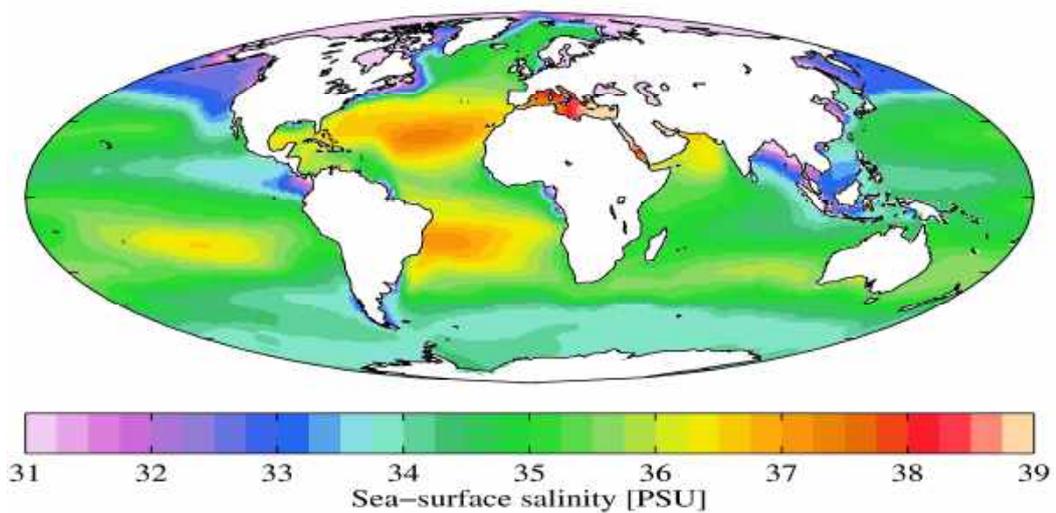


Arved Fuchs

International Ice-Climate Education 2020



International Competition for Schools



I.C.E. Competition 2020

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P r e f a c e

Global Warming

Scientists around the world have come to the conclusion that the global warming of the climate is an established fact. International scientific studies like the Arctic Climate Impact Assessment (ACIA, 2004) and the recent publications of the UN Inter-governmental Panel on Climate Change (IPCC, **2007:AR4, 2013/2014:AR5, Katowice 2018:SR1.5**) underline these findings and re-emphasise the increasing speed of the global climate change caused by the emission of evermore quantities of **CO₂**, **CH₄** and other greenhouse gases.

Facing a wide variety of predominantly negative consequences like rising ocean levels, flooding, droughts, storms, tornadoes and health problems, politicians worldwide are trying to come to terms with the advancing economic and social disturbances. International agreements to reduce the emission of **CO₂** on a global level were only the beginning (Rio 1992, **Kyoto 1997**, Bali 2007, Copenhagen 2009, Cancun 2011, Durban 2011, Doha 2012, Warsaw 2013, Lima 2014, **Paris 2015**, Bonn 2018, Katowice 2018) and did not stop the emissions of greenhouse gases to rise by 25% since 1990.

Climatic processes are immensely complicated and interrelated. A variety of contradicting political and economic lobbies is taking advantage of the situation and thus the general public often lacks unbiased, trustworthy and statistically firm information in the first place. Hence many people in industrial as well as in developing countries react with confusion and alarm, with disbelief, indifference or even with resignation.

Competition Aims

Pupils and students attending our schools today will be the first generation to fully experience the consequences of the present global warming caused by human activity. It is them who need to be informed as early as possible in order to make them understand these climatic processes. They will have to face the consequences and they will have to look for solutions. Much in demand at present are unbiased opinion, curiosity, imagination and a positive approach to problems. Qualities which generally abound in young people of any nation. The **I.C.E. Project-Competition**, launched by **Arved Fuchs** in 2007 aims at exactly these qualities, asking for creative approaches to well defined scenarios related to the present climatic changes in the Arctic and the situation at home. The international competition, now repeated for the **13th** time, also encourages participants to use modern information technologies and to utilize the enormous resources which are provided and made accessible via the WORLD WIDE WEB for the first time in human history.

International Youth Camp

Personal impressions and hands on experience are priceless instructors and invaluable assistants when learning from books and lectures. This is where the International **I.C.E. Youth Camp** comes in. Based on his knowledge and insight gained during many expeditions in the Arctic **Arved Fuchs** decided to organize international youth camps in polar or semi-Arctic climate regions in order to facilitate first hand experience and personal encounters with climate changes where they actually happen. These processes continue to take place in a much more dramatic way in the Arctic and in glacial areas than anywhere else. Guided and assisted by scientists (meteorologists, biologists, historians) students from many different nations will personally collect data on the spot and samples in the field. They will then analyse and discuss their findings and personally experience their own group as a sort of global community facing a common global issue.



Introduction

The polar and glacial regions are more severely affected by global warming than most other regions on our planet, and the ongoing changes are already affecting a number of plant and animal species in the Arctic and around the globe. They might bring to an end the century-old traditional life style of indigenous communities around the Arctic Sea.

Arved Fuchs, a German expedition leader and polar explorer knows the polar regions better than most, having carried out a great number of expeditions in the high latitudes. Arved Fuchs has just returned from his latest expedition „**OCEAN CHANGE**“ at the harbor of Hamburg in 2019. He sailed up the west coast as well as the east coast of Greenland, focussing on local attempts to become independent of fossile fuels ([best practice projects](#)), the amount of plastic junk on beaches and micro plastic in the sea as well as monitoring melting glaciers along the eastern coastline of Greenland using special drones. The 88-year old cutter „**Dagmar Aaen**“ had sailed 10.000 miles in 16 month, taking Fuchs and his crew to several Inuit settlements along the coast where they took samples from polluted beaches and abandoned military airfields, recorded scientific data and interviewed locals about the impact of the global warming on their environment. As during previous expeditions, the crew communicated their observations via the internet and by means of a newly installed INMARSAT Fleet Broadband technology capable of video transmission (<https://www.arved-fuchs.de/>). However, to raise awareness of the ongoing threats to polar regions owing to the climate change, there will again be a school competition and an **International Youth Camp** in 2020 as organized in Svalbard, Iceland, Norway, Austria and Denmark during previous years.

In 2018 Arved Fuchs transferred the project to the charitable **in.media.vitae foundation** of **Iris and Alexander Hofmann**, which now runs and supports the project, especially in order to attract further donations from additional financial supporters . The foundation and the longstanding I.C.E. Camp volunteers are now forming the new **I.C.E. Camp Team**, which continues to receive the constant help and support of Arved Fuchs himself. See <https://imv-foundation.org/ice-camp-mit-arved-fuchs/> and <https://www.arved-fuchs.de/en/ice/project>

This year´s competition will focus on a contest of ideas concerning the present situation as regards the decrease of the number of insects, especially bees in Europe, the continuous warming up of sea-water temperatures and the fate of new invasive species in the Baltic Sea. Again the concept of this year´s competition has been developed as openly as possible, in order to give pupils and teachers the possibility of developing activities which coincides or correlates with individual subjects and their school´s curriculum. This concept also allows the integration of existing school projects which have taken place in the past or which are already underway. A further goal of this contest is to foster new long-term projects dealing with global warming and the reduction of **CO²** emission. It is hoped that this will allow for a connection to the daily lives of the pupils and for the development of strategies of action.

For the 2020 competition, three main subjects are envisaged:

- 1) The present situation : **Insects affected by the climate change**
- 2) The future : **Increasing water temperatures in the Baltic Sea**
- 3) Biotope protection: **Invasive species**



Further information about these subjects can be found on the following pages. The contest is intended mostly for pupils who are at least **16 years** old. Participants are expected to have **sufficient command of the English language and to be able to actively participate in lessons given in English during the Ice-Climate Youth Camp.**



topic 1

present situation

Insect Armageddon

Climate change affecting insects

Among all living creatures insects are the most species - rich group on this planet. They thrive in all climatic zones, even in the ice. However, recent scientific studies revealed serious biomass declines among insects. In October 2017 European researchers found that within 63 protected areas in Germany their abundance had declined by 75 percent within 27 years. These are shocking news, as insects provide the base of the foodchain for many species like birds, various mammals and fish. And besides, insects serve as essential plant pollinators. Around 75 percent of all flowering plants are pollinated by insects, including crops which produce more than 33 percent of the world's food supply. Bees for example increase the yield of more than 80 commercially used crops, like vegetables, nuts, seeds, spices, all kinds of fruits and even coffee. These pollination services contribute to the global economy to the tune of \$ 577 billion (£ 453 billion) annually.



source :wikipedia

Example: the honeybee (Apis mellifera)

In recent years there has been a worldwide decline of the so-called honeybee (Apis mellifera). In Europe scientists observed a 10% decline, in the USA they recorded a near 30% loss and in the Middle East region it was a 85% decrease. As regards the **climate change** an earlier plant blooming period was one of the reasons identified. Bee-colonies' lifecycles are getting out of step, warm winters and sudden temperature changes cause the bees to prolong breeding times or consume supplies needed in the spring, thus weakening colonies making them vulnerable to diseases or parasites like the Varroa mite (Varroa destructor). But not only honeybees are affected, their wild relatives suffer also. There are thousands of bee species in Europe alone with Germany counting 578 species. Around 7% of them experienced a population decline in recent years, 9% are threatened with extinction. In the USA even 25% of them face the same risk. Scientists could prove that a greater diversity of wild bees pollinating fields improved harvest results and the quality of crops. Harvests sometimes doubled or even tripled, since wild solitary bees will pollinate certain flowering plants 100 times more effectively than honeybees.

Modern agriculture destroying habitats As scientists were eager to point out, temperature changes are not the only cause for the decline of insect populations and insect biomass. They identified other important and mostly manmade factors:

- **industrialized agriculture**, using a plethora of pesticides
- **extensive monocultures**
- **destruction of habitats** : i.e. 320 hectares per day in Europe
- **air pollution**
- **separation of habitats** by road construction, railways, fences and walls
- **light pollution** affecting nocturnal insects

- **cocktail effect**: mixture of different chemicals in air, water and plants resulting in unknown effects on organisms



Scientists of the University of East Anglia (UK) declared insects to be essential for the ecosystem which could not function without them. They would play an absolutely critical role in the food chain. New research analysing the impact of different levels of climate change on about 115,000 species found that mammals and birds would be less affected because of their mobility. Insects however, would be the most sensitive group.

So, what needs to be done? What is the situation like in your country? Where would you start to save these insects? What could be done in your home town, the area where you are living?

Inspired by the Swedish climate activist Greta Thunberg around 6 million mostly young people joined the latest wave of global protests on September 27th 2019. They demanded urgent action on the escalation ecological emergency.



source :wikimedia



source :wikimedia

Task:

What are your urgent demands regarding the decline of insect populations. Use your own imagination and don't be afraid of „impossible dreams“ . You are expected to have them.

Form:

In this competition it is up to you to decide how you want to deal with the task. Create a master plan or prepare a powerpoint presentation or a short movie showing local condition and practices. Invent a game or a computer programme demonstrating local solutions to the problem. Demonstrate your very own approach dealing with local obstacles. Methods or techniques you use aren't quite as important as your own unique approach. Try to find new perspectives and trust your own creativity. The form is up to you, **the focus on the task is not.**

In any case add a short personal statement informing us why exactly you chose this particular topic from the three available ones.

Sources of Information: You will be provided with pictures, maps and relevant information. As regards the distribution of plastic particles you will find a collection of internet addresses, recent publications and satellite data at the end of this document. You may also refer to Arved Fuchs' homepage or get into e-mail contact with other students via Arved Fuchs' web presence on [FACEBOOK](#) Do not hesitate to ask questions...



topic 2

the future

Baltic Blues

Effects of rising water temperatures in the Baltic Sea

The Baltic Sea is a small and rather shallow sea linked to the North Sea and the Atlantic Ocean. It drains into the Kattegat passing the straits of Øresund, the Great- and Little Belt. There is a limited water exchange between the Atlantic and the Baltic Sea which causes a lower salinity and temporary alterations in the amount of oxygen in sea water. The Baltic Sea was formed after the last glaciation which ended about 11,000 years ago. The Kattegat and the southwestern Baltic Sea contain enough oxygen to support a well developed marine life whereas the eastern parts have less oxygen and fewer species. The water is more brackish because of the influx of many rivers.

Increasing water temperatures

With the ongoing warming up of the atmosphere because of anthropogenic greenhouse gas emissions the oceans are getting warmer also. Since 1995 scientists recorded an average increase of 0,04 degrees Celsius. However, the surface temperatures of the watercolumn warmed up by 0,6 degrees Celsius. Not very much but comparison - landmasses warm up much faster than sea-water. The shallow Baltic Sea will continue to warm up even faster, exceeding global average because of warmer winters and increasing precipitation which will reduce the low salinity even further. Reduced ice coverage in the eastern and northern parts will also result in rising water temperatures.



Consequences

The consequences are manifold. As of September 2018 the herring population in the western Baltic had shrunk tremendously. The reproduction rate was down to 50 %. Because of higher water temperatures the growth of plankton and the herring larvae-hatch did not match anymore, thus reducing the food supply for young herrings. This desynchronization (daylight-temperature) affects the entire marine ecosystem and does not only hit fish stocks. As temperatures rise the sea-water oxygen level is reduced. This in turn will aggravate the effects of eutrophication, especially in shallow waters like the Baltic Sea which already receives high levels of nutrients. Algae blooms are the result. They cause widespread oxygen deprivation and even create anoxic areas. Bottom-living fish species like cod and flatfishes face reduced habitats in turn and become less abundant.

Increased acidity

Because of the rising amount of CO₂ in the atmosphere the oceans absorb more and more of it, thus increasing sea-water acidity. Recent research proved the atmospheric CO₂ concentration to be the decisive factor as regards the pH level of the Baltic Sea. This means there are less carbonate ions available which are essential for many marine organisms to build calcium carbonate (CaCO₃) needed for shells and skeletons. Calcifying organisms (e.g. corals, mollusks, crustaceans, echinoderms and coccolithophore algae) are affected by the present acidification. Reduced calcification in turn leads to reduced growth rates of shellfish (lobster, shrimps, crab and mussels).

Water salinity			
Fresh water	Brackish water	Saline water	Brine
< 0.05‰	0.05 – 3‰	3 – 35‰	> 35‰
< 0.5 ‰	0.5 – 30 ‰	30 – 50 ‰	> 50 ‰



Because of all these effects, more serious and happening faster in the Baltic area than elsewhere, scientists at the **GEOMAR Helmholtz Centre for Ocean Research** at Kiel (Germany) propose taking the Baltic Sea as a model region for other coastal regions under the influence of the global warming and climate change.

What a bleak scenario indeed. What could be done ? What could YOU do about it ? First of all, the basic information has to be spread and the consequences have to be made conceivable. This is something for the imaginative individuals among you. How could you raise awareness and create knowledge about the state of the Baltic Sea?

Task:

Try to find ways and methods to teach other students and younger pupils about the complicate processes and the consequences of rising sea water temperatures in the Baltic Sea. Use your imagination, artwork and modern media. Try to make things easier to understand.

Form: It is up to you to decide how you want to deal with the task. Perhaps write a power-point presentation showing these facts to your classmates. Arrange an interview with local travel agencies. Produce a short movie or a computer programme visualizing the development of sea-water temperatures. Whatever the means, stick to the question! Methods or techniques you use aren't quite as important as your own unique approach to the problems. Try to find new perspectives and **trust your own creativity**. The form is up to you, the focus on the task is not.

In any case add a short personal statement informing us why exactly you chose this topic from the three available ones.

Sources of Information: You will be provided with pictures, maps and relevant information. As regards the effects of climate change on fish stocks you will find a collection of internet addresses, recent publications and satellite data at the end of this document. You may also refer to Arved Fuchs' homepage or get into e-mail contact with other students via Arved Fuchs' web presence on [FACEBOOK](#) Do not hesitate to ask questions..



topic 3

biotope protection

Meeting the Goby

Invasive species in the Baltic Sea

Containing around 20 000 cubic kilometres of water the Baltic Sea is the largest brackish water sea area in the world. At rather irregular intervals there are salty water spillovers from the Atlantic.

All this was created by the receding glaciers of the latest glaciation forming a shallow sea and a unique stratification of water layers with the heavier salty water at the bottom and the brackish type created by freshwater run- offs from rivers and lakes at the top.

The same spillover- path from the Atlantic has been used by a continuous stream of marine organisms migrating into a new environment. New species arrived and if they found conditions they liked they stayed and reproduced, if not they perished.

The presence of non-indigenous species (NIS) is due to intentional or unintentional introduction or resulting from human activities adding some more ways for newcomers. Drivers of change of the ecosystem are now shipping (ballast tanks containing alien organisms), fishing, eutrophication and pollution. In the invaded areas these NIS may disturb the local aquatic ecosystems either as competitors or predators or both. Scientists recorded around 70 alien species which successfully established themselves in the Baltic Sea, with only a few of them causing serious problems. According to the Helsinki-Commission (HELCOM) only 10 new species of fish arrived since the Middle Ages.



Global warming effects

Negative impacts caused by the present global warming are sea-level rise and the rise of sea water temperatures. In the enclosed shallow Baltic Sea there are only narrow and primarily east-west orientated movement corridors, preventing the northward movement of species affected by warmer temperatures, as monitored in the Atlantic. Therefore species threatened by warmer temperatures cannot just escape northwards into colder waters and may disappear.

According to the Leibniz-Institute for Baltic Sea Research, Warnemünde (IOW) average water temperatures have risen by 1,5 degrees in surface waters near the Danish island of Bornholm during the last century.

New species

Invasive species like the **comb jelly** (*Mnemiopsis leidyi*) benefit from the absence of natural enemies and multiply very quickly. The organism has been observed in the south-western and the central Baltic since 2007. These jellyfish produce more than 11,000 eggs per day and rapidly occupy any ecological niche. In certain areas this caused a 6-fold decrease in abundance of zooplankton, a fresh competition for herring and sprat stocks in the Baltic Sea. Another NIS, "Gammarus tigrinus", a North American amphipod crustacean, is now competing with local species and there is another one, the **round goby** (*Neogobius melanostomus*), an invasive species for example now in the Gulf of Finland. These bottom-dwelling gobies



topic 3

biotope protection

Invasive species in the Baltic Sea

of the family Gobiidae, origin from the Black Sea and the Caspian Sea. Recent research revealed that the species is spreading rapidly in German and Danish waters. In coastal waters of Poland it is competing with flounders for food and suspected to feed on herring eggs and larvae. The new goby tolerates the low salinity (0 to 30 per thousand) and temperatures between -1 and +30 °Celsius. In addition it gets on well in low oxygen-level waters typical for certain areas of the Baltic Sea. Coastal fishermen fear it might even displace other species like flatfish. The goby, once an occasional bycatch, a local fisherman complained, he had recently harvested a hundredweight of goby in his twelve eel-traps but hardly any eel. However, coastal fisheries are beginning to adapt. In Latvia they are already selling smoked gobies although most of them still end up as fishmeal.



Mnemiopsis leidyi

source :wikimedia

Good or bad ?

Considering the ongoing changes in the Baltic Sea as regards the arrival of new species scientists hesitate to condemn newcomers as "invaders" or "aliens". Existing ecosystems always change as conditions change. Are invasive species always "bad" ? Is their impact on existing ecosystems always negative? Shouldn't we rather concentrate on regulating manmade interference such as emptying ship ballast tanks, eutrophication (agriculture) and pollution, overfishing, building new canals?

task:

Outline a guideline for the protection of marine species in the Baltic Sea or comparable coastal waters that includes the appearance of "new" species. How should these newcomers be dealt with? Try to develop criteria which justify intervention but avoid negative effects on biodiversity. Keep in mind the addressee of your proposals which could be students at your own school, existing nature conservation organisation or even the EU (Coastal and Marine Policy).

Form: It is up to you to decide how you want to deal with the task. Perhaps write a powerpoint presentation showing these facts about invasive species to your classmates. Arrange an interview with local fishmongers. Produce a short movie or a computer programme visualizing the development of the comb jelly-fish. Whatever your means, stick to the question! Methods or techniques you use aren't quite as important as your own unique approach to the problems.

Try to find new perspectives and **trust your own creativity**. The form is up to you, the focus on the task is not.

In any case add a short personal statement informing us why exactly you chose this topic from the three available ones.

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Application Form

International Ice-Climate Education 2020

Surname: _____

First name: _____

Address: _____

Postal code: _____

City: _____

Country: _____

Telephone number: _____

E-Mail: _____

Date of birth: _____

Nationality: _____

School: _____

Address: _____

Postal code: _____

City: _____

Country: _____

Telephone number: _____

Fax number: _____

Homepage: _____

Signature of parents or legal guardian:

City : _____ Date : _____

To be sent to:



I.C.E. Competition 2020

**Arved Fuchs,
Reiherstieg 2,
D-24576 BAD BRAMSTEDT,
GERMANY**



Terms of the Contest

The contest is part of the project:

Ice-Climate-Education 2020 (I.C.E. 2020)

Participants:

Participants of the contest can be all pupils of schools that have signed up for the project.

The pupils must be at least **16 years old**.

Participants are expected to show a general interest in environmental questions and in the impact of global warming in the Arctic. They must have sufficient command of the English language.

Members of the expedition, the project development members, teachers involved or members of their families are excluded from participating in the competition.

Each participant can submit only **one** entry.

Form:

Entries must be developed independently and produced by the participants themselves in their native language. Written entries should amount to 5 pages, but not be longer than **10 A4 pages** in normal printing size (10-12 pt). Each entry should include a short summary or description of its content (max. 1 page).

Prize-winning entries must be translated into English.

Registration:	Applicants must register before February 3rd 2020
Deadline:	Entries must be handed in to the teachers before April 9th 2020
Jury:	The entries are being judged by one or more teachers of the participating schools. Their judgement is final.
Identification:	Each entry must be accompanied by an entry form that has been filled out completely. Each entry must have the same personal data written legibly as on the entry form.
Winner:	The winners will be announced by the teachers and reported to Arved Fuchs' office before May 11th 2020
Whereabouts and return of the entries:	The winning entries will be kept in Arved Fuchs' office and will eventually be published.



Prizes

The best entry of each participating school wins a 1st prize. All **1st prize winners** will receive funding to participate in the **International Youth Camp** in Northern Germany and Denmark. This youth camp will take place in **July 2020** (dates have not been finalized yet) and be based onboard the saillogger **RYVAR** travelling in Danish waters and the Baltic Sea. The programme will include lectures and excursions, deal with the general topics of global warming and its regional impact on Northern Europe as well as on the Arctic.

It is expected that the participants of this international youth camp will return to their schools as climate change experts and "ambassadors" of the endangered hemispheres.

The **1st prize** is an invitation to the 2020 International Ice -Climate-Education Youth Camp. This includes a return trip/flight to Hamburg and all subsequent transfers. It also covers meals and accommodation during the entire youth camp as well as all costs for excursions and tours.

The participants will, however, not be provided with pocket money and must provide themselves with the necessary clothing (tourist standard).

The prizes cannot be transferred to another person and cannot be offset with anything else or paid out. If a winner steps back, the next best winner in line will take his or her place.

Insurance:

Participants of the youth camp or of the sailing trip must provide their own travel insurance, accident insurance and health insurance.

Travel papers:

Participants require valid travel documents in order to participate in the I.C.E-Youth camp in the EU and if necessary a valid travel permit.

Declaration of Consent:

The winners and as such participants of the youth camp must provide a declaration of consent by their **parents or legal guardians** in order to participate.



This declaration of consent must be sent separately.





<https://www.arved-fuchs.de>

Arved Fuchs on "facebook"

<https://www.facebook.com/Arved-Fuchs-Expeditionen-248247028523296/>



postal address:

Arved Fuchs

Reiherstieg 2

D-24576 BAD BRAMSTEDT

GERMANY



I.C.E. Competition 2020



Collection of data & information

topic 1: Insects affected by the Climate Change

This page is not to be published or made accessible via the internet !

version 09-10-2019

International Ice-Climate Education 2020



	logo	titel	interactive URLs : click URLs below !
General information on insect decline		Insects or Insecta	https://en.wikipedia.org/wiki/Insect
		Fact Sheet: Bees	https://www.earthday.org/2018/05/23/fact-sheet-bees/
		The selfish case for saving bees: it's how to save ourselves	https://www.theguardian.com/commentisfree/2019/may/18/saving-bees-save-ourselves-pollinators https://www.theguardian.com/commentisfree/2019/aug/29/500-million-bees-brazil-three-months
		Why insect populations are plummeting—and why it matters	https://www.nationalgeographic.com/animals/2019/02/why-insect-populations-are-plummeting-and-why-it-matters/
		Insects coping with climate change by University of Connecticut	https://phys.org/news/2018-09-insects-coping-climate.html
Impact of agriculture, destruction of habitat & pollution		The cocktail effect of pesticides	http://www.inra.fr/en/Scientists-Students/Food-and-nutrition/All-reports/Cocktail-effects-of-toxic-substances/The-cocktail-effect-of-pesticides/(key)/0
		Wild bees and pollination Research Institute of Organic Agriculture (FiBL)	https://shop.fibl.org/CHde/mwdownloads/download/link/id/656/?ref=1
		Wild Bees And Pollination - Why Do Wild Bees Matter?	https://www.buzzaboutbees.net/wild-bees.html
Impact of climate change		Climate change on track to cause major insect wipeout, scientists warn	http://www.theguardian.com/environment/2018/may/17/climate-change-on-track-to-cause-major-insect-wipeout-scientists-warn
		Redlists Major Threats	https://ec.europa.eu/environment/nature/conservation/species/redlist/index_en.htm https://ec.europa.eu/environment/nature/conservation/species/redlist/bees/major_threats.htm
NGOs: Non Governmental Organisations		Ensuring sustainable food production for people and pollinators	https://www.wwf.org.uk/updates/how-bee-friendly https://www.wwf.org.uk/sites/default/files/2019-05/EofE%20bee%20report%202019%20FINAL_17MAY2019.pdf
		Bees in Decline	https://fr.greenpeace.ch/wp-content/uploads/2017/01/2013_Agriculture_Rapport_BeesDecline.pdf
		Insektensterben vs. Insektenommer – ein Widerspruch?	https://blogs.helmholtz.de/falter-blog/2018/08/insektensterben-vs-insektenommer-ein-widerspruch/ GERMAN
		Limiting warming to 1.5C would save majority of global species from climate change	https://www.uea.ac.uk/about/-/limiting-warming-to-1-5c-would-save-majority-of-global-species-from-climate-change

Scientific Institutes		Ice bug, (order Grylloblatodea)	https://www.britannica.com/animal/ice-bug
		Climate Change and Agriculture: Promoting Practical and Profitable Responses III - 6 Climate Change Effects on Insects and Pathogens	https://www.panna.org/sites/default/files/CC%20insects&pests.pdf
		THE IMPACTS OF CLIMATE CHANGE ON LIFE IN THE North Sea	https://www.awi.de/fileadmin/user_upload/AWI/Im_Fokus/Meereis/Downloads_FactSheets/WEB_UK_Factsheet_NorthSea.pdf
Maps		NOAA maps	https://www.ncdc.noaa.gov/data-access/paleoclimatology-data/datasets/insect https://noaa.maps.arcgis.com/apps/MapJournal/index.html?appid=8b910d9c7b9744ea94e07d82f5420782
Books		ACIA , Arctic Climate Impact Assessment	Hassol, S.J., <i>Impacts of a Warming Arctic: Arctic Climate Impact Assessment</i> Cambridge University Press, 2004 excellent report - see: https://acia.amap.no/
Meteorological data		Satellite pictures from NOAA National Oceanic and Atmospheric Administration	http://www.noaa.gov/ http://www.weather.gov/satellite
public domain pictures		Images of Change	https://www.nasa.gov/multimedia/imagegallery/index.html http://climate.nasa.gov/state_of_flux#Lyell-Glacier-1883-2015-930px.jpg
			http://www.photolib.noaa.gov Most NOAA photos and slides are in the public domain and CANNOT be copyrighted.



International Ice-Climate Education 2020

click URLs below !

General Information		The Coastal Wiki is a public information site	http://www.coastalwiki.org/wiki/Main_Page http://www.coastalwiki.org/wiki/Effects_of_climate_change_on_the_North_Sea_and_Baltic_Sea#Warming_leads_to_an_increase_in_North_Sea_fish_species
		The Baltic Sea	https://en.wikipedia.org/wiki/Baltic_Sea
NGOs: Non Governmental Organisations		The Intergovernmental Panel on Climate Change (IPCC)	https://www.ipcc.ch/about/
		The Baltic Sea is a unique but also vulnerable sea	https://wwf.panda.org/knowledge_hub/where_we_work/baltic/
		Oceans in the Balance	https://www.greenpeace.org/international/publication/6864/oceans-in-the-balance/
Scientific Institutes		SMHI, the Swedish Meteorological and Hydrological Institute: Conference on targets of the Baltic Sea Sea Surface Temperature	https://www.smhi.se/en/research/conference-on-targets-of-the-baltic-sea-1.18487 https://www.smhi.se/en/theme/sea-surface-temperature-1.12287
		Assessing the state of the Baltic Sea	https://www.helcom.fi/baltic-sea-trends https://www.helcom.fi/about-us/organisation/ https://www.helcom.fi/helcom-at-work/groups/maritime/ http://www.helcom.fi/baltic-sea-trends/environment-fact-sheets/hydrography/ http://www.helcom.fi/Lists/Publications/BSEP137.pdf http://www.helcom.fi/Lists/Publications/BSEP111.pdf
		Climate of the Baltic Sea Region	https://oxfordre.com/climatescience/browse?t0=ORE_CLI:REFCL1036
		Europe sea temperatures	https://www.seatemperature.org/ https://www.seatemperature.org/europe/
		Calcifying microalgae are witnesses of increasing ocean acidification	https://www.awi.de/en/about-us/service/press/press-release/new-study-in-journal-nature-calcifying-microalgae-are-witnesses-of-increasing-ocean-acidification.html
	Media		Baltic Sea oxygen levels at '1,500-year low due to human activity'
		Die Ostsee erwärmt sich um bis zu vier Grad GERMAN	https://www.welt.de/wissenschaft/umwelt/article140848160/Die-Ostsee-erwaermt-sich-um-bis-zu-vier-Grad.html
Maps		maps	https://commons.wikimedia.org/wiki/
		NOAA maps	https://www.nauticalcharts.noaa.gov/index.html
Books		ACIA , Arctic Climate Impact Assessment	Hassol, S.J., <i>Impacts of a Warming Arctic: Arctic Climate Impact Assessment</i> Cambridge University Press, 2004 excellent reports - see: https://www.amap.no/documents/doc/arctic-arctic-climate-impact-assessment/796 https://acia.amap.no/
Meteorological data		Satellite pictures from NOAA	https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/regional_monitoring/



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General Information about Invasive Species		Marine Invasive Species : These Invaders Came, Saw, Conquered—and Destroyed	https://www.nationalgeographic.com/environment/oceans/critical-issues-marine-invasive-species/ https://www.nationalgeographic.com/environment/habitats/invasive-species/
		Invasive species	https://en.wikipedia.org/wiki/Invasive_species
		Effects of global climate change on European marine biodiversity	http://www.coastalwiki.org/wiki/Effects_of_global_climate_change_on_European_marine_biodiversity
Media		Invasion of the ladybirds! Why are these STI-infected insects taking over our homes?	https://www.theguardian.com/environment/shortcuts/2018/oct/11/invasion-of-the-ladybirds-why-are-these-sti-infected-insects-taking-over-our-homes
		Scotland's shellfish 'at risk' from invasive species from Japan	https://www.bbc.com/news/uk-scotland-47882493
		Invasion der Schwarzmundgrundel in der Ostsee	https://www.wz.de/ratgeber/haus-und-garten/garten/invasion-der-schwarzmundgrundel-in-der-ostsee_aid-27845819 GERMAN
Scientific Institutes		Impacts of invasive phytoplankton species on the Baltic Sea ecosystem in 1980-2008	http://www.helcom.fi/baltic-sea-trends/environment-fact-sheets/eutrophication/impacts-of-invasive-phytoplankton-species-on-the-baltic-sea-ecosystem-in-1980-2008
		Invasive and Exotic Marine Species	http://www.climate.org/archive/topics/ecosystems/invasivespecies.html
		5 Invasive Species You Should Know	https://ocean.si.edu/ocean-life/5-invasive-species-you-should-know
		AquaNIS Information system on aquatic non-indigenous and cryptogenic species	https://www.corpi.ku.lt/nemo/mainnemo.html http://www.corpi.ku.lt/databases/index.php/aquanis
		Was sind Neobiota? Was sind invasive Arten?	https://neobiota.bfn.de/grundlagen/neobiota-und-invasive-arten.html GERMAN
		Invasive and Exotic Marine Species	https://www.fisheries.noaa.gov/insight/invasive-and-exotic-marine-species
Non Governmental Organisations		World Wildlife Fund : Why some species are unwelcome	https://wwf.panda.org/our_work/wildlife/problems/invasive_species/
		Victory for the Baltic Sea – Ballast Water Management Convention to finally come into Force!	https://wwf.panda.org/knowledge_hub/where_we_work/baltic/news/?279353/Victory%2Dfor%2Dthe%2DBaltic%2DSea%2D%2DBallast%2DWater%2DManagement%2DConvention%2Dto%2Dfinally%2Dcome%2Dinto%2DForce
		Environmental own goals: Invasive species	https://wwf.panda.org/knowledge_hub/teacher_resources/own_goals/invasive_species/

		<p>Tiny organisms, massive impact</p>	<p>https://www.greenpeace.org.au/blog/tiny-organisms-massive-impact/</p>
<p>Maps</p>		<p>free NOAA Maps</p>	<p>https://search.usa.gov/search?utf8=%E2%9C%93&affiliate=sanctuaries.noaa.gov&query=maps</p>
		<p>Global Maps</p>	<p>http://earthobservatory.nasa.gov/GlobalMaps/?eocn=topnav&eoci=globalmaps</p>
<p>Books</p>		<p>ACIA , Arctic Climate Impact Assessment</p>	<p>Hassol, S.J., <i>Impacts of a Warming Arctic: Arctic Climate Impact Assessment</i> Cambridge University Press, 2004 excellent report - see: https://acia.amap.no/ https://www.amap.no/documents/doc/arctic-arctic-climate-impact-assessment/796</p>
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		<p>Invasive Species</p>	<p>https://www.nasa.gov/multimedia/imagegallery/index.html https://nasasearch.nasa.gov/search?utf8=%E2%9C%93&affiliate=nasa&sort_by=&query=invasive+species</p>
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