



Climate change, Global Warming and the Shonai Sea



“Human resource development to protect the sea”

Purpose

Thinking about SDG 13 (Prevention of global warming) by researching the relationship between changes in Shonai sea and climate change/global warming

Research method

- Data survey at Yamagata Pref. Fisheries Research
- Data survey using books from libraries
- Research using the Internet
- Interviews with fishermen

Hypothesis

The decreasing catch in Yamagata Pref. is due to climate change and global warming

Climate change

Natural factors: Oceanic changes, atmospheric changes due to solar activity
Human factors: Combustion of fossil fuels, etc.

Status of climate change

Increase in carbon dioxide levels

20% increase when comparing the five year-period between 2015 to 2019.

Rise in average temperatures

The average surface temperature has risen by about 0.6 degrees Celsius in the past 100 years. The global average temperature is the highest in recorded history and has risen by about 0.2 degrees Celsius compared to the last five years. It has risen 1.1 degrees Celsius compared to the pre-industrial era.

Rise in sea levels

Since 1900, sea levels have been rising about 1 to 3 mm annually. The sea level rose 5 mm over the five years from May 2014 to May 2019 and is expected to rise by up to 88 cm by 2100 according to a report from the IPCC. If this become a reality, 260 million people living in coastal areas will be forced to move, and many people will have difficult living situations.

Rise in seawater temperatures

More than 90% of heat energy generated by climate change is purportedly absorbed and accumulated in the ocean.

Ocean acidification

The ocean absorbs 30% of man-made carbon dioxide emissions each year, and, despite the control over the increase in the ratio of carbon dioxide in the atmosphere, the acidification of seawater is advancing. Ocean acidity is said to have increased 26%.

Why is climate change a problem?

About 90% of the 6,457 natural disasters observed over the past 20 years were caused by climate conditions, and disasters, such as heatwaves, forest fires, and tropical cyclones, are becoming more severe in many parts of the world.

Antarctica is the Earth's time capsule (a message from 4.6 billion years ago)

The thick ice sheet covering Antarctica is a historical record of climate change for a period of more than a million years.
Meteorites found in Antarctica are historical records of the origins of the solar system.
The bedrock under the ice sheet preserves traces of changes on Earth.

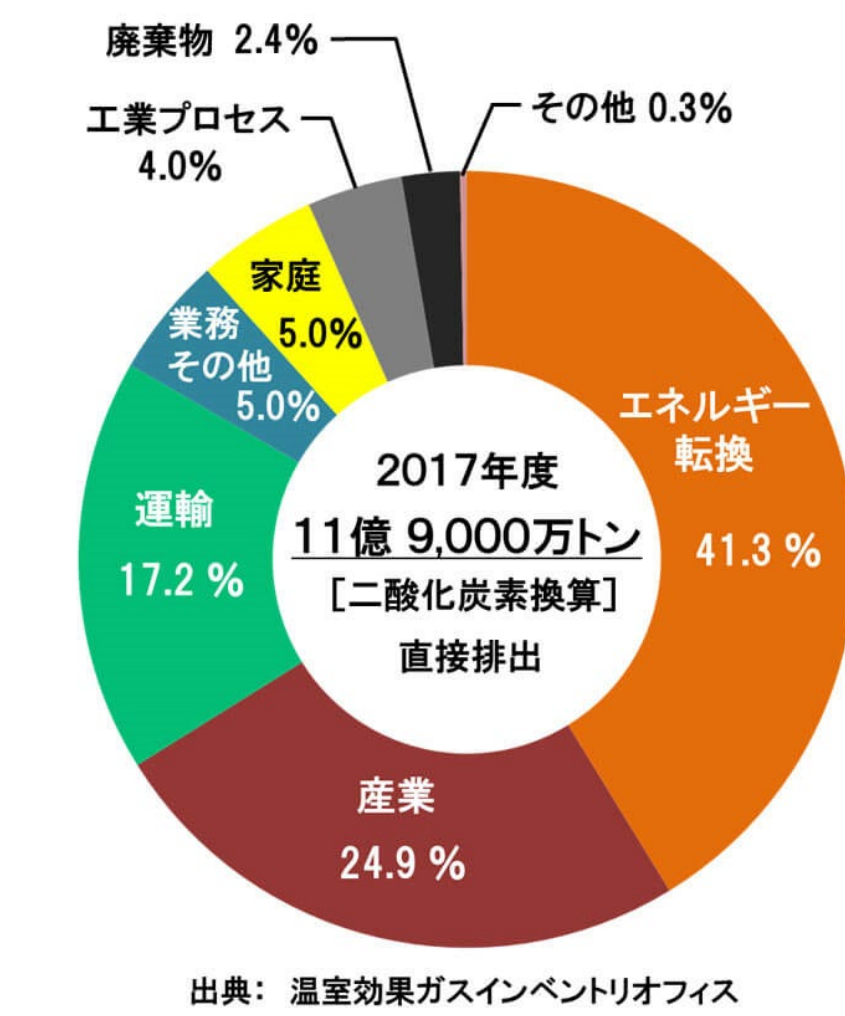
Global warming

- The global average temperature rose 0.58 degrees Celsius over the 132 year-period from 1880 and 2012
- Carbon dioxide concentration in the atmosphere has increased 40% compared to the pre-industrial era
- The rise in temperatures due to global warming also causes the seawater temperature to rise
- The cause of global warming is greenhouse gases such as carbon dioxide
- Carbon dioxide is absorbed by forests, turned into oxygen, and released into the atmosphere. Only plants can turn it into oxygen. Other than plants, the only thing that absorbs carbon dioxide is the ocean.
- The ocean absorbs carbon dioxide and thermal energy, reducing global warming. 90% of the thermal energy accumulated over the 40 year-period between 1971 and 2020 was absorbed by the ocean.
- About 30% of carbon dioxide emitted by human production activities is absorbed by the ocean, which means the ocean itself is exacerbating global warming.
- The ocean absorbs thermal energy and increases seawater temperature, causing seawater to expand, and global sea levels to rise.
- One of the roles of the ocean is to slow down the progress of global warming. On the other hand, the ocean itself is being warmed due to heat absorption.

▼ 世界の石油・石炭などからの二酸化炭素排出量の推移



▼ 日本の二酸化炭素排出の分野別割合

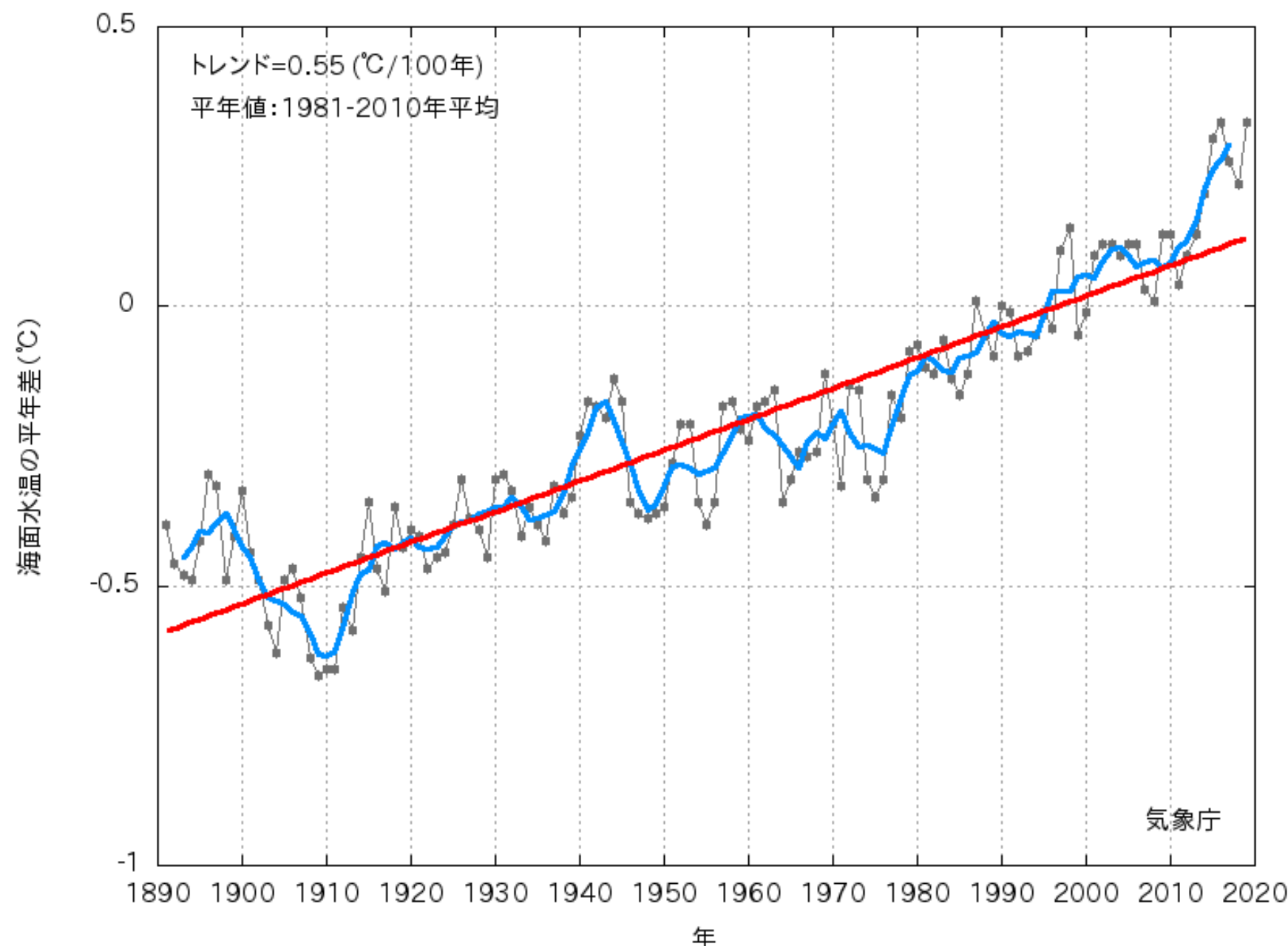


[Impacts of global warming]

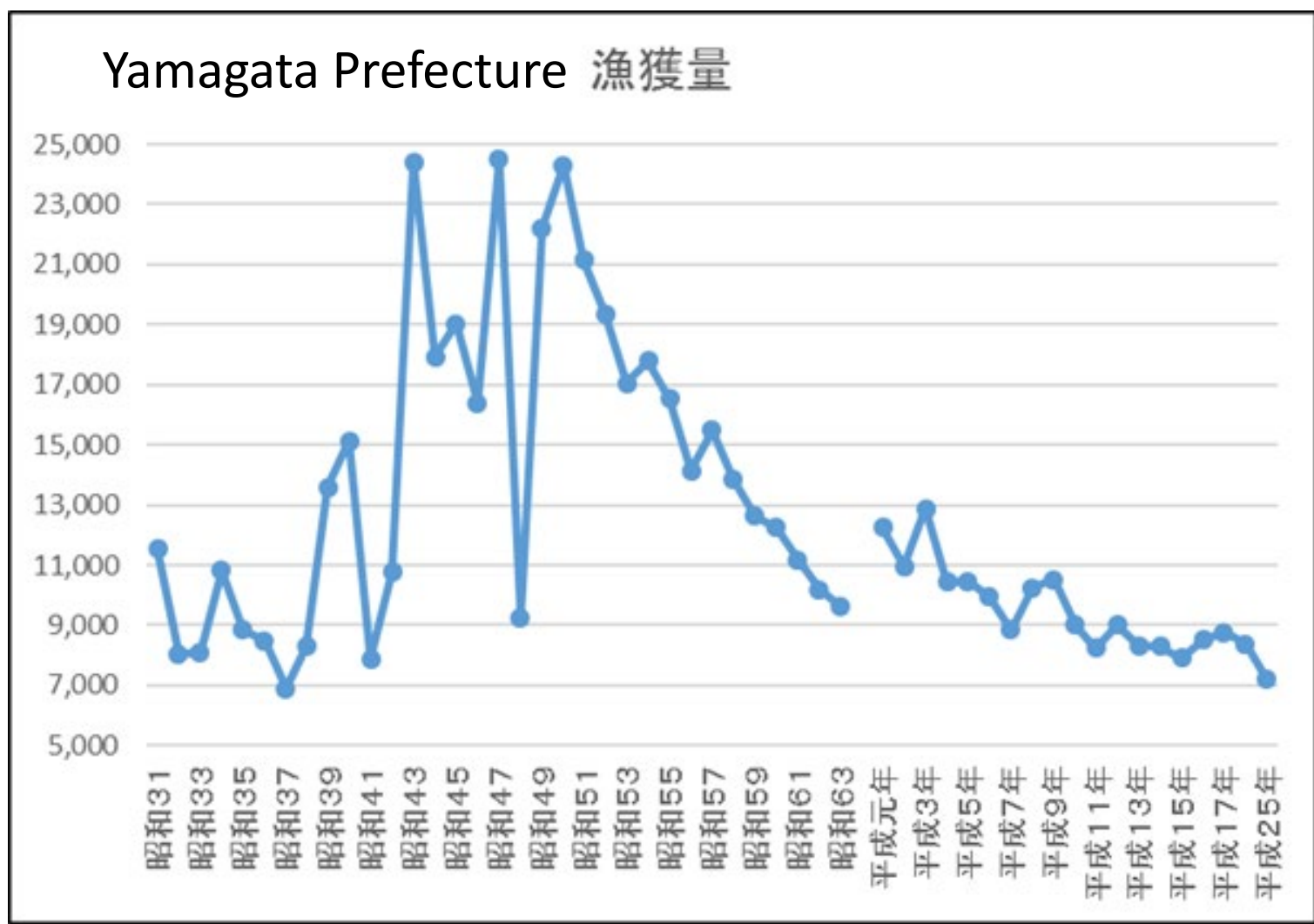
- 1℃ rise Coral bleaching
- 1.5℃ rise Rapid increase in people suffering water shortages/Melting of Greenland's ice sheet
- 1℃ to 2℃ rise Increase in extreme climate events
- 2℃ rise Flood damage in many coastal areas/Increase in malaria sufferers
- 3℃ rise Significant impact on terrestrial ecosystems/Cessation of oceanic general circulation
- 5℃ rise Collapse of methane hydrate



2021 United Nations Decade of Ocean Science for Sustainable Development 2030



Annual transition in global average sea surface temperatures



Interview with Mr. Jusaku Suzuki

(Awarded the Medal with Yellow Ribbon in 2019)

Former Chairman of Obako Sawara Brand Promotion Council

The difference in water temperature throughout the year is disappearing. There is almost no drop in water temperature in the winter, so fish that move south stay put, and the southern hemisphere fish (neon flying squid) are now being seen in stationary fishing nets. Fish migration is expanding. Behavioral patterns among fish are changing, and fish seasons are disappearing. Stormy seas are increasing in duration. Abalone are decreasing and can no longer be caught. When the mountains suffer, the sea also suffers.

Interview with Mr. Kazuhiro Akino, Kamo District, Isomi Union President

- Abalone has disappeared from the Kamo seas
- Fish that didn't exist here before, such as convict grouper and red grouper, are now being caught
- The number of blue crab has decreased, yet other species are now being caught.
- Salmon are migrating upstream earlier than usual this year.
- Sea cucumbers are getting smaller.



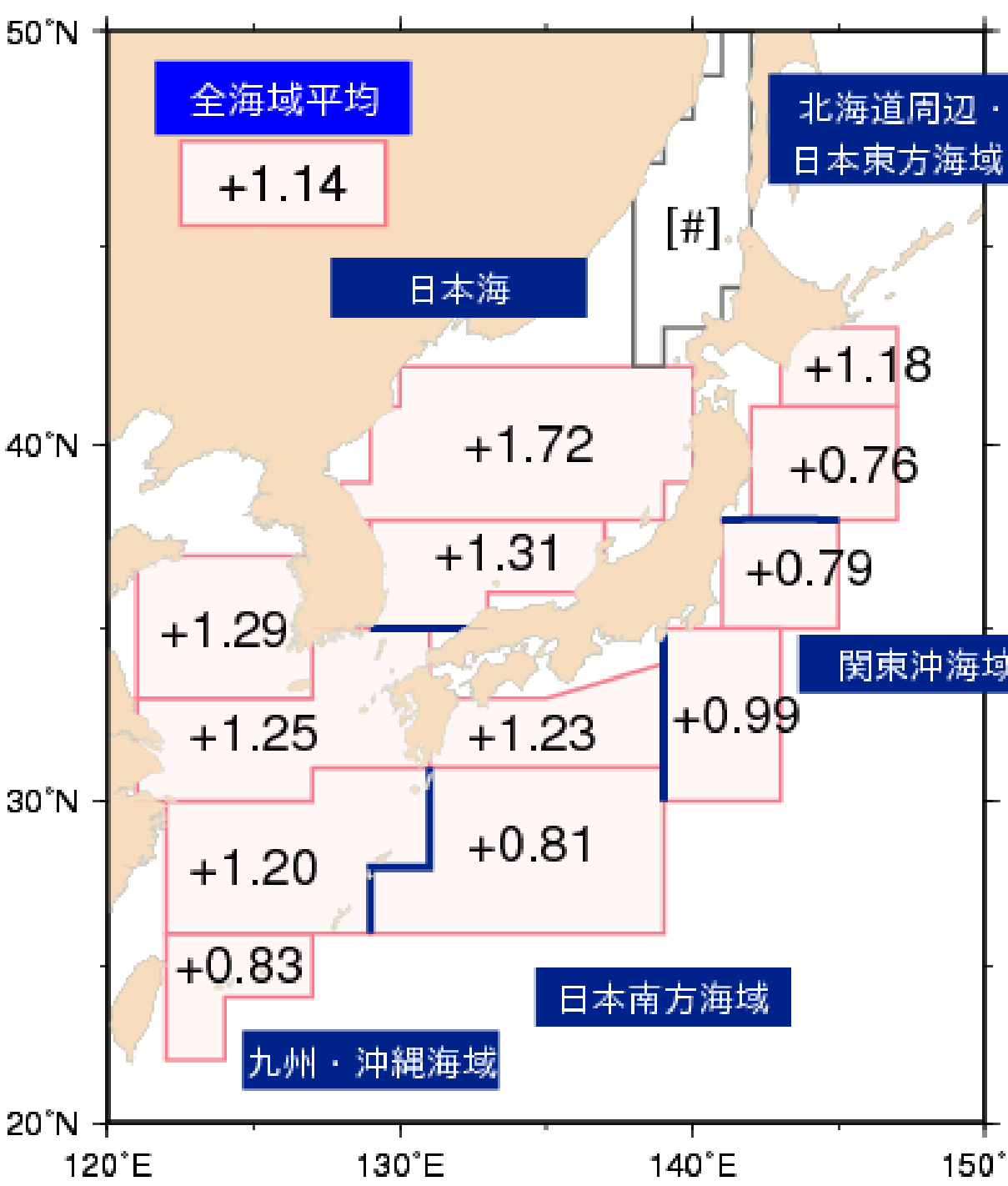
Consideration

- As the data shows, climate change and global warming are progressing.
- The temperatures of seas around the world and the Sea of Japan are rising. As a result, catches and ecosystems are changing.
- The catch in Yamagata Prefecture is decreasing. Although we cannot conclude that it is due to global warming, fishing and oceanographic condition information and data about water temperatures on water opening/closing days show that the temperature is increasing.
- We learned from the fishermen that abalone have disappeared, seasons for fish are fading, southern hemisphere fish are appearing, and sea cucumbers are getting smaller.
- The interviews with the fishermen showed us that the sea has changed, and that the catch has decreased due to global warming.

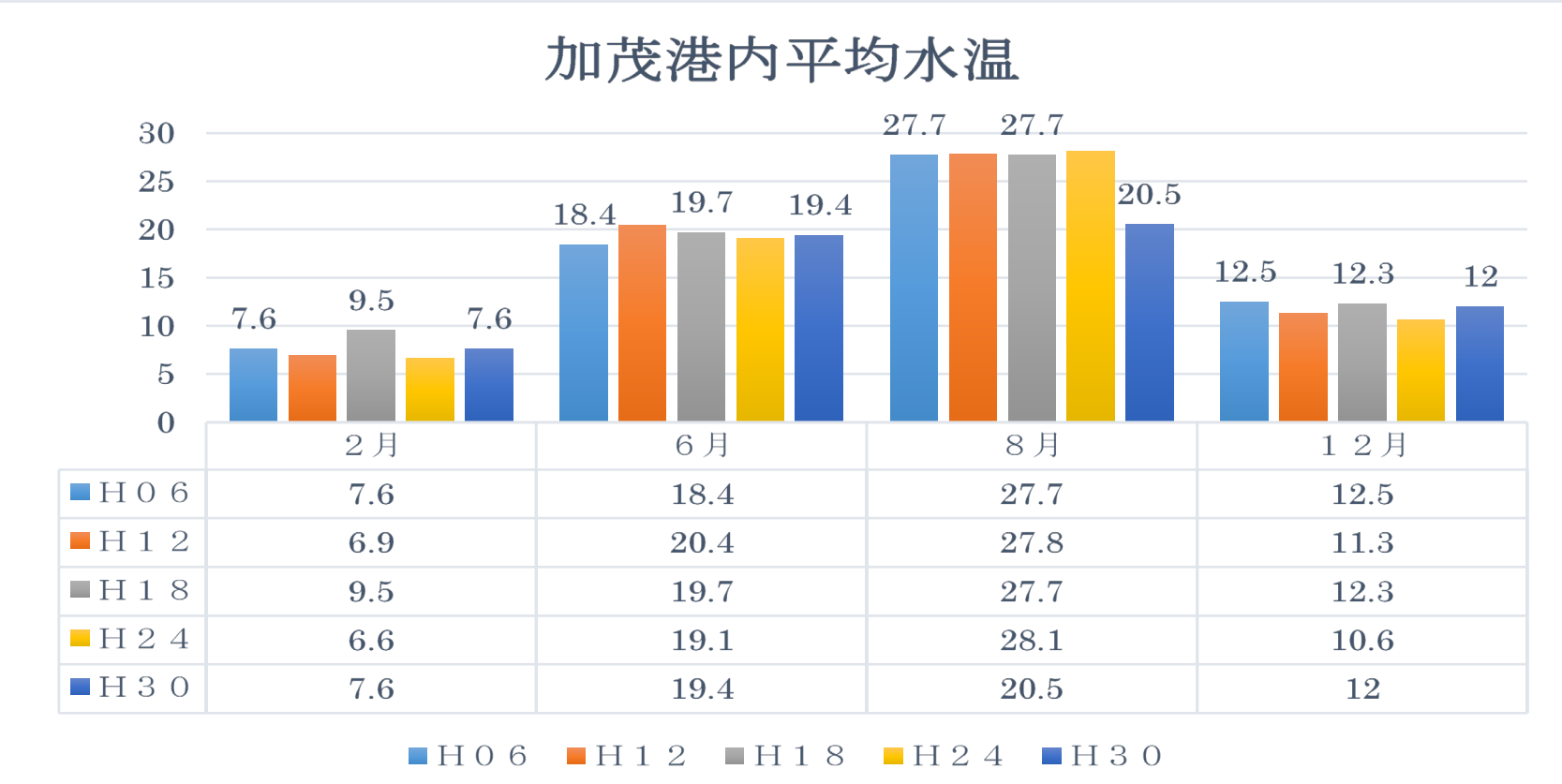
Global warming prevention

- Energy transition policy initiatives (transition of coal-fired power plant) Sakata Kyodo Power Company. Ltd. in Shonai Region
- Industrial and transportation energy transition policy (transition to fossil fuels and reduction of CO2 emissions) Buses, trucks, ships and jet aircraft
- Spreading and promoting ESG investment (Environment, Social, and Governance) in order to establish a society in which only environmentally-conscious companies can operate
- Development and utilization of the blue carbon ecosystems (carbon absorbed by marine organisms)
- Implementation of forest and marine environment improvement projects
- ◎ Measures to prevent global warming and conserve energy on an individual level (greenhouse gas reduction)
- Air conditioner temperature adjustment. Summer: 28℃; Winter: 20℃
- Unplug electrical appliances that are not in use.
- Turn off lights in unoccupied rooms.
- Stop leaving the TV on.
- Minimize the use of private cars and motorcycles

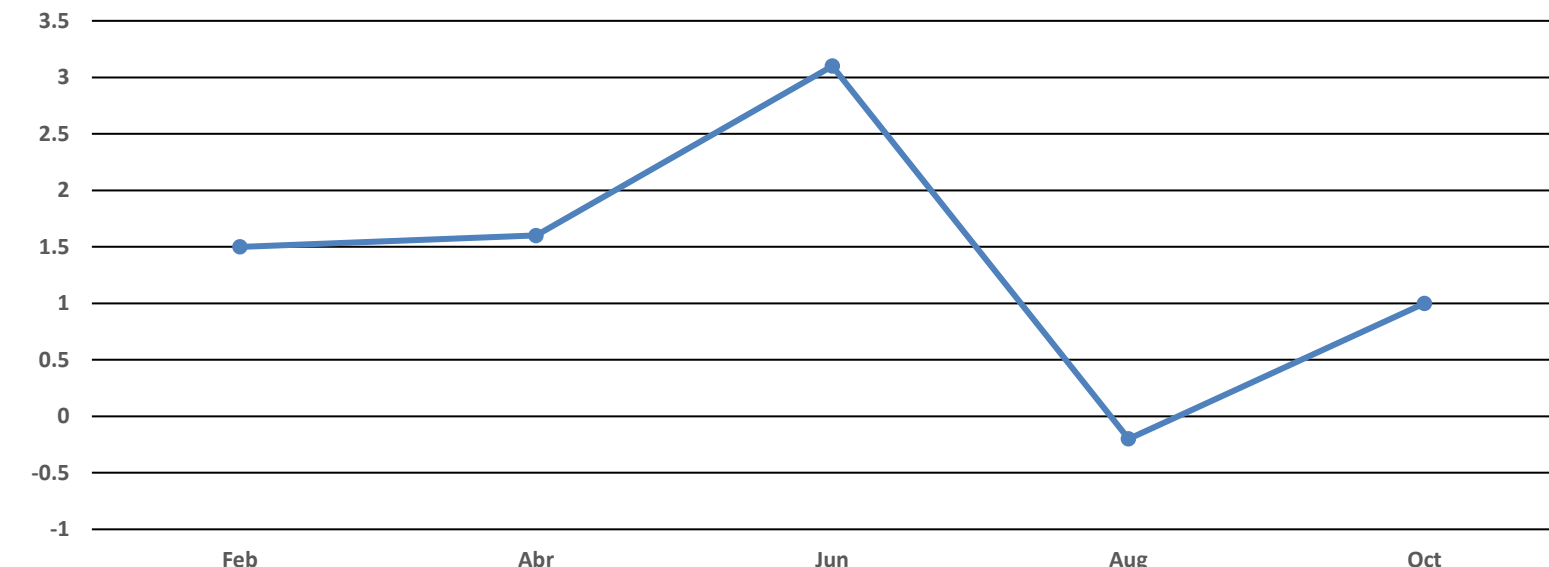
References: Yamamoto R. Climate Change +2℃, Ocean Research Institute, The University of Tokyo 100 crises in the marine environment
Books: The Atlas of Coasts and Oceans Translated by Kodomo Club, Stationary Observation Data by Yamagata Prefectural Fisheries Experiment Station, Fishing and Oceanographic Condition Information by Yamagata Prefectural Fisheries Research Institute, Long-term trends in sea level temperature and rate of increase by Japan Meteorological Agency



Rate of increase in the average sea surface temperature over the 100 year-period until 2017

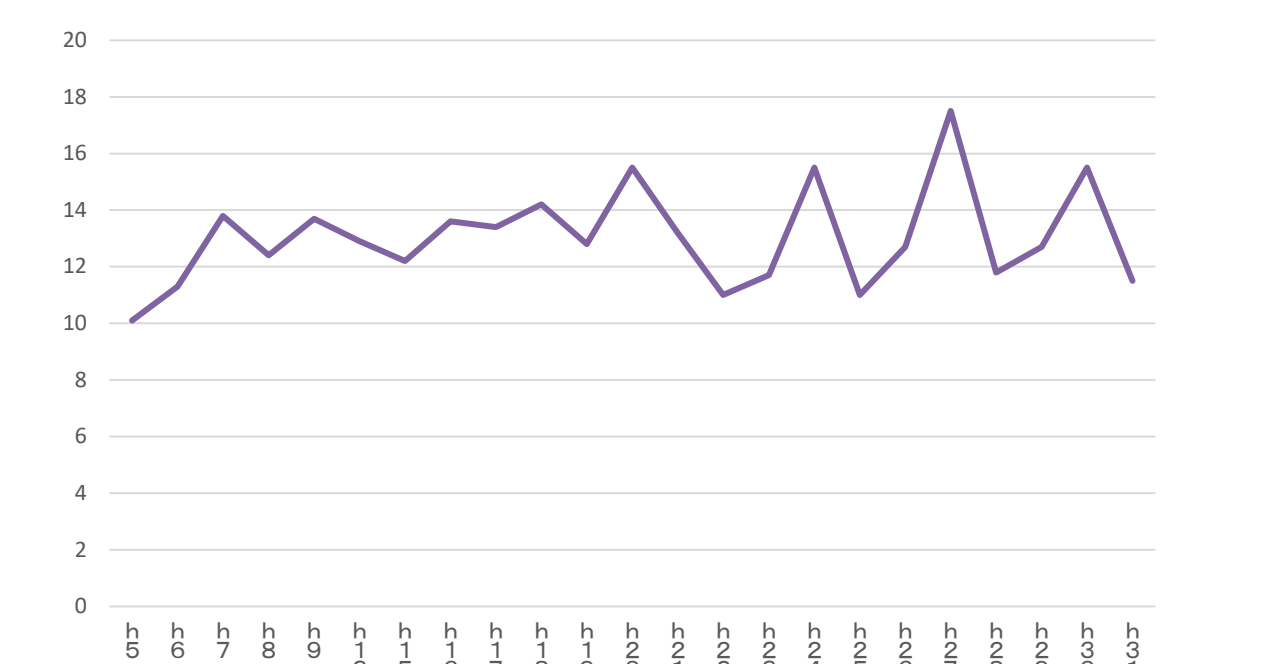


R3 Deviation in average water temperatures at 25 nautical miles into the Shonai Coast

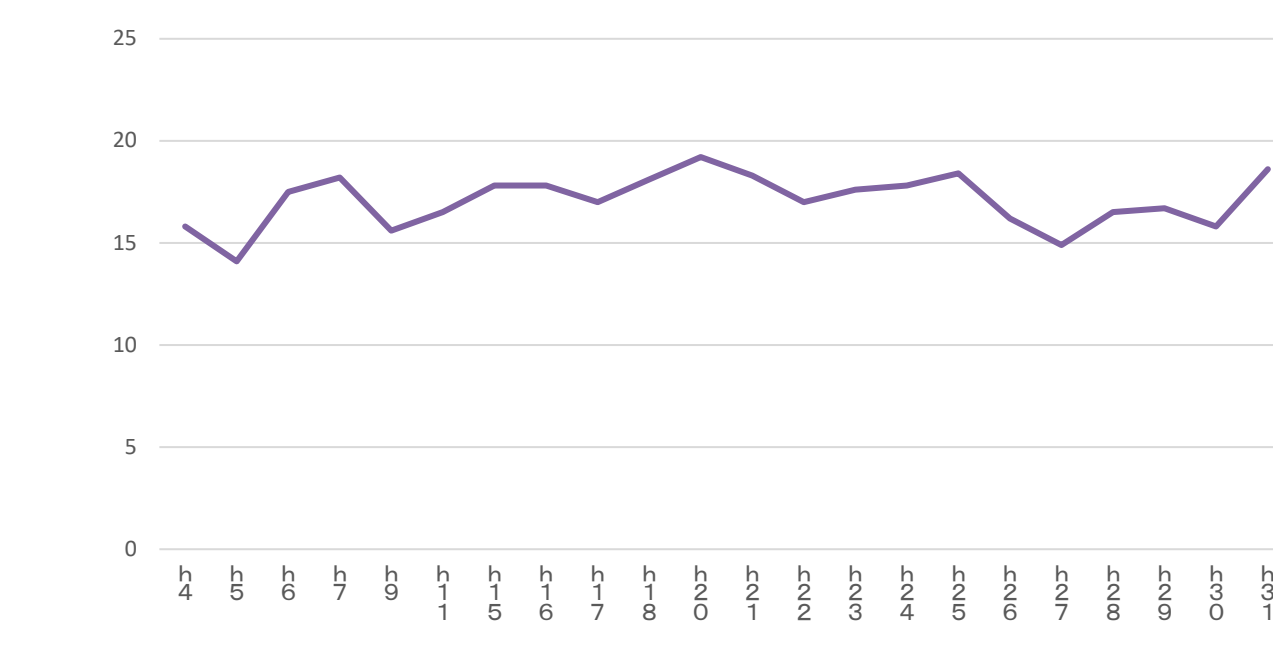


Fishing and Oceanographic Condition Information Published by Yamagata Prefectural Fisheries Experiment Station

Water temperature data on water opening day



Water temperature data on water closing day



Change in water temperature on water opening/closing day at this School (From H4)

