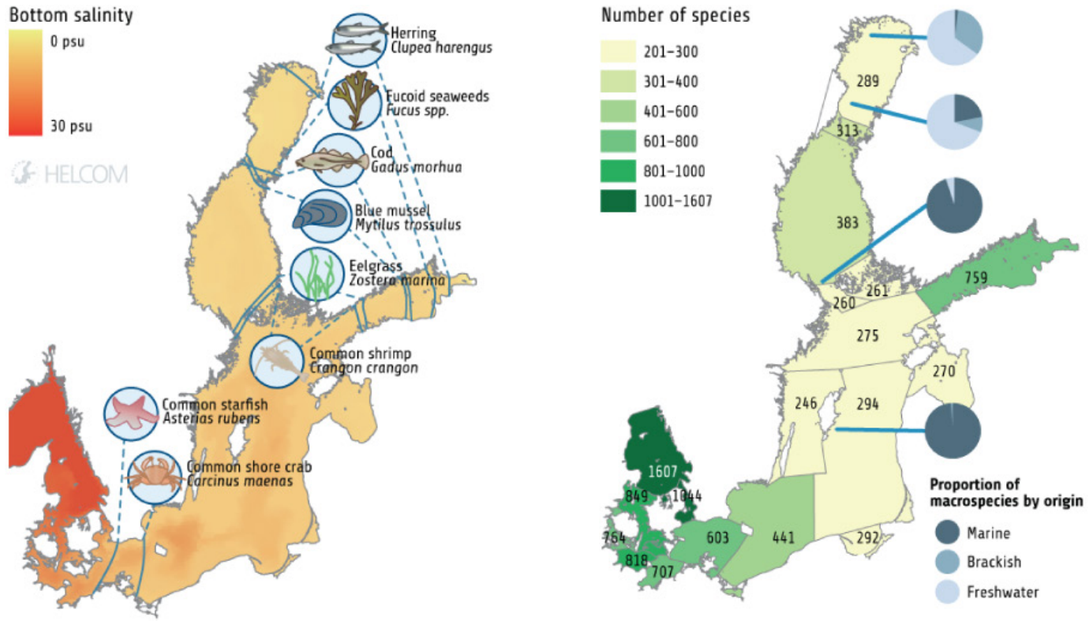
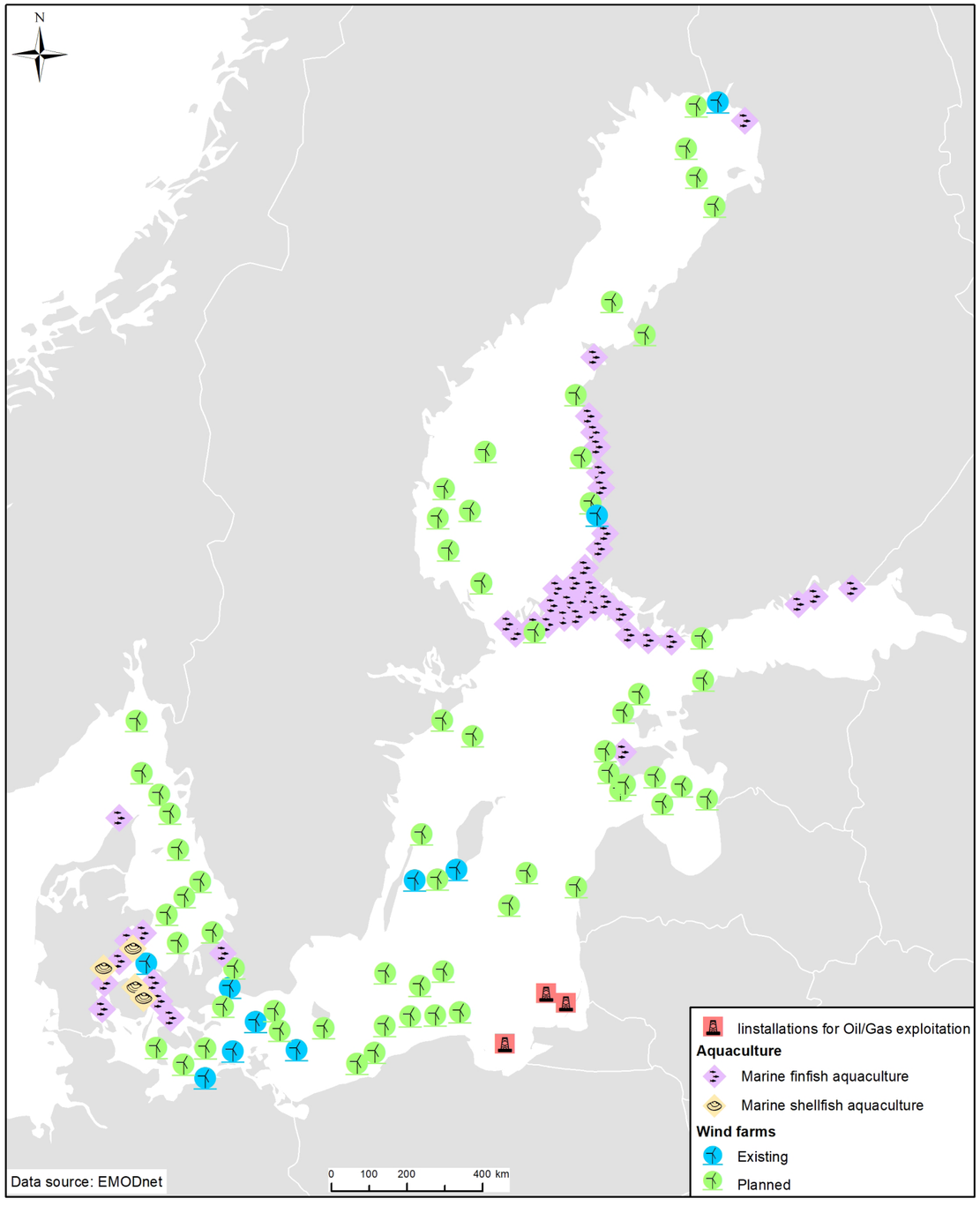


Fig. 5: Distribution of some marine and freshwater species due to salinity (Based on Fuhrman et al. 2004 and HELCOM 2010a).



The Baltic Sea has been an important route for maritime trade, cargo ships come by all water routes exporting and importing goods from all over the world. Nonetheless, the tourism routes also developed over time, from ferries to cruise ships taking passengers across the Baltic Sea. Tourism also developed in each country around the coastline, including spa, sun bathing, recreational homes, restaurants, etc.
Apart from all the goods, renewable energy is also an important natural resource of the Baltic Sea region. So far wind farms are the most efficient renewable offshore energy. Since there are higher wind speeds offshore than over land, the offshore wind farms generate more electricity per amount of capacity installed. In the Baltic seabed there are some oil and gasses areas that lie in rock formations beneath the seabed. Thus far is several large structures, which helps to extract and process petroleum and natural gas. Fisheries and aquaculture have been developed in the region. The largest are maintained by Denmark, Germany, Sweden and Finland.

Fig. 6: Wind farm, fisheries and aquaculture, oil and development in the Baltic Sea.

LEARN MORE:

http://stateofthebalticsea.helcom.fi/in-brief/our-baltic-sea/

https://www.researchgate.net/figure/Oil-pollution-endangered-areas-on-the-Baltic-Sea-main-oil-terminals-and-their-volumes_fig1_284624895

https://nordregio.org/maps/fish-catch-and-aquaculture-2016/

https://www.researchgate.net/figure/Operating-offshore-wind-farms-in-the-Baltic-Sea-as-of-June-2020-the-majority-of-them_fig1_348297303

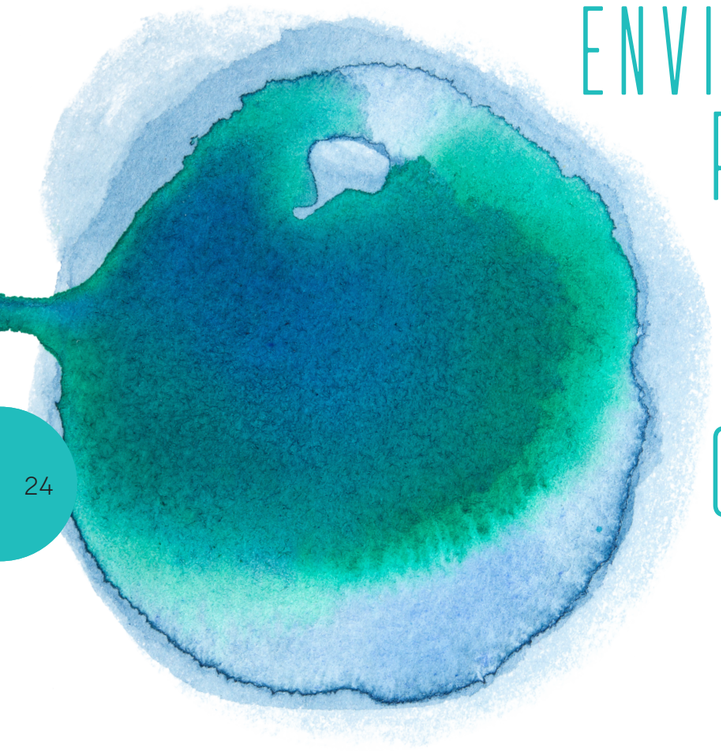
2.4. Baltic Sea - morphometry, hydrology, climate

The Baltic Sea is a relatively shallow inland sea in north-east Europe, surrounded by the coastlines of Sweden, Finland, Estonia, Latvia, Lithuania, Russia, Poland, Germany, and Denmark.

Fig. 7: Baltic Sea and its drainage basin.
© HELCOM, 2017

It is a semi-enclosed sea which was formed after the last glaciation as the ice retreated about 10 000 years ago. Its geomorphology was formed by the glacial and the geological uplifting of land after the glaciation. When the ice of a glacier started to melt, a freshwater Baltic ice lake was established. Due to the further sea level change, the Baltic sea has established 3 more water body formations until present day. During these phases the hydrology, biodiversity, and morphology were changing, too.

Despite generally being a shallow water body, Baltic comprises three deep basins: The Arkona Deep inside the entrance to the Baltic Sea, the Bornholm Deep and the Gotland Deep farthest inwards. The shallow parts between Sweden and Denmark provide a limited water exchange with the North Sea, with full exchange of its water masses estimated at 25-30 years.
In a view of the geological formations, the Baltic Sea became one of the largest brackish inland seas by area. Due to the slow water exchange the salinity gradient is evident across the Baltic, from the almost oceanic conditions in the northern Kattegat to the almost freshwater conditions in the northern Gulf of Bothnia. Saltier, heavier and oxygen-rich water from the North Sea enters the Baltic Sea through the shallow, narrow entrance and travels to the deeper regions, while a counter current of freshwater flows outwards at the surface. The freshwater generates an outflowing low-salinity surface current towards the Skagerrak and the North Sea. Most of the water input comes from rivers, with both seasonal and long-term variability. Continuing westerly winds can generate large short-term inflows of higher salinity. This stratification (division of salinity through the water column) significantly limits the passage of oxygen from the surface into deeper waters, which causes the dead zones (conditions of low oxygen or even anoxia).
The whole Baltic Sea region is situated in a temperate climate zone. Annual mean temperature increases gradually from north and east to south and west. The middle and northern areas have longer winters with stronger frosts, whilst the southwestern and southern areas have relatively moist and mild winters. The northern part of the Gulf of Bothnia (Bothnian Bay), the coastal zone down to the Åland Sea, and the inner parts of the Gulf of Finland and the Gulf of Riga usually become completely ice-covered in January, which makes Klaipeda the last ice-free port in the area.



3. ENVIRONMENTAL PROTECTION – INCL. THE GREATEST CHALLENGES OF THE 21ST CENTURY

3.1. Sustainable development goals

Pollution in the ocean is a major problem affecting the Earth. It affects ocean organisms, people's health and other areas of life. Oil spills and dumping toxic waste and other harmful materials into the sea are all major sources of pollution in the ocean. The international community has formulated rules and regulations and concluded a number of international conventions that comprehensively address the protection and preservation of the marine environment.

In 2015, the international community prioritized "Life below water" as Sustainable Development Goal 14. It sets goals for international policy focused on preserving coastal ecosystems and supporting more sustainable economic practices for coastal communities. To avoid significant adverse impacts the goals by 2020 were to sustainably manage and protect marine and coastal environments, in order to restore fish stocks and regulate harvesting, overfishing and prohibit certain forms of fisheries subsidies, and conserve at least 10 percent of coastal and marine areas. By 2025 main goals are: to prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution.

By 2030 the international community is ready to increase the economic benefits to Small Island developing States and least developed countries from sustainable fisheries, aquaculture and tourism. Thus far, the main goals are to minimize and address the impacts of ocean acidification, increase scientific knowledge, develop research capacity and transfer marine technology, provide access for small-scale artisanal fishers and implement international law.

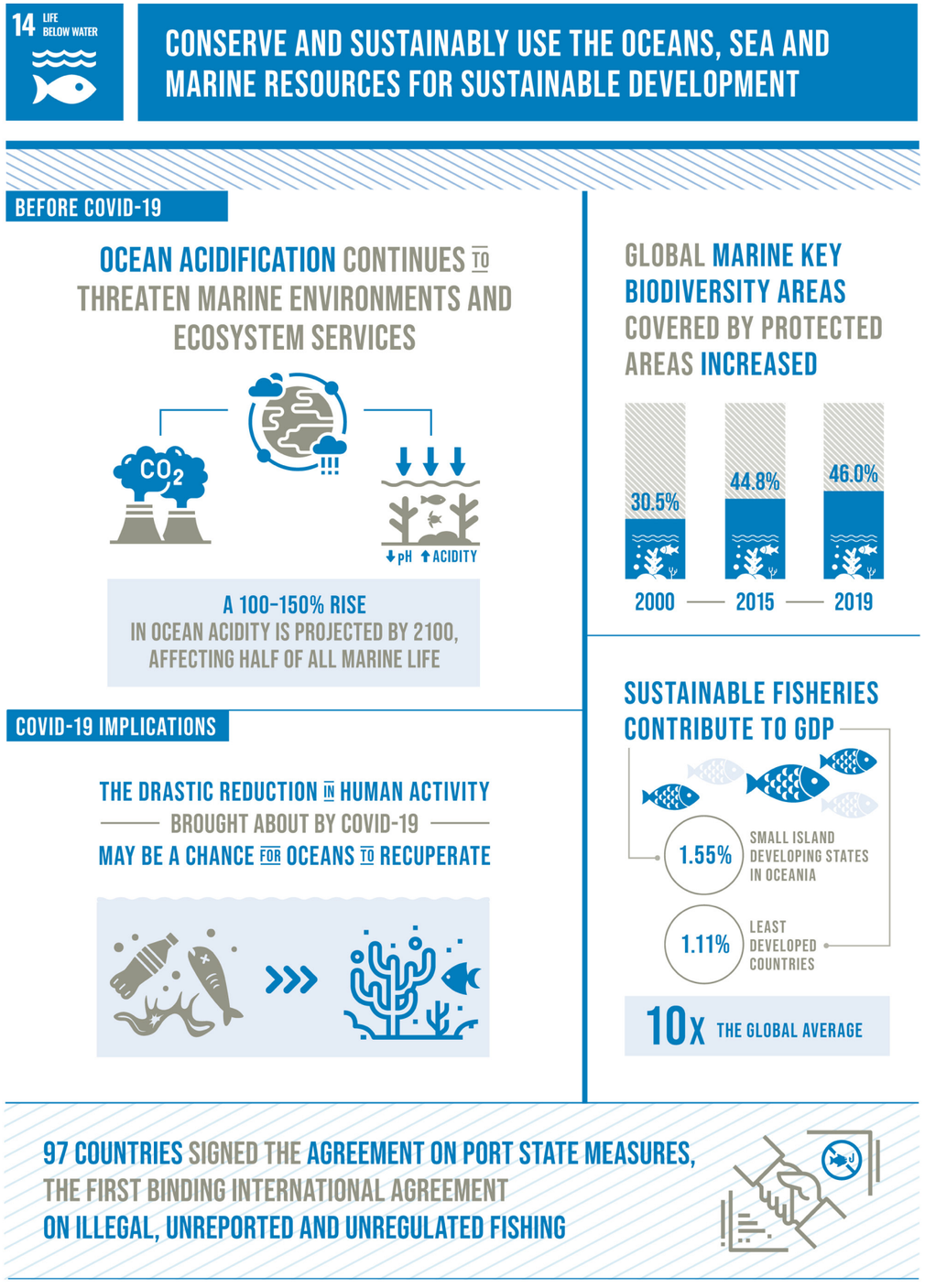


Fig. 8: Goal 14 of sustainable development.

Likewise, the United Nations has declared 2021-2030 the UN Decade on Ecosystem Restoration, but restoration of coastal ecosystems has received insufficient attention. For open ocean and deep sea areas, sustainability can be achieved only through increased international cooperation to protect vulnerable habitats. Establishing comprehensive, effective and equitably managed systems of government-protected areas should be pursued to conserve biodiversity and ensure a sustainable future for the fishing industry.

Apart from global actions we all can achieve great goals with our small actions. Sustainable habits on board can be hard, but still we can fish sustainably by avoiding overexploited species, release those undersized fish back to the water. We can reuse the old sails and make any kind of bags and backpacks, furniture like lamp covers or tablecloths. There are many ways to use your ropes too, like plant pots holders, jewelry. We can all be better with a little bit of creativity.

Fig. 9: Examples of upcycling the sails.

LEARN MORE:

http://www.un.org/sustainabledevelopment

3.2. Climate change - IPCC report, global and regional perspective

All people on Earth depend directly or indirectly on the ocean. Climate change poses a serious threat to life in our seas, mostly to the most vulnerable coral reefs and fisheries. It also has an impact on marine ecosystems, economies and societies, especially those most dependent on natural resources. The risk posed by climate change can be reduced by limiting global warming to no more than 1.5°C. All life in most of the world ocean, from pole to pole and from sea surface to the abyssal depths, is already experiencing higher temperatures due to human-caused climate change. The world ocean has been warming unabatedly since the 1970s and has taken in more than 90% of the excess heat in the climate system. Based on the IPCC Fifth Assessment Report the rate of ocean warming and thus heat uptake has more than doubled since 1993. By absorbing more CO2, the ocean has undergone increasing surface acidification. The ocean has taken up between 20 and 30% of total anthropogenic CO2 emissions since the 1980s which caused further ocean acidification. Open ocean surface pH has been declining by a very likely range of 0.017–0.027 pH units per decade since the late 1980s. Due to anthropogenic climate change we are observing increased precipitation, stronger winds and extreme sea level events associated with some tropical cyclones, which has increased intensity of multiple extreme events and associated cascading impacts. Coastal ecosystems are affected by ocean warming, including intensified marine heatwaves, acidification, loss of oxygen, salinity intrusion and sea level rise, in combination with adverse effects of current human activities on ocean and land.

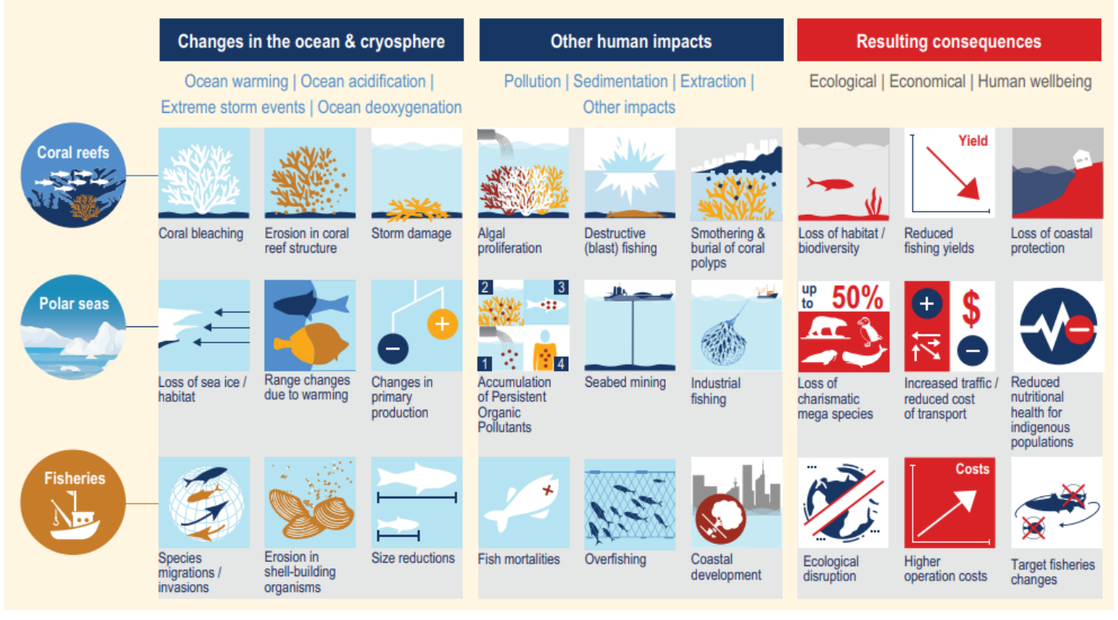


Fig. 10: Summary diagram of the impacts and resulting consequences of climate change (ocean warming, acidification, extreme weather conditions and deoxygenation) and other human impacts on coral reefs, polar seas, and fisheries. (Bindoff, 2019)

In many places that increase may be barely measurable. In others, particularly in near-surface waters, warming has already had dramatic impacts on marine animals, plants and microbes. Due to complex changes in seawater chemistry, there is less oxygen left in the water (in a process called ocean deoxygenation). Seawater contains more dissolved carbon dioxide, causing ocean acidification. Non-climatic effects of human activities are also common, including overfishing and pollution. Whilst these stressors and their combined effects are likely to be harmful to almost all marine organisms, food-webs and ecosystems, some are at greater risk.

The consequences for society can be serious unless sufficient action is taken to constrain future climate change.

3.3. Biodiversity of Baltic ecosystems

The term biodiversity is simply a short version of the two words ‘biological diversity’ coined by Edward O. Wilson in the 1980s. The concept embraces not only the variety of living organisms but also the genetic diversity within species, as well as the diversity of habitats and landscapes. The formal definition given by the Convention on Biological Diversity is that “Biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they a are part of; this includes diversity within species, between species and of ecosystems”.

Geologically, the Baltic Sea is very young. The current brackish water form of the Baltic Sea was initiated only around 2,000 years ago (Emeis et al. 2003). Most of the species of marine origin in the Baltic Sea originate from the time when the sea was saltier, and since then they have had limited genetic exchange with their counterparts in fully marine waters. The brackish water imposes physiological stress on both marine and freshwater organisms, but there are also several examples of genetic adaptation and diversification (Johannesson and André 2006). Although marine species are generally more common in the southern parts, and freshwater species dominate in the inner and less saline areas, the two groups of species create a unique food web where marine and freshwater species coexist and interact. The Baltic Sea with salinity levels and climate conditions close to the current state has existed for about 3000 years. In recent decades, increased anthropogenic pressure on the Baltic Sea marine environment has contributed to considerable changes in biodiversity. There are also a few cases of extinction of species in

the recent history of the Baltic Sea. The best-known example is that of Atlantic sturgeon (Acipenser oxyrinchus). After a period of over-exploitation of fisheries, it has only been observed occasionally since the 1960s (Paaver 1999). Because of the open link to the North Sea, there were also a number of marine species that had occasionally migrated into the Baltic Sea but are absent or rarely observed at present.

Currently, there are a total of 59 species and 16 biotopes that are considered as endangered and/or declining in such a way that their future sustainability depends on protective measures (HELCOM 2007b). The biodiversity of the Baltic Sea is valuable as such, but it also provides a variety of goods and ecosystem services. Nutrient recycling, water and climate regulation, production of fish and other food items as well as high quality of life and recreational opportunities are among the ecosystem services provided by the Baltic Sea (Rönnbäck et al. 2007).

The Baltic Sea was estimated to be among the most productive ecosystems, with much of the area providing services with an annual worth in the range of 2 000 to 3 000 US dollars per hectare (Costanza et al. 1997). Ecosystem goods and services also include a number of benefits that are not directly valuable to humans. These include the features and processes that are important for the maintenance of the ecosystem, such as provision of habitats and resilience or capacity of the ecosystem to withstand changes (Beaumont et al. 2007). The significance of 'diversity' is highlighted by its role in supporting the capacity of the ecosystem to adapt to changing conditions.

3.4. Pollution of marine environment

3.4.1. Antifouling – choose an eco-friendly alternative!

Choosing an environmentally friendly method for antifouling is one of the most essential things a leisure boater can do for the Baltic Sea. Antifouling, in other words, the prevention of having different organisms settle on the boat hull, is highly important for ensuring a smooth ride and avoiding excess use of fuel during a sailing trip as it reduces the friction caused by clinging marine organisms. Fouling organisms include hard shell organisms, such as barnacles and mussels, as well as algae, that form a slimy surface, called a biofilm, on the hull surface. In addition, keeping the hull clean minimizes the risk of your boat ending up as a form of transportation for non-indigenous species that may be extremely harmful when spread to a new habitat.

Different strategies exist to prevent biofouling. The most common option is the use of biocidal antifouling paints, that are deadly not only to the organisms trying to attach themselves to the hull, but to other marine organisms as well. The paint constantly releases biocides such as copper and zinc. Several studies have shown that these biocides have a clear negative effect on marine organisms, soils, and humans (Bonus Change – project, 2014-2018). For example, the reproduction of bladder wrack and blue mussel, key species of the Baltic Sea, is disturbed by biocides. Studies conducted by the Bonus Change project show that not only are antifouling paints often used needlessly, but several paints also contain biocides in unnecessarily large amounts for the Baltic Sea.

The use of alternative methods for keeping the hull clean is highly recommended to decrease the influx of harmful substances in the Baltic Sea. For small pleasure craft, physical methods such as scrubs, scrapers and boat washers are certainly enough to keep the hull clean during the boating season. Other methods include ultrasound devices to prevent barnacles and mussels from attaching to the hull or you can simply take the boat out of the water when it is not in use.

In case you still choose to paint your boat, it is very much recommended to use non-biocidal paints or paints with the lowest possible concentration of biocides. The boat does not need to be painted every year. Patch painting (painting only the damaged parts) or painting only the surface line reduces the amount of paint needed.

Tip: Clean the bottom of your boat before the barnacles reach their adult form. You can check if you have to clean your boat already by simply touching it: when the hull under the waterline changes from smooth to rough, it is time to clean it.

Fig. 11: It is recommended to brush or scrape off the barnacles from the boat hull. / Keep the Archipelago Tidy Association

Fig. 12: Boat cleaning with a brush and a water hose. / Keep the Archipelago Tidy Association

Fig. 13: Boat cleaning with a pressure washer. / Keep the Archipelago Tidy Association

3.4.2. Marine litter: what to do, where to report?

Marine litter is one of the biggest issues in the oceans and one of the most trending environmental topics in popular science. Most of us have probably seen gruesome images of marine mammals and birds tangled in plastic, as well as huge garbage islands in the Pacific Ocean. The situation in the Baltic Sea is not quite as bad, but we still share many of the same problems as the larger bodies of water.

Most of the marine litter in the Baltic Sea consists of plastic, especially single-use plastic items. Cigarette butts, take-away packaging, plastic wrappers are just a few examples of the dominant categories lying on our beaches. Plastic is such a popular material due to its cheapness and durability, but also because of these traits it's not appreciated enough to be disposed of properly.

Plastic causes problems when it gets into the natural environment: it does not decompose, but breaks into small, eventually microscopic pieces called microplastic, that never disappear completely. Plastic litter in all sizes can cause animals' death by starvation or suffocation. Plastic bags can block digestive organs of a whale, and microplastic can do the same to plankton. It has also been observed in preliminary studies that plastic particles are able to pass cell membranes and cause inflammatory reactions (CORDIS). Some plastic contains chemicals that could disturb hormone systems and cause cancer. Plastic can also absorb chemical pollutants from surrounding waters, and therefore it could act as a potential carrier of these chemicals when entering organisms.

Most litter, roughly 80%, originate from land-based sources, with most of it deriving from activities involving human consumption at or near the coastline. 48% of marine litter in the Baltic Sea is household-related waste, and 33% originates from tourism and recreational activities (MARLIN project, 2011-2013).

There are several pathways for litter to find its way into the water. In the Baltic Sea, data from beach litter monitoring tells us that one of the most significant pathways is direct human activity, in other words litter is dumped or misplaced during our everyday activities. Infrastructure, such as storm water drains and sewage systems, may greatly affect litter ending up in the waterways. Runoff water may carry litter to the nearest river or ditch, where it is eventually washed into a natural body of water (BLASTIC project, 2016-2018).

The easiest way to prevent littering onboard is to take care of one's own litter and make sure that it is disposed of correctly. Even though it might seem like a small thing to do, it makes a huge difference. If you want to go an extra mile, organize a beach clean-up by yourself or with your friends. Be sure to check beforehand how to transport and dispose of the collected litter properly, since it often is the responsibility of the clean-up organizer. Also, remember to observe bird nesting periods, which usually happen in the spring. Ensure that you know whose land you are on and, if necessary, request permission to hold the clean-up event. Check your local organizations if they can offer some tips or support in organizing your clean-up. Provide bags and gloves, even litter-pickers if possible. Some organizations or authorities are happy to receive citizen-science reports of the litter found on beaches. For example, Keep the Archipelago Tidy Association has a Clean Beach application for reporting collected litter in Finland. The reports help gain information about littering, and furthermore increase knowledge about where the litter comes from. If there is no national report system available, you can contact local authorities and inform them of places where the amount of litter is considerable.

3.4.3. Eutrophication

Many of us heard the term “eutrophication”, which is considered as one of the main threats to the Baltic Sea. But are we really familiar with what is hiding beneath this term and how each of us could help combat it?

In the Britannica dictionary, eutrophication is defined as “the gradual increase in the concentration of phosphorus, nitrogen, and other plant nutrients in an aging aquatic ecosystem such as a lake”. Although Baltic Sea is not a lake, but its physical-geographical characteristics, i.e., being a landlocked, shallow shelf sea with low-saline brackish water (a unique mix of salty water from the ocean and fresh water from the rivers) surrounded by nine directly bordering countries makes it very vulnerable to various natural and anthropogenic (caused or influenced by people, either directly or indirectly) impacts. And one of those impacts is eutrophication, which leads to “cloudy” water, the excessive growth of blue-green algae (including harmful ones), oxygen depletion on the seabed (when algae die, they sink to the bottom, where their decomposition consumes oxygen from the water creating “dead zones”), loss of biota and even fish kills.

According to HELCOM, the inputs of nitrogen and phosphorus have been increasing for a long time in the Baltic Sea (especially between the 1950s and the late 1980s) causing eutrophication symptoms of increasing severity to the ecosystem. The main causes of eutrophication are: waterborne loads, coming from inland via rivers and direct discharges from the coast (this is how nutrients are released to the sea). The two most significant sources of waterborne nutrient loads come from agriculture and urban waste water (Helcom, 2011). Climate change also has an influence on worsening the situation, i.e., shorter and wetter winters will lead to less snow and ice cover, increased rainfall and thus to a greater run-off from rivers’ catchment areas. This will result in increasingly high nutrient loads entering the sea (BACC II, 2015). In addition, increased sea temperatures will provide better conditions for the growth of algal blooms and will also lead to a prolonged growing period (ECA, 2016). As a response to the deteriorating development, many actions to reduce nutrient loading were agreed on by the Baltic Sea countries. But what one should understand – that the governments themselves, without our help and understanding, are unable to fight against eutrophication. Although we cannot immediately stop climate change – we can mitigate it; we cannot completely abandon agriculture – but we can reduce the nutrient load arising from human activity. Even small things matter. Several ideas, how we can lessen our impact on the eutrophication of the Baltic Sea:

- Just being aware of the chemicals and/or fertilizers we are using, e.g., purchase soaps and detergents that don’t contain phosphates or use alternative products which don’t contain phosphates or other nutrients, but work just as well as traditional ones.
- Food waste is generated in all types of galleys and dining areas. And as scientific research results have shown “food waste discharged into the Baltic Sea can contribute to eutrophication processes during structural degradation in water” (Kalnina et al., 2021). What one can do is reduce food waste while planning meals, and to “transform” food waste - when nutrients are recycled within food production, they do not end up in water bodies.
- Not all water is sea life friendly and coastal areas are the most vulnerable. Maintain your septic tank regularly. Even though the regulations allow ships to legally discharge a broad range of wastewater and food waste into the Baltic Sea, always use pump out facilities where they are available, and if in a country where pump out is not available, always discharge far from shore and in deep water where the impact will be reduced.

And read more about it in the following chapters:

3.4.4. Wastewater and how to manage it

Eutrophication is one of the biggest problems of the Baltic Sea. One of the sources of nutrients causing eutrophication are the boats’ wastewaters. These wastewaters include “black waters” which come from toilets and contain fecal matter and urine, and “gray waters”, which include untreated water from showers, sinks and cleaning.

The black waters cause a concentrated load, particularly in harbors and shallow bays. Urine contains abundant nitrogen and phosphorus, and the nutrients that are already in a form that can be easily absorbed by plants. Excrement contains less nutrients, but it can spread bacteria, which are health hazards, especially in shallow waters during the warm months of summer.

The leisure boat wastewater legislation varies in the countries around the Baltic Sea. In Finland the release of sewage into waterways has been prohibited by law since 2005 and in Sweden since 2015. All boats equipped with a marine toilet should also be equipped with a pumpout system. The waste is stored in a septic tank aboard the boat and is emptied later by using a septic pump. This ensures that the sewage is processed at a water purification plant instead of being dumped and causing eutrophication of waterways.

When planning a boating trip, it is important to check the location of pumpout stations on the route beforehand. There are many different types of sewage pumps, such as floating or onshore pumpout stations. Pumpout stations can usually be found in well-equipped marinas and popular waterways. Remember to check if the stations are publicly available for all users and if you should be prepared to pay for using it. There are a couple of national applications and websites showing a map of pumpout stations in Finland and Sweden. Also, several marinas share information of provided services on their websites. Most pumps operate in basically the same way, but it is important to read the instructions for each pump thoroughly before use.

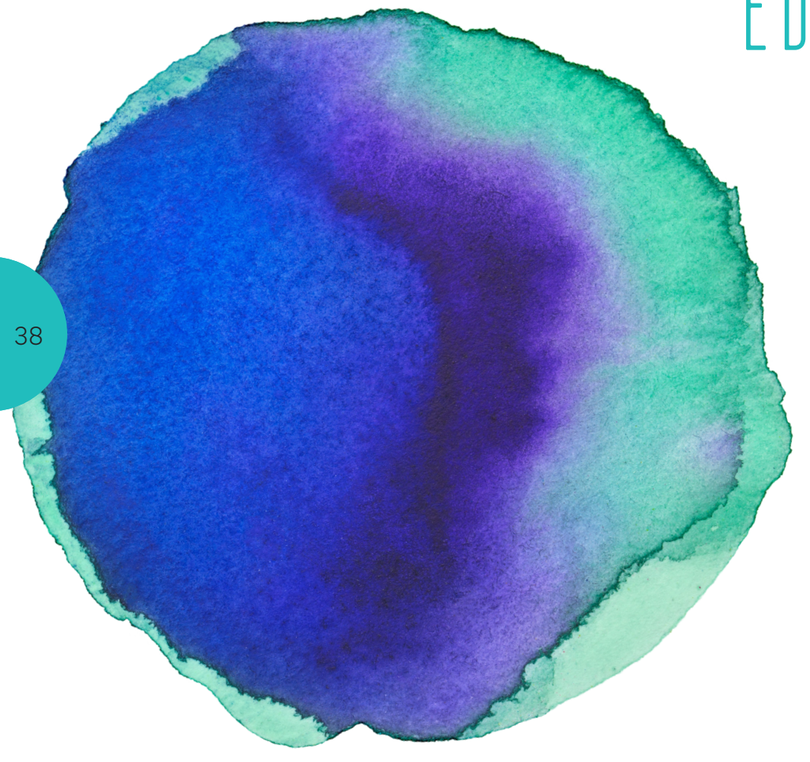
Fig. 14: Emptying the boat's septic tank.
/ Keep the Archipelago Tidy Association

Gray water originates from cleaning your boat, washing dishes, or cleaning yourself. Protected inner bays where water changes slowly are particularly vulnerable to the release of unfiltered gray water. It is recommended for the gray water produced by boaters to be collected in a separate container or septic tank until it can be disposed of properly. Even if there is no possibility to obtain a container on your boat, you should never let the grey water into the sea.

Make use of any dishwashing facilities, showers or filtering systems located on land rather than washing anything aboard your boat. If there is none of these alternatives available nearby, pour the greywater on the ground a little further away from the shoreline, since the soil has more bacteria that can break down the detergents. The surfactants of grey waters generally break down rapidly in nature, but to marine life they are poisonous. Moreover, if you need to use a washing agent, choose an environmentally friendly, phosphate-free product. Phosphates accelerate the eutrophication of waterways. When selecting cleaning agents, remember that mild agents are usually sufficient. Also try to avoid an excessive use of these agents, more detergent does not always guarantee a better effect.

Fig. 15: Try to always wash your dishes on land and never let the gray water into the sea.
/ Keep the Archipelago Tidy Association

4. ENVIRONMENTAL EDUCATION



4.1. Ocean literacy - attitude, awareness programmes

The Ocean is under unprecedented local and global challenges (IPCC). This increasing destruction and pollution subsequently threatens humankind by putting the countless services provided by marine ecosystems at risk. In the face of global issues such as ocean warming and acidification, only collective actions can lead to the needed mitigation and adaptation of the right measures.

Over the past two decades marine research and education have been improving. More knowledge on marine physics, biodiversity, energy exchange, human impact, environmental issues and others formed today's Ocean Literacy. The International Ocean Literacy Survey (IOLS) aims to serve as a community-based measurement tool that allows the comparison of levels of ocean knowledge across time and location. Ocean Literacy is the 'understanding of the ocean's influence on you and your influence on the ocean' (Cava et al., 2005). Various types of literacy, such as science literacy, digital literacy, environmental literacy or ocean literacy point to skills that are essential in our time and that not only include but go beyond reading and writing in their literal sense.

In 1975 UNESCO defined the Ocean Literacy as a:

- Awareness: to help social groups and individuals acquire awareness of and sensitivity to the global environment and its allied problems.
- Attitude: to help social groups and individuals acquire a set of values and feelings of concern for the environment, as well as, the motivation to actively participate in environmental improvement and protection.
- Skills: to help social groups and individuals acquire the skills for identifying and solving environmental problems.
- Participation: to provide social groups and individuals with an opportunity to be actively involved at all levels in working towards resolution of environmental problems (Fauville, 2019).

Ocean Literacy includes three dimensions: knowledge, communication, and decision-making.

LEARN MORE:

https://oceanliteracy.unesco.org/

4.2. Psychology behind the environmental crisis

It does seem fairly reasonable to assume that sailors have a thing for nature. Their sensibility to the captivating beauty of the sea is, after all, not only of aesthetical kind, but also very pragmatic: to be able to observe, understand and react is to make it home safe.
Seas, oceans, rivers, skies and winds have all been animated or even personified, described, painted, metaphorized, and romanticized. This may become quite a starting point for reflection on human relationship with the environment.
By now it is difficult not to be familiar with the topic of the environmental crisis. There is something so intangible about it, though. If we hear of an acquaintance's relative's death, we feel sorry for them and sympathise, but we do not mourn. If it is our own kin, we grieve. And emotional it is.

For a lot of people, to be aware of the deep environmental crisis today is like being aware that everybody is going to die - we realize that, it is sad, but life goes on. There is another side of the spectrum as well. Those who suffer from the feeling of hopelessness and helplessness. Those who feel deserted and misunderstood when trying to tear the veil of indifference of their fellows. And yet, even if that seems cruel, despair will fix nothing. Environmental anxiety is a fact. Studies show that we have no basis to consider it one of types of pathological worry. Those emotions matter. And so do facts. Let us remember that not only are the two not contradictory. They are complementary, for to create an overall view of what is happening we need to balance between these aspects. We need to know how to act properly, so that our energy is directed in the right actions, and we need to feel the urge to continue. There is so much to do, but without the knowledge we may get caught up in a narrative that does nothing but calms the conscience.
Are there any simple ways to address this case? Probably not. An individual's position in a global problem is a multi-layered mix-up. By the time one has accomplished most of the milestones of "beginner's guide to be eco", ie. giving up on fast fashion, cutting down on meat, cycling to school or work, planting a tree and using reusable straws for drinks, the only conclusion is that this is simply not enough, and that there is way more to be done, but this is policy-makers' and corporations' job. There is an open end to it, and soon to find comfort and safety in our vision of the future will not be possible. Taking our surroundings for granted is no longer a viable option as the necessity to give up on anthropocentrism becomes apparent.

4.3. Effective teaching

Imagine that you are strongly devoted to an idea and wish to convince others to live by your values. Is it fair? Do you have the right to persuade (educate) people or should everyone live as they please?
When it comes to environmental issues, the answer seems to be simple. We all inhabit planet Earth, some call it home. Sooner or later, the problems of other homemates will be our problems as well. Emitting greenhouse gasses in some countries creates a worldwide increase in temperature. Polluting one river spreads over the entire ocean. There are other examples.
Assuming that environmental education is needed, how to teach effectively?
First, being an educator, we need to be reliable. Hypocrisy and pretending don't work in the long run in an education process.
Second, we must base the environmental teaching on facts, not opinions. There is a scientific method behind issues discussed here. Avoid unchecked materials, self-proclaimed "specialists", greenwashing actions etc. Use trustworthy sources i.e. university publications, articles from authorized magazines ("Science", "Nature") and official reports like IPCC or IPBES.
Next, we should be understandable. It means that the way of communication depends on recipients and circumstances. A different language is used at scientific conferences and different at meetings with local youngsters.
Finally, probably the most difficult task. You may know the famous sentence "Tell me and I forget, show me and I remember, involve me and I understand". Education process based on involvement is crucial as it is considered as deeper, more effective and self-propelling than "only" remembering facts. But how to involve people and let them understand? There are different ways and we don't need to judge which is better. Experiential education, scouting, sail training - all are closely related.
Common assumption is that we engage all the senses (things are seen, heard, tangible etc.), feel emotions (joy, wonder, sorrow, anxiety, compassion), think about it - reflection appears in our minds. Eventually we act (or not act) adequately to the situation.
Living this way makes life more profound, learning and teaching more effective. The effect is not only to solve environmental problems, but to be an integral part of the environment.
Detailed proposals of workshops are described in subchapter 4.5. Some of them are based on a following didactic scheme:
1. General objective
2. Specific goals
3. Method
4. Materials
5. Content
6. Assessment

4.4. Good practices in a field of ecology (daily life)

Different environmental sources suggest various ways for each person to make their lifestyles more sustainable both ecologically and socially. The main rule that should be followed is: "Reduce, Reuse, Recycle". There are various tips on how to act in order to help the environment, and the ones below are rather common and basic. There are more to be discussed during workshops.
1. Say "no ,' to single use items: instead of plastic or paper bags at the store, use handmade bags. Opt for reusable water bottles over disposable plastic water bottles.
2. Say "no" to industrial chemicals: Instead of harmful chemicals it is better to use biodegradable ones which are not harmful to the environment. Or use natural acids such as winegard or citric acid as all purpose cleaners.
3. Eat local products: based on environmental knowledge the best way to preserve the planet is to stop consuming animal products. It is suggested that by choosing food products, it is better to buy local and organic food.
4. If possible, use renewable energy in your household: depending on local weather conditions try to install solar, wind energy sources, or other devices to generate electricity from renewable resources.
5. Make your own environmentally friendly cosmetics, shampoo and deodorant. Most of the chemicals used in modern cosmetics, such as deodorants and shampoos, can cause health concerns. By making your own cosmetics, you can avoid health problems and save money.
6. Instead of buying new things for your home, try to find used ones: there are many pre-owned items that are in good condition: furniture, clothes, tools. You can also find a lot of lessons on the internet on how to renovate old items such as furniture or other things.
7. Try to be a more socially responsible consumer: By buying less, you reduce your ecological footprint. Buy products that are Fair Trade certified. These types of companies declare that their employees earn fair wages and have decent working conditions.

LEARN MORE:

https://www.healtheplanet.com/

https://www.globalcitizen.org/

https://www.goodenergy.co.uk/

https://cnz.to/recipes/round-ups/super-easy-diy-natural-cosmetics/

4.5. Proposal of workshops

4.5.1. Topic I: Physical oceanography and marine environment of the Baltic Sea

Introduction to the Physical Oceanography of the Baltic Sea and its Marine Environment.
Theory: The Baltic Sea is a unique brackish water sea, a small, shallow basin, which is connected to the oceans through the narrow Danish Straits. It has a long water residence time. Water exchange through the Danish Straits is restricted: brackish water has salinity values of 1/5 of oceanic values. The Baltic Sea has been under heavy anthropogenic external loading of nitrogen and other pollutants. Only from 1970's onwards the interest to improve the state of the sea as well the concern about its future has started to grow. The functioning of marine ecosystems and the existing interactions there are often difficult to understand. Many factors, like increasing algae blooming, related to general eutrophication and worsening of the water quality, are related to interaction of physical, chemical and biological processes in the sea. Physics determines the external conditions in which the biogeochemical processes take place. Thus, the physical properties of the sea and knowledge of the processes in the Baltic Sea form the basis for a comprehensive understanding of the functioning of the Baltic Sea system.
Background: additionally read the Baltic Sailor Catalog, chapters 2.4. Baltic Sea - morphometry, hydrology, climate and 3.3. Biodiversity of Baltic ecosystems.

Split into two groups and discuss questions below:
Group A. Discussion topic:
Baltic sea morphometry, hydrology, climate
Group B. Discussion topic:
Biodiversity of Baltic ecosystems

Questions for Group A.
1. When did the Baltic Sea finally form?
2. Distinguish the three main basins of the Baltic Sea?
3. The Baltic Sea is semi-enclosed, how long does it take for its water masses to completely change?
4. Which island in the Baltic Sea is the largest?
5. How deep is the Baltic Sea at its lowest point?

Questions for Group B.
1. What is the main factor impacting the Baltic Sea biodiversity?
2. How long have the current salinity levels exist in the Baltic Sea?
3. Are there any differences in biodiversity of the Baltic Sea in the south and north parts?
4. How many species are considered as endangered and/or declining in the Baltic Sea?
5. Please identify what are the main ecosystem services provided by the Baltic Sea biodiversity?

After the discussions in the groups, a general discussion about the Baltic Sea should be planned, considering the answers given in the groups. The main task of the general discussion should be to reach a conclusion on how the interaction of Baltic Sea morphometry, hydrology, and climate affects the biological diversity of Baltic Sea ecosystems.

4.5.2. Topic II: Marine heritage

Theory: The region once was an important trade route, with rich cities and developed ports. Now it holds the history via preserved places, ships, tools, etc. Maritime heritage is still an undiscovered mystery in many Baltic countries. One of the reasons is that information on maritime heritage is scarce and often not easy to obtain. The use of maritime education in schools and universities could help to raise awareness of the importance of maritime heritage and the threats to its preservation due to the increasing use of marine areas. There are different types of maritime heritage, according to BalticRIM research, the general categories of maritime heritage protected in the Baltic Sea area are: wrecks, burial sites, stone or wooden structures/foundations, fortifications. During the visit to the Maritime Museum of Klaipėda, the group will visit: Nerijos fortas, the exhibition of historical boats and anchors, and will get to know the history of Lithuanian shipping.

Practice: During the stops at different ports visit local maritime museums or/and other attractions related to maritime culture. Discuss among the participants what new information you found out, how the history of different port cities is similar, and what are the main differences.

4.5.3. Topic III: Coastal processes

Theory: The main coastal features in the Baltic Sea region are sand or gravel spits with diversified dunes, cliffs cut in a variety of sediments and low-lying areas such as lagoons, wetlands and salt marshes. Most Baltic Sea coastlines and coast types were formed during the last deglaciation and the subsequent Holocene sea transgression. The Baltic coasts are susceptible to wind and wave impacts, including storm surges, and destructive forces which cause shore erosion. Coastal dune systems in the southern and the eastern parts of the Baltic Sea coast have been heavily degraded over the last centuries, following the exploitation of their natural resources, settlement expansion, and industrial growth. The largest and longest sandy coasts are found at the southern and the eastern coasts of the Baltic Sea. The shoreline there is mainly straight and the dunes form due to its exposure to frequent winds. There are large inland forms and long barriers exposed to erosion by westerly and north-westerly storm surges. The coasts exposed to the East (e.g. the Gulf of Gdańsk and the Island of Rügen barriers) usually feature very low dunes and are mainly devoid of larger inland forms. The south-facing coasts show smaller foredunes as well (e.g. in Scandinavia). The scarcity of sand material in the western part of the Baltic coast has resulted in a diversified coastline covered by low dunes (e.g. Denmark, Germany, western part of the Polish coast). Some of the barriers developed due to sandy cliff erosion, others were formed on account of river discharges. In the northern part of the Baltic Sea, dunes are narrow, and a sandy coast is rare; however, due to the land uplift, a new sandy coast emerges mainly in narrow bays featuring river mouths.

Characteristics of Coastal Types Around the Baltic Sea: Sweden: narrow sandy coasts with low dunes in the region of Scania. **Denmark:** rare and scattered stretches of sandy coast and low dunes. **Germany:** diverse shores with scattered dune coasts. **Poland:** a coast abounding in dunes, with high-dune formations. **Russia's Kaliningrad Zone:** extensive dune shores of long spits. **Lithuania:** shifting dunes on the largest sandy spit. **Latvia:** long sandy coasts with diverse dune formations; **Estonia**: scarce sandy coasts, narrow bay barriers; **Finland:** very sparse dunes – sandy spots on narrow uplifting promontories;

Fig. 16: Coastal types of the Baltic Sea. **a** Skerries in the Gulf of Finland, Finland; **b** Igneous rock, low coast shaped by glaciers, Helsinki, Finland; **c** Low coast of glacier boulders, northern Estonia; **d** Wetlands in southern Sweden near Malmö; **e** Rocky, chalk cliff covered by moraine sediments with an abrasive platform instead of beach, Rügen Island, Germany; **f** High-eroded cliff–klint coast in Estonia; **g** High soft moraine cliff coast of tills and fluvioglacial sands, Wolin Island, Poland; **h** Typical cliff coast of tills and clays of moraine deposits, landslides on the beach caused by ongoing storm surge, Sambian Peninsula, Kaliningrad region, Russia; **i** Low eroded coast without dune ridges in Heiligendamm, Germany; **j** Low coast of end moraine deposits covered by sands, Latvia; **k** Retreating dune coast entered and covered peatbog, Kolobrzeg, middle Polish coast; **l** Sandspit dunes: shifting inland with typical accumulative foredunes, Lebsko Lake Sandbar, Poland (Photo copyright by Tomasz Labuz) Łabuz, T.A., 2015. Environmental Impacts—Coastal Erosion and Coastline Changes, in: The BACC II Author Team (Ed.), Second Assessment of Climate Change for the Baltic Sea Basin, Regional Climate Studies. Springer International Publishing, Cham, pp. 381–396. https://doi.org/10.1007/978-3-319-16006-1_20

Practice ①: Every beach has a story. During the voyage, a different type of coast will be introduced, and all participants will be able to identify the type of coast and the processes and factors that affect them.

Additional task: Initial assessment of the beach "health" by looking at the beach and sand.

- Wide beach/very fine sand – the beach is healthy and growing (accumulation).
- Beach with escarpment and predominant coarse sand – the beach is at medium risk (erosion).
- Narrow beach with the coarse sediments (Lots of gravel/pebbles) – the beach is at risk (highly eroded).

Fig. 17: Examples of Baltic Sea beaches with different "health".

4.5.4. Topic IV: Weather routing

General objective:
Ability to behave adequate to weather conditions

Specific goals:
a. understanding the global atmospheric circulation
b. knowledge of weather system elements
c. ability to observe and determine current weather conditions
d. ability to prepare weather routing based on weather forecast

Method:
presentation, observation, practical individual work, discussion

Materials:
smartphone with internet connection, paper, pen; extra option if available on sailing yachts: NAVTEX, navigation charts, barometer, anemometer, Admiralty List of Radio Signals Publication

Content:
1. Introduction (5 min.)
2. Presentation. Global atmospheric circulation (10 min.)
3. Discussion. Difference between climate and weather (5 min.)
4. Presentation and observation. Basic weather elements: pressure, wind force, wind direction, state of sea, visibility, precipitation (15 min.)
5. Presentation. Creation of low pressure systems in medium latitudes (5 min.)
6. Presentation and observation. Sources of meteorological data (20 min.)
7. Discussion. Heavy weather sailing - how to avoid, how to adapt? (10 min.)
8. Instruction to practical part - weather routing (5 min.)
9. Practical individual work - guided or independent. Prepare a 5 days long sailing route on a Baltic Sea based on an actual weather forecast. Choose the port of departure, arrival and two visiting (along the way) ports. Establish details: TWA (True Wind Angle) not less than 60 degrees, TWS (True Wind Speed) not more than 30 knots, time in each port - 8 hours. Weather forecast source: windy.com (30 min.)
10. Presentation of routes proposed by participants of workshops. Discussion on strengths and weaknesses of each strategy (30 min.)

Assessment:
Teacher's comment on each strategy concerning safety and effectiveness (15 min.)

4.5.5. Topic V: Planet Earth Simulator

Sailing ship with a crew can be seen as a simulator of a planet with inhabitants. The ship contains limited resources of fuel, water, gas or food. The same is with planet Earth. Therefore crew (inhabitants) must define the limits of resources, learn how to manage it responsibly to meet the needs of the population (crew). Sooner or later resources are going to run out. This is a turning point in discussion about how to avoid it.

Proposal of workshops:
Day 1 - introduction to the topic (above), presentation of resources on a yacht - types (fuel, fresh water, gas, food), capacity (volume), characteristics, ways of supply. Description of a garbage and sewage management plan. Comparing of yacht and home conditions / reality (90 minutes)

Day 2-6 (depends on a length of a trip) - every 4 hours check of resources, calculation of average consumption per person (10 minutes x 6 checks = 60 minutes a day)
Day 7 (last day)- summary of workshops: discussion, assessment of activities, conclusions (90 minutes)

4.5.6. Topic VI: Clean beach (+ litter reporting)

Background: the Baltic Sailor Catalog, chapter 3.4.2: Marine litter - what to do, where to report?

Workshop instructions
To do list, before the clean-up:
- → Ensure that you know whose land you plan to organize a clean-up. If necessary, request permission to hold the clean-up event.
- → Ensure that all the litter gathered at the event makes it off the beach: find out the nearest available disposal station and how you can transport the litter there.
- → Make sure that the site is safe and accessible for all participants. Find out how the participants can reach the site (public transport, car, bicycle, etc.).
- → It is good to know how well-equipped the site is: does the site have a dry/flush toilet, the possibility to enjoy snacks/picnics on site, etc.
- → Are you going to provide for the clean-up equipment? If not, inform the participants so that they know to take their own work gloves and trash bags.
- → If you will report the collected litter, make sure the necessary equipment is available: reporting forms, pens, or phone applications for reporting
- → Do not disturb nature. Observe the bird nesting times, which are at their peak during the spring.

Workshop: beach clean-up in Finland
1. Split the participants into smaller groups of 2-4 persons.
2. One person on the team keeps a tally of the collected litter on the form provided. The other member(s) of the team state(s) the type and number of pieces of collected litter.
3. Use the form in English (appendix) or report the litter via an online form (https://www.lyyti.fi/questions/aaa94177e3). There is also a free Siisti Biitsi -phone application available in Finnish or Swedish. After the clean-up, return the completed form to the event organizers or send the information via the provided application/online form.
4. Dispose the collected litter properly: if the litter is dirty, only metals and glass may be recycled.

4.5.7. Topic VII: Waste management en route

Workshop instructions
1. Split the participants into smaller groups of 3–5 persons. In case the participants have different backgrounds, make sure to have varying backgrounds in the small groups (different nationalities, different home cities or they have boating experience from different areas)
2. Let the small groups discuss the questions below for 15 to 20 minutes and instruct them to write the main points of their discussion on paper.
   - → How is the waste management organized in your country/city/region? What types of litter are collected/sorted?
   - → How do you take care of the waste produced on your sailing/boating trips? Do you put all litter in the same litter bin, or do you sort your litter according to the material in separate recycling bins?
   - → Does your waste management on board differ from the way you treat litter at home on land? In what way? Why?

- Is it possible for you to sort your litter even better on board? Why/why not?
- Why is it important to take care of one's litter?
- If a beginner would ask you for help in their litter management onboard, what kind of instruction would you give them? Do you have some self-constructed or well-functioning solutions for waste management?

3. Bring the groups together and go through their main points of discussion: do their answers differ or are they similar? Does waste management differ in their countries/ backgrounds? Are there some good examples someone wants to share?

Notes to help the lead of discussion (for the tutor)

- Does the waste management differ in the participants' countries? How do they sort their litter on land, what materials are collected?
- Paper, plastic, glass, metal, carton, biowaste, bottles/cans, hazardous waste? Is there some other material that is collected?
- What kinds of solutions for waste management do the participants have onboard when boating? Do they sort their litter immediately onboard or after the trip on land?
- If the participants sort their litter at home, do they sort the litter similarly onboard?
  - If not, why so? Is it because it's difficult to find the right sorting bins along the route? Is there not enough space to do sorting onboard?
- Littering affects the environment in a harmful way, that is why it is important to take care of one's litter also onboard. If litter is left in nature, it may cause environmental, financial, aesthetic and health problems among other things. Sorting one's waste is an important way of enabling the recycling of materials as the natural resources are limited. (More information about littering in the Baltic Sailor Catalog: 3.4.2 Marine litter- What to do, where to report?)
- Instructing a beginner in waste management onboard:
  - Minimize the amount of litter already before your sailing trip: remove the unnecessary materials some food might be packed in. Pack food supplies in reusable and washable packages, avoid single-used packages and cutlery. When shopping for groceries, use a reusable shopping bag or reuse your plastic bag.
  - Check the location of disposal bins and recycling stations along your route (online maps, for example). Plan your trip so that you will have access to them when necessary.
  - Sorting on your boat is easy and simple and requires no complicated or difficult special installations. In addition to a mixed waste bin, it is easy to insert recycling bins or bags, at least for recyclable glass and metal waste, underneath the boat seats or in the anchor box.
  - Remember to keep hazardous waste separate from other waste and dispose them properly

4.5.8. Topic VIII: Fouling organisms

Fouling organisms (typically barnacles, mussels and algae) are organisms that attach themselves on the boat hull, which reduces speed and, due to increased friction, increases gas consumption. Fouling organisms may be controlled by the use of antifouling, in other words: means to make sure these organisms can never attach to your boat hull. However, some parts of the boat will still be exposed to at least some fouling, since antifouling paints and other methods may not cover the entire exposed surface. These surfaces might not necessarily have an effect on your boat speed, but they may pose a different threat: bringing invasive species to the Baltic Sea. The best way to reduce the risk of spreading invasive species are through precautionary actions, such as making sure to clean your boat hull before and after a trip, as well as looking into whether a suitable antifouling method is in place. However, if one wants to contribute to adding to the database to increase awareness and knowledge on invasive species currently in the Baltic Sea, they may report any suspicious findings to your environmental authorities.

Common fouling species in the Baltic Sea

To be able to spot any irregular species, it is worth having a look at some of the most common fouling organisms found on boat hulls. Some of these species aren't attached to the hull, but are lurking in between barnacles and crevices and clinging to algae.

Amphibalanus improvisus - Bay barnacle
Gammarus sp.- (amphipod crustacean, no English name)
Idotea balthica - Baltic isopod
Mytilus trossulus x edulis - Blue mussel
Macoma balthica - Baltic clam

Invasive species in the Baltic Sea

Spotting invasive fouling species is very difficult, due to their small size and that they are often lurking in crevices and algaes and barnacles. However, would you be keen to take a closer look, these species are worth knowing. If you find any of these or other suspicious organisms, make sure to report them to your local environmental authority!

Gammarus tigrinus - (an amphipod crustacean, no English name)
Rhithropanopeus harrisii - Estuarine mud crab
Palaemon elegans - Rockpool shrimp

Workshop

1. Which species can be found on your, or other boat hulls presently moored at your location? Can you spot any of the species mentioned in the catalog?
2. Discuss which methods of antifouling you're aware of and why antifouling is important.
3. What consequences might invasive species have? Did you know that the common bay barnacle is an invasive species? What effect has it had on boating in the Baltic sea? What other risks can you find in bringing in invasive species to the Baltic sea?

Fig. 18: The bay barnacle is an invasive species in the Baltic Sea. / Keep the Archipelago Tidy Association

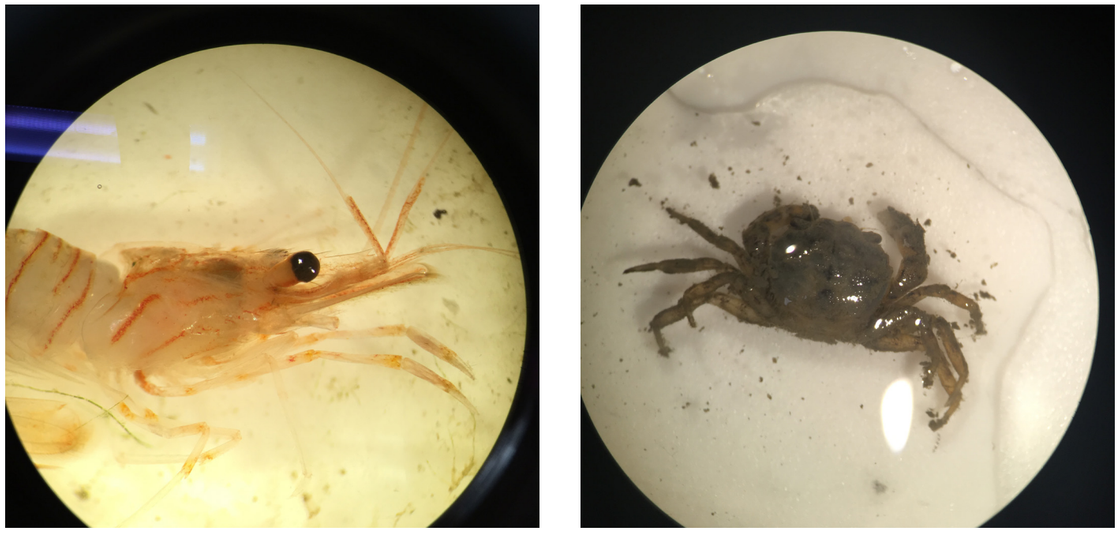


Fig. 19: *Gammarus tigrinus* and estuarine mud crab *Rhithropanopeus harrisii* under a microscope. Both of these species are invasive in the Baltic Sea. / Keep the Archipelago Tidy Association

LEARN MORE:

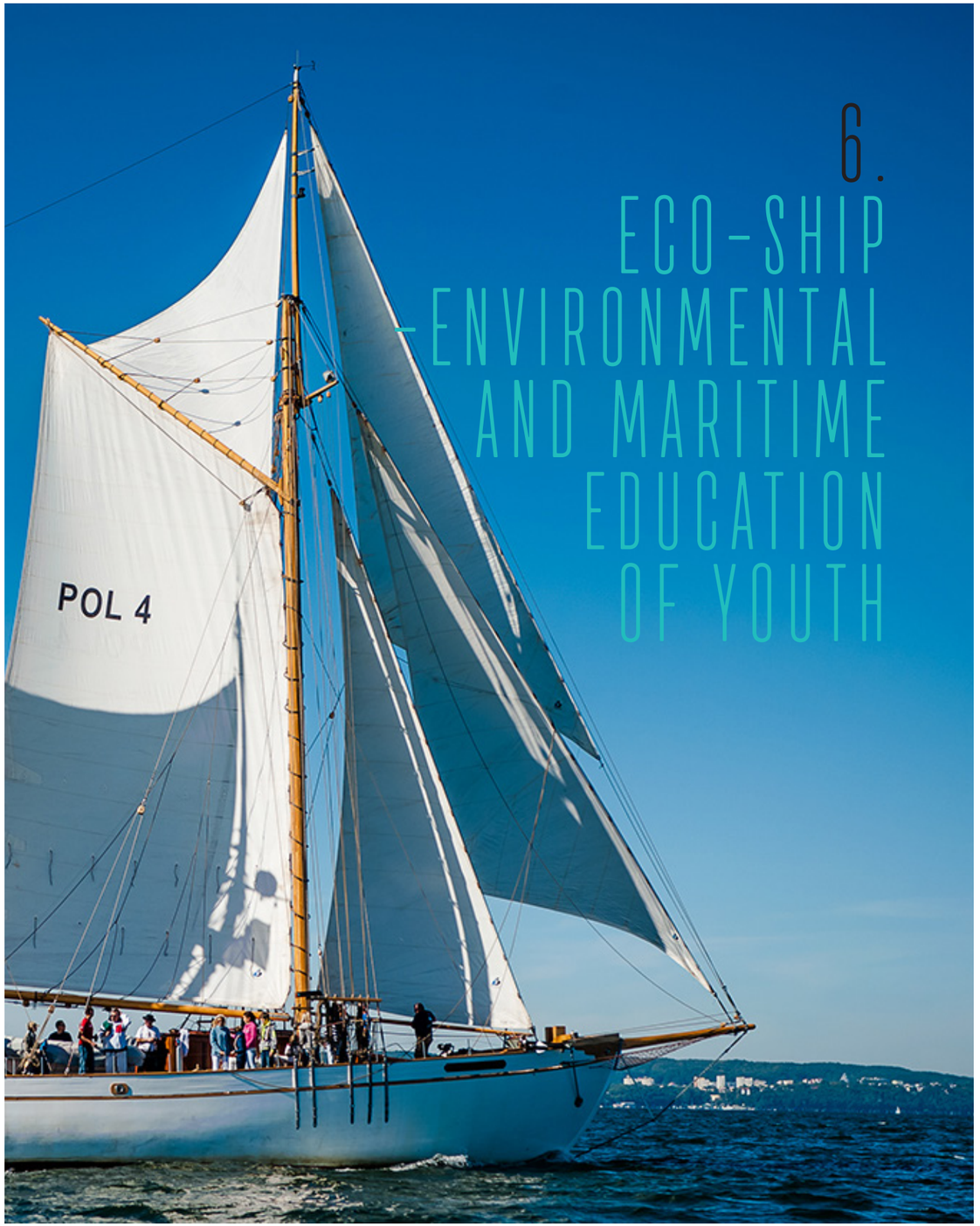
https://www.balticcomplete.com/

https://plus.balticcomplete.com/news/5-the-spread-of-invasive-species-in-the-baltic-sea

https://www.balticcomplete.com/attachments/article/299/recommdendations%20for%20biofouling%20management_KAT.pdf

5. GLOSSARY

acidification	Ocean acidification is a result of carbon dioxide absorbing rapidly into the waterbody. It creates a reaction that will end up decreasing the seawater pH, or in other words increasing the seawater's acidity. This causes great harm especially for organisms that rely on carbonate-based shells and skeletons.
anoxia	A condition of no, or at times very little, dissolved oxygen in marine or freshwater systems.
anthropogenic	Caused or influenced by people, either directly or indirectly.
antifouling	A coating, paint, surface treatment, surface or device that is used on a vessel to control or prevent attachment of unwanted organisms (Definition by International Maritime Organization).
benthic zone	The benthic zone is the lowest ecological zone in a water body, and usually involves the sediments at the seafloor. These sediments play an important role in providing nutrients for the organisms that live in the benthic zone.
biocidal	Biocidal products are used to control unwanted organisms that are harmful to human or animal health or to the environment, or that cause damage to human activities. These harmful organisms include pests and microorganisms (Definition by European Commission). Antifouling paints are biocidal when they include certain chemical compounds as biocidal substances. The active ingredients in such products include, for example, copper, zinc and organic compounds. When these active ingredients dissolve in the water, they are naturally poisonous even to organisms other than those that they were intended to repel.
brackish sea	A sea, which water has more salinity than freshwater, but not as much as typical sea/ocean water. Brackish water contains between 0.5 and 30 grams of salt per liter—more often expressed as 0.5 to 30 parts per thousand (‰).
deoxygenation	A decline in the oxygen content of the sea. This occurs when oxygen consumption is greater than oxygen replenishment. In other words, organisms in the sea use more oxygen for respiration than what is produced through photosynthesis or mixing of air and water.
eco-driving	Using engines in an economic way by reducing RPM (revolutions per minute), resulting in lower fuel consumption.
eutrophication	The process in which a water body becomes overly enriched with nutrients (e.g., phosphorus, nitrogen) leading to plentiful growth of simple plant life, water blooming, degradation of recreational opportunities, and hypoxia.
experiential education	Learning by doing (experience, practice).
hazardous substances	A chemical or product that has hazardous properties, such as explosiveness, flammability, radioactivity, toxicity, corrosivity to the environment.
hypoxia	Low or depleted dissolved oxygen concentrations in a marine or freshwater water body (O2 < 2 ml/l).
intertidal zone	It is the area where the sea meets the land between high and low tides.
morphometry	Describes the shape of the seafloor, what main features are there to be found (slopes, plains, deeps, sea mountains, trenches etc.).
noxious (substance)	Harmful, unhealthy.
nutrient	A substance that is essential for life and growth of organisms. There is an overload of nutrients in the Baltic Sea caused by human activities such as agriculture and industry. The Baltic Sea receives excess nutrients (nitrogen and phosphorus compounds) that stimulate excessive plant growth, which has led to eutrophication and problems in the ecosystem.
overfishing	Catching too many fish, which leads to a depleted fish population that is not able to reproduce and renew the population. Overfishing is a global and unsustainable problem caused by e.g. the increasing human demand, lack of global protective regulations and poor management of fisheries. Overfishing can lead to major changes in food chains and endangering ecosystems.
sensitive seabed	Sea bottom with fragile habitats.
sewage treatment plant	Place where sewage (excrements, wastewater etc.) are cleaned and neutralized.
stratification	The separation of water in layers that occur due to different properties of water (e.g., due to differences in temperature (warm layer overlying a cooler layer), salinity (fresh water overlying saltier water), or both). Stratification can be observed in different water bodies such as seas, lakes, or the ocean.
waterway	A route used regularly by boats.



6. ECO-SHIP – ENVIRONMENTAL AND MARITIME EDUCATION OF YOUTH

6.1. About the project

“ECO-SHIP - environmental and maritime education of youth” is an international maritime and ecological education project implemented by the Gdańsk Sports Center in partnership with the Lithuanian University of Klaipeda and the Finnish pro-ecological association “Keep The Archipelago Tidy”.

The assumptions:
The activities of the project are addressed to young people aged 15-29, as well as to teachers, educators and people, institutions and organizations working for maritime and environmental education and implementing sustainable development goals directly related to the subject of the project.
Our project responds to the challenges of the modern world, i.e.:

1. Progressive degradation of the natural environment, including the marine environment.
2. Insufficient knowledge of the marine environment in school-aged people.
3. Low environmental awareness among young people.
4. Lack of motivation for pro-environmental activities among young people.
5. Lack of effective tools to disseminate the principles of sustainable development regarding the protection of the seas and marine resources.

The aim of the ECO-SHIP project is to increase the knowledge and skills of young people in the field of maritime education, environmental protection and sustainable development in the Baltic Sea basin by creating the “Baltic Sailor Catalog” containing elements of ecological and sailing education.
Thanks to these activities, we want to contribute to slowing down the degradation of the natural environment and to increasing the knowledge, awareness and activity of young people in the field of pro-ecological activities.
To achieve this goal, the following activities were undertaken during the implementation of the project:

- International partner meetings.
- Creation of the “Baltic Sailor Catalog” by the research team.
- Training of 30 Environmental Officers as part of two 14-day workshops in the form of cruises on board the STS “Generał Zaruski”.
- Organization of international conferences disseminating the results of the project.
- Cooperation with people, institutions and organizations working for maritime and ecological education and implementing sustainable development goals directly related to the subject of the project.

Project website:
zaruski.pl/projekt/projekt-eco-ship/

GDAŃSK SPORTS CENTRE
(POLAND)

Gdańsk Sports Centre (GOS) is a financial unit of the City of Gdańsk, northern Poland, responsible for creating and developing sport policies in the city. GOS implements city's tasks in the field of sport which are as following:

- management of the sports and recreation infrastructure of the commune like football stadium, athletics stadium, playgrounds, speedway stadium, indoor sports hall, swimming pools etc.,
- cooperation with entities operating for the physical culture on the municipal and over communal level,
- administering quays, marinas and hydrotechnical facilities,
- organizing sports and recreational events, including i.e. Gdansk Marathon, Triathlon,
- creating conditions and supporting activities aimed at the development of sports and tourism in the City of Gdansk,
- promoting sailing and maritime education through activities onboard traditional wooden ship STS "General Zaruski" - a flagship of Gdańsk and small inshore yachts dedicated to youth education within the "Zaruski Academy" project.

Gdansk Sports Centre

CONTACT PERSON:
Anna Turnik-Pieciun
E-MAIL: anna.turnik@sportgdansk.pl
ADDRESS:
Traugutta 29, 80-221 Gdańsk, Poland

WEBSITE:
www.sportgdansk.pl
FACEBOOK:
www.facebook.com/GdanskiOsrodekSportu
INSTAGRAM:
www.instagram.com/gdanskiosrodeksportu/

KEEP THE ARCHIPELAGO TIDY ASSOCIATION
(FINLAND)

Established in 1969, the Keep the Archipelago Tidy Association (Pidä Saaristo Siistinä ry - Håll Skärgården Ren rf) is a Finnish environmental organization for boaters and all those traveling in and around Finnish waterways. The Association serves the archipelago and coastal regions, as well as the network of lakes in the Finnish Lakeland region.

The task and aim of the Association is to keep Finland's coastlines and archipelago clean, and to support opportunities for recreational boating and the enjoyment of all the waterways in and around Finland. The activities of the Association are diverse and concrete, from environmental maintenance tasks and educational work to national and international project work.

The operations of the Association are divided into three distinct areas of activity:

- Environmental management
- Environmental communication
- Project work

The Association maintains the Roope services intended primarily for those traveling in and around Finnish maritime and lake regions. The Roope services found in harbors, on islands and along waterways include approximately 200 Roope waste recycling and disposal stations, 30 floating sewage pumpout stations, and maintenance of 139 excursion harbors in the Finnish Lakeland region. Our responsibilities cover waste management, maintenance of wooden grill covers and structures, the emptying of dry toilets and other maintenance work. As a member of the Association, you have access to all the Roope services provided by the Association. All the Roope services are mapped on the website: https://www.roopekartta.fi/map.

WEBSITE:
www.pidasaaristosiistina.fi/en
E-MAIL: roope@pssry.fi
ADDRESS:
Linnankatu 16, 20100 Turku, Finland

FACEBOOK:
@ Pidä Saaristo Siistinä ry
INSTAGRAM:
@ pidasaaristosiistina

KLAIPEDA UNIVERSITY
(LITHUANIA)

Klaipeda University is a dynamic, growing multidisciplinary university located at the Baltic sea coast in Klaipeda, Lithuania. The University boasts two research institutes: the Marine Research Institute and the Institute of Baltic Region History and Archaeology, where a large number of researchers concentrate on research and simultaneously teach students. The three faculties – those of Marine Technology and Natural Sciences, of Social Sciences and Humanities, and of Health Sciences – are the divisions where academic spirit predominates and scientific projects are developed. KU is among 200 universities in the world best in the area of oceanographic sciences. In 2019, Klaipeda University became a member of the EU-CONEXUS, an alliance of universities in Europe. The specialism of EU-CONEXUS representing nine partners – universities from coastal cities in different European countries – is sustainable development of smart coastal cities. The result of the integration of science and study structures is that joint bachelor's and master's study programs are already underway, efforts have been united in scientific research of partner universities, new opportunities for the mobility of academic staff and students opened up, and new cultural and sports traditions are being developed.

Klaipeda University

CONTACT PERSON:
Greta Srėbalienė
E-MAIL: greta.srebaliene@ku.lt
ADDRESS:
84 Herkaus Manto Street, 92294 Klaipėda
Lithuania

WEBSITE:
www.ku.lt/en/
FACEBOOK:
www.facebook.com/Klaipedos.universitetas.Oficialus

7. REFERENCES

(n.d.). MARPOL Practical Guide. Retrieved July 12, 2022, from https://maddenmaritime.files.wordpress.com/2015/08/marpol-practical-guide.pdf

(n.d.). Why are the oceans important? Retrieved July 12, 2022, from https://hahana.soest.hawaii.edu/cmoreserver/oceanacidification/documents/PML_TechnicalSheet_high_CO2_world.pdf

Angerman River | river, Sweden | Britannica. (n.d.). Encyclopedia Britannica. Retrieved July 13, 2022, from https://www.britannica.com/place/Angerman-River

The Baltic Sea — European Environment Agency. (n.d.). European Environment Agency. Retrieved July 12, 2022, from https://www.eea.europa.eu/publications/report_2002_0524_154909/regional-seas-around-europe/page141.html/#1

Bindoff, N.L., Cheung, W.W.L., Kairo, J.G., Arístegui, J., Guinder, V.A., Hallberg, R., Hilmi, N., Jiao, N., Karim, M.S., Levin, L., O'Donoghue, S., Purca Cuicapusa, S.R., Rinkevich, B., Suga, T., Tagliabue, A., & Williamson, P. (2022, March 7). Changing Ocean, Marine Ecosystems, and Dependent Communities. IPCC. Retrieved July 12, 2022, from https://www.ipcc.ch/site/assets/uploads/sites/3/2022/03/07_SROCC_Ch05_FINAL.pdf

Cava, F., Schroedinger, S., Strang, C., & Tuddenham, P. (2005). Science Content and Standards for Ocean Literacy: A Report on Ocean Literacy. Retrieved July 12, 2022, from https://www.coexploration.org/oceanliteracy/documents/OLit2004-05_Final_Report.pdf

Chen, C.-T. A., & Arthur, C. (n.d.). Role of the Oceans in the Global Climate System. Encyclopedia of Life Support Systems. Retrieved July 12, 2022, from https://www.eolss.net/Sample-Chapters/C01/E6-18-01-04.pdf

Conventions - International Convention for the Prevention of Pollution from Ships (MARPOL). (n.d.). International Maritime Organization. Retrieved July 12, 2022, from https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx

Effect of plastic particles on cell membranes | NANOPLAST Project | Results in brief | FP7 | CORDIS | European Commission. (2017, June 7). CORDIS. Retrieved July 12, 2022, from https://cordis.europa.eu/article/id/198767-effect-of-plastic-particles-on-cell-membranes

Environmental impacts – coastal erosion and coastline changes. Chapter 20. (2015). In Second Assessment of Climate Change for the Baltic Sea Basin (p. 3810396). Springer International Publishing.

Fauville, G., Strang, C., Cannady, M. A., & Chen, Y.-F. (2019). Development of the International Ocean Literacy Survey: measuring knowledge across the world. Environmental Education Research. 10.1080/13504622.2018.1440381

I am the Ocean - arts and sciences to move from ocean literacy to passion for the ocean. (n.d.). Journal of the Marine Biological Association of the United Kingdom, 97⑥. 10.1017/S0025315417000376

International Council for the Exploration of the Sea (ICES). (n.d.). 4.2 Baltic Sea Ecoregion – Fisheries overview. Baltic Sea Advisory Council. Retrieved July 12, 2022, from http://www.bsac.dk/getattachment/Meetings/BSAC-meetings/BSAC-Executive-Committee-meeting-⑤/BalticSeaEcoregion_FisheriesOverviews.pdf.aspx?lang=en-GB

The International Law of the Sea (3rd edition ed.). (2019). Cambridge University Press. https://doi.org/10.1017/9781108545907

Łabuz, T.A. (n.d.). Polish coastal dunes – affecting factors and morphology. Landform Analysis. 33-59.

Łabuz, T.A. (2005). Dune shores of Polish Baltic coast (in Polish). Czasopismo Geograficzne, 19-47.

Łabuz, T.A. (2009). The West Pomerania coastal dunes – alert state of their development. Zeitschrift der Deutschen Gesellschaft fur Geowissenschaften, 160②, 113-122.

Łabuz, T.A. (2016). Coastal dunes: Changes of their perception and environmental management. In C. Makowski & C. W. Finkl (Eds.), Environmental Management and Governance: Advances in Coastal and Marine Resources (pp. 323-410). Springer International Publishing.

Łabuz, T.A., & Grunewald, R. (2007). Studies on vegetation cover of the youngest dunes of the Świna Gate Barrier (West Polish coast). Journal of Coastal Research, 23①, 160–172.

Łabuz, T.A., Grunewald, R., Bobykina, V., Chubarenko, B., Česnulevičius, A., Bautrėnas, A., & Tõnisson, H. (n.d.). Coastal dunes of the Baltic Sea shores: A review. Quaestiones geographicae, 37①, 47-71.

MARPOL ANNEX 4 Explained: How to Prevent Pollution from Sewage at Sea. (2021, March 16). Marine Insight. Retrieved July 12, 2022, from https://www.marineinsight.com/maritime-law/marpol-annex-4-explained-how-to-prevent-pollution-from-sewage-at-sea/

Offshore Wind in Europe. (n.d.). WindEurope. Retrieved July 12, 2022, from https://windeurope.org/wp-content/uploads/files/about-wind/statistics/WindEurope-Annual-Offshore-Statistics-2019.pdf

Paul, D. (2021, styczeń 1). Protecting the Marine Environment from Land-based Activities. International Institute for Sustainable Development. iisd.org. https://www.iisd.org/system/files/2021-01/still-one-earth-GPA.pdf

Pörtner, H.O., Roberts, D.C., Masson-Delmotte, V., Zhai, P., Tignor, M., Poloczanska, E., Mintenbeck, K., Alegría, A., Nicolai, M., Okem, A., Petzold, J., Rama, B., & Weyer, N.M. (n.d.). IPCC. 2019.Summary for Policymakers. In: IPCC Special Report on the Ocean and Cryosphere in a Changing Climate. Cambridge University Press. https://www.ipcc.ch/site/assets/uploads/sites/3/2022/03/01_SROCC_SPM_FINAL.pdf

Rosander, E. (n.d.). BSTC Baltic SeaTourism Center - State of the Tourism Industry in the Baltic Sea Region – 2018 Edition. Baltic Sea Tourism Center. Retrieved July 12, 2022, from https://bstc.eu/fileadmin/bstc.eu/Downloads/Final_Report_Tourism_Industry_in_BSR_2018.pdf

State of the Baltic Sea – Second HELCOM holistic assessment 2011–2016. (n.d.). State of the Baltic Sea. Retrieved July 12, 2022, from http://stateofthebalticsea.helcom.fi/in-brief/our-baltic-sea/

Thulin, J. (n.d.). THE BALTIC SEA: ITS PAST, PRESENT AND FUTURE. IW:LEARN - Archived web sites. Retrieved July 12, 2022, from http://archive.iwlearn.net/helcom.fi/stc/files/Projects/BSRP/BalticSea_Past_Present_Future.pdf

United Nations. (1992). Convention on Biological Diversity.

United Nations Environment Programme (2021). (n.d.). Food Waste Index Report 2021. Nairobi.

Why should we care about the ocean? (2021, February 26). National Ocean Service. Retrieved July 12, 2022, from https://oceanservice.noaa.gov/facts/why-care-about-ocean.html

**Project “ECO-SHIP - environmental and maritime education of youth”,
project no. 2021-1-PL01-KA220-YOU-000029718,
is co-funded by the European Union under the Erasmus+ Programme.**