

Sustainable seaweed creation

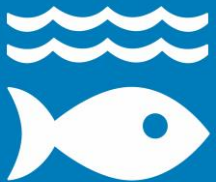
12 RESPONSIBLE
CONSUMPTION
AND PRODUCTION



13 CLIMATE
ACTION



14 LIFE
BELOW WATER



17 PARTNERSHIPS
FOR THE GOALS



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Masuyama · Okumura · Higashi · Yamada

The table of contents

1. Research Background
2. Significance and Purpose of the Study
3. Research methods
4. Results and Discussion
5. Future outlook
6. Research collaborators
7. References

1. Research Background

(1)What is “Seaweed bed”?



①Carbon fixation

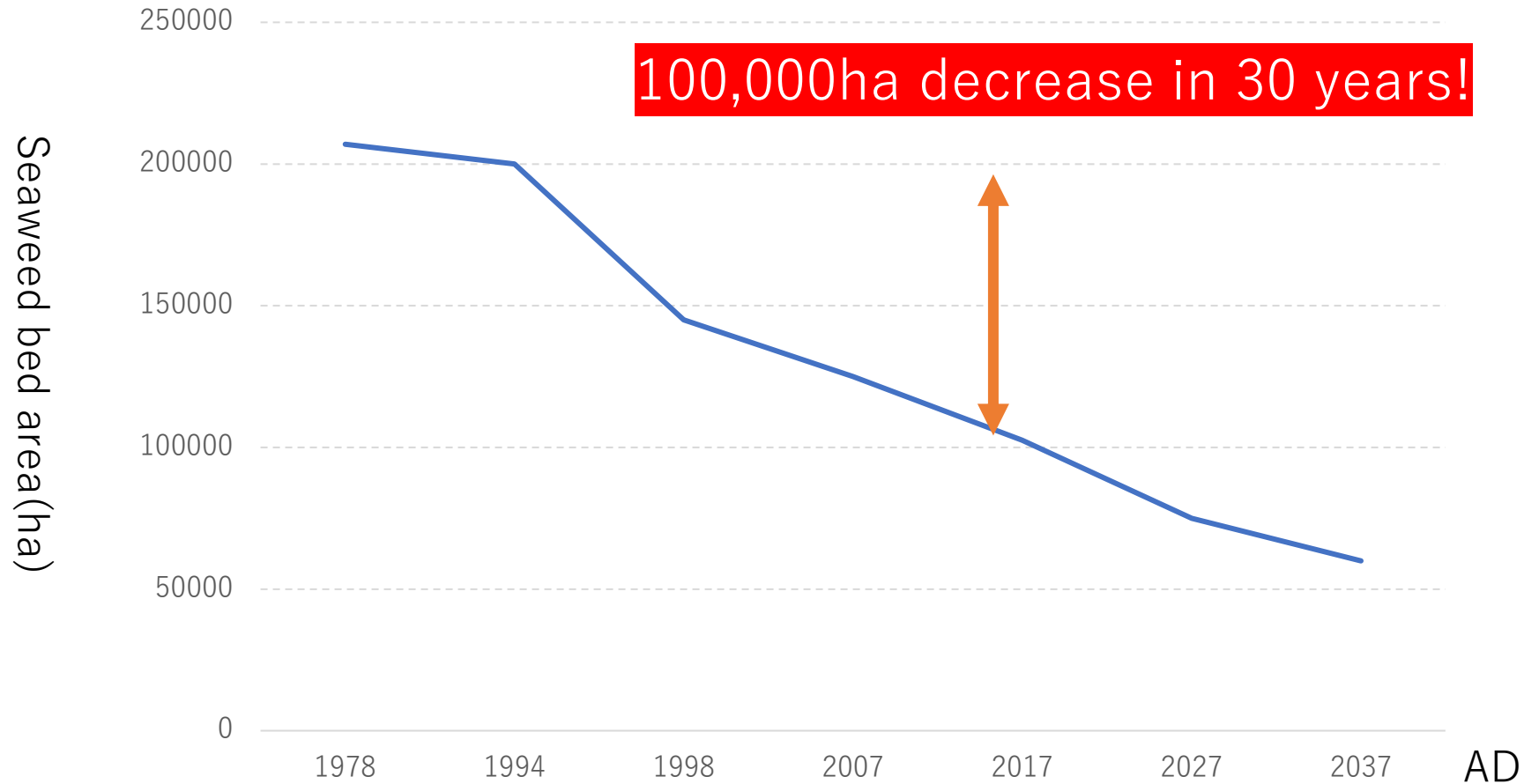
②Environment creation

③ Support for fishery resources supply

1. Research Background

(2) Decrease in seaweed beds

Changes in the area of seaweed beds in Japan (Fisheries Agency)



※Estimated value

1. Research Background

(2) Decrease in seaweed beds

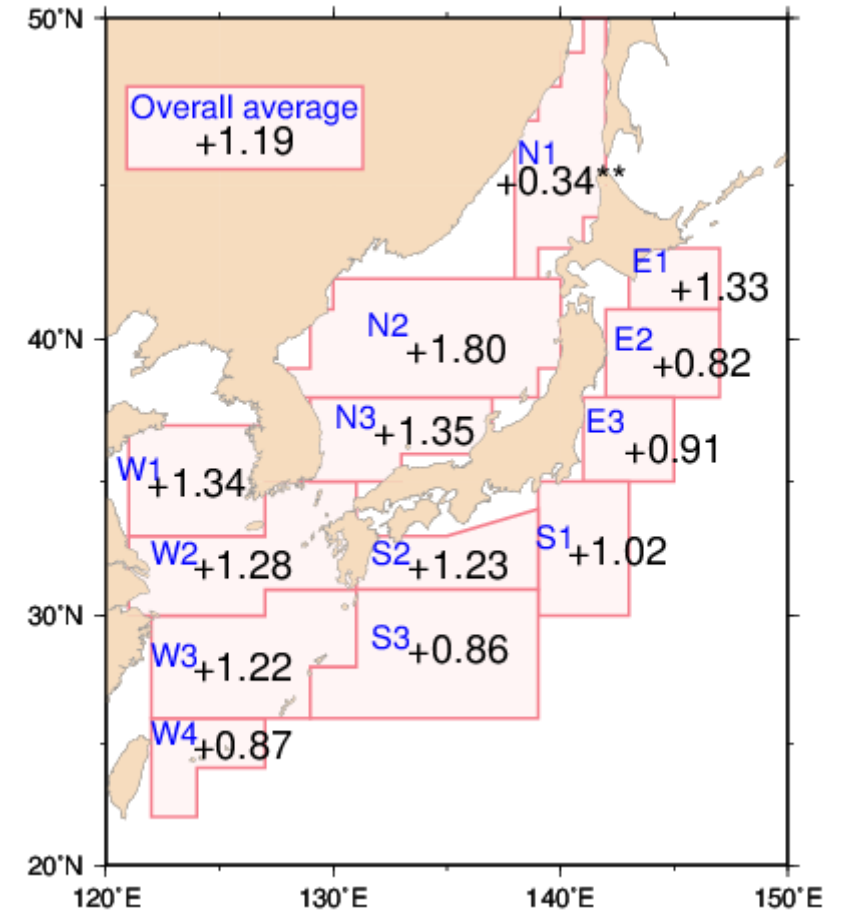
- Main causes ①

Global warming

→ **Rise in sea water temperature**



Difficulty in growing conventional varieties



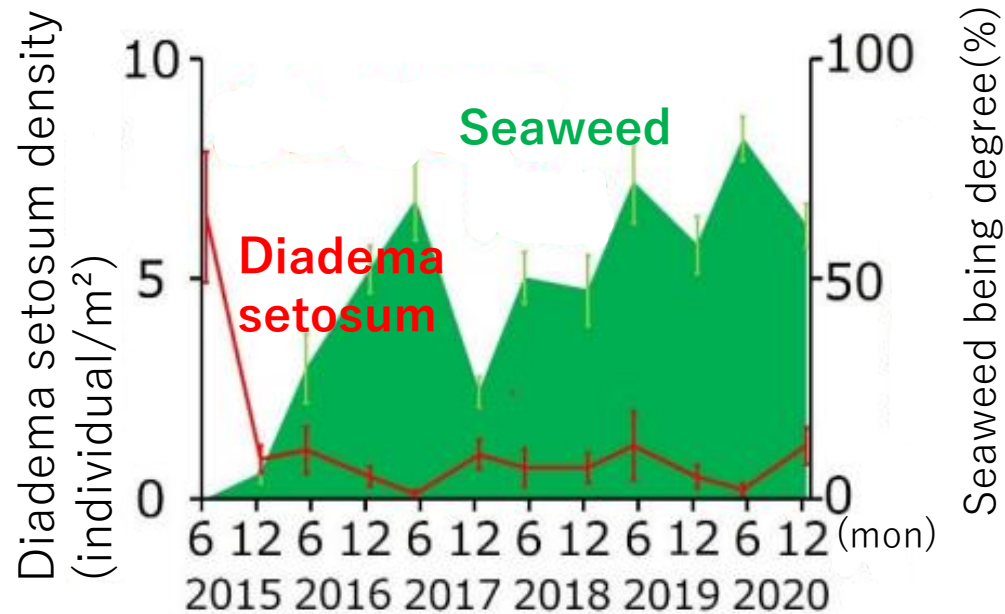
(Japan Meteorological Agency Updated March 10, 2022)

1. Research Background

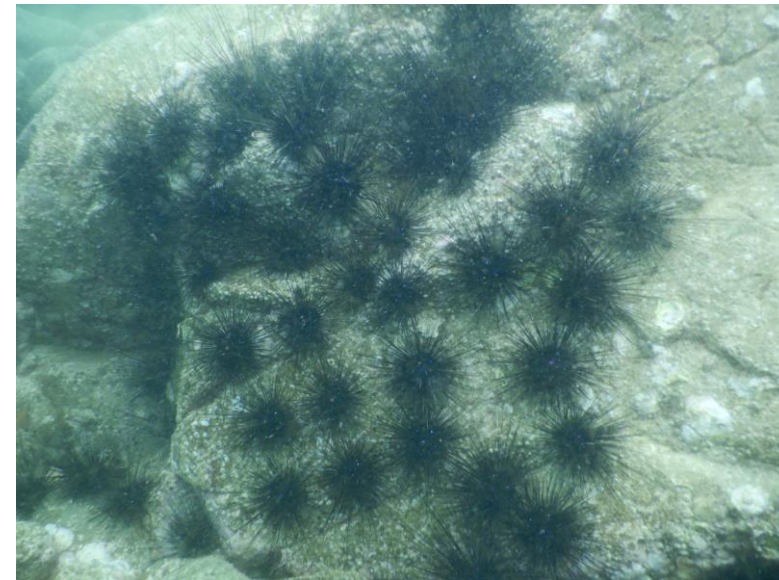
(2) Decrease in seaweed beds

- Main causes②

Feeding damage by marine organisms including sea urchins



Diadema setosum and Seaweed change over time
(Fisheries Agency)



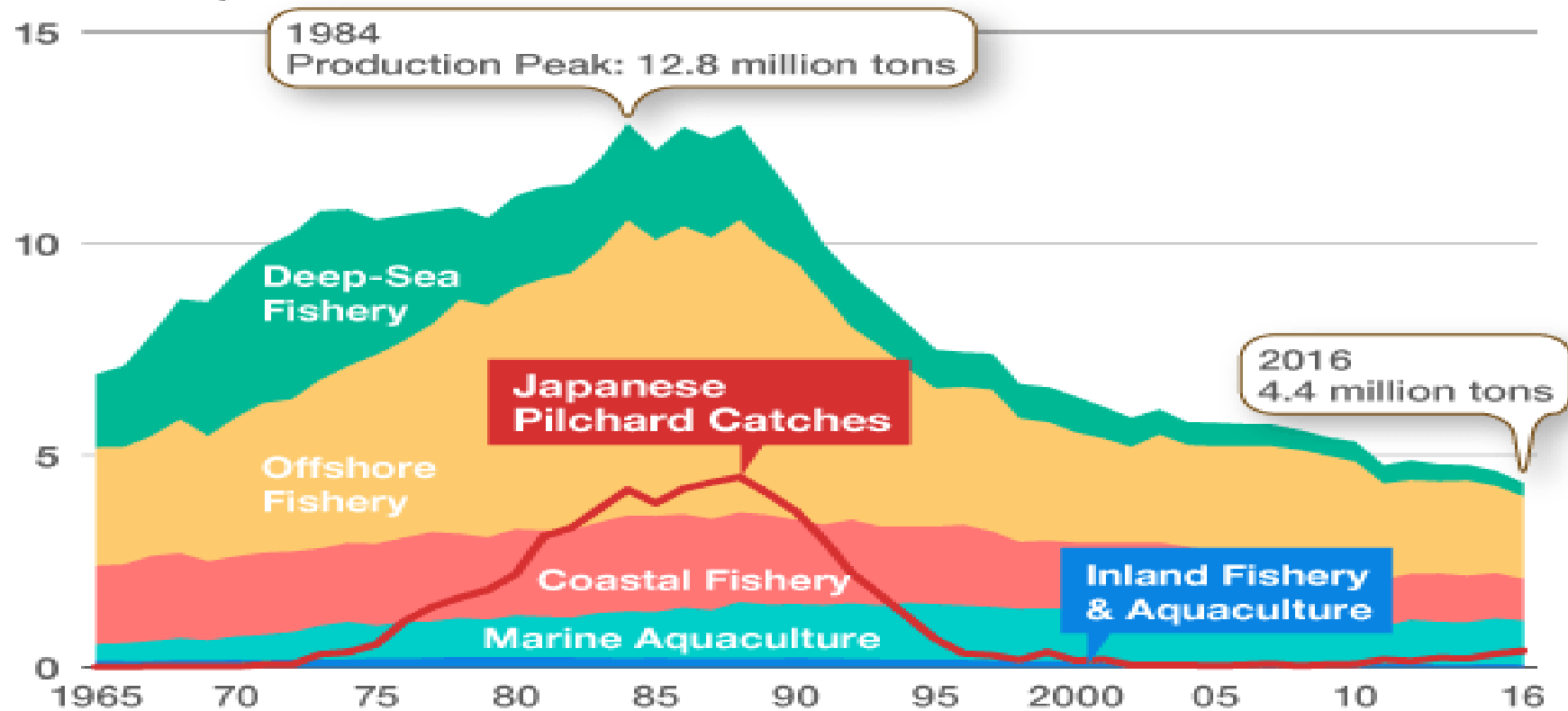
(Courtesy of Gotō City)

1. Research Background

(3) Japan's fishing industry

Japan's Fishery Production Volume

(million tons)

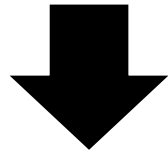


Compiled by *Nippon.com* based on data from the 2017 White Paper on Fisheries.

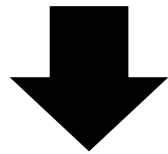
2. Purpose/ Hypothesis/ Significance of the Study

(1) Purpose and Hypothesis

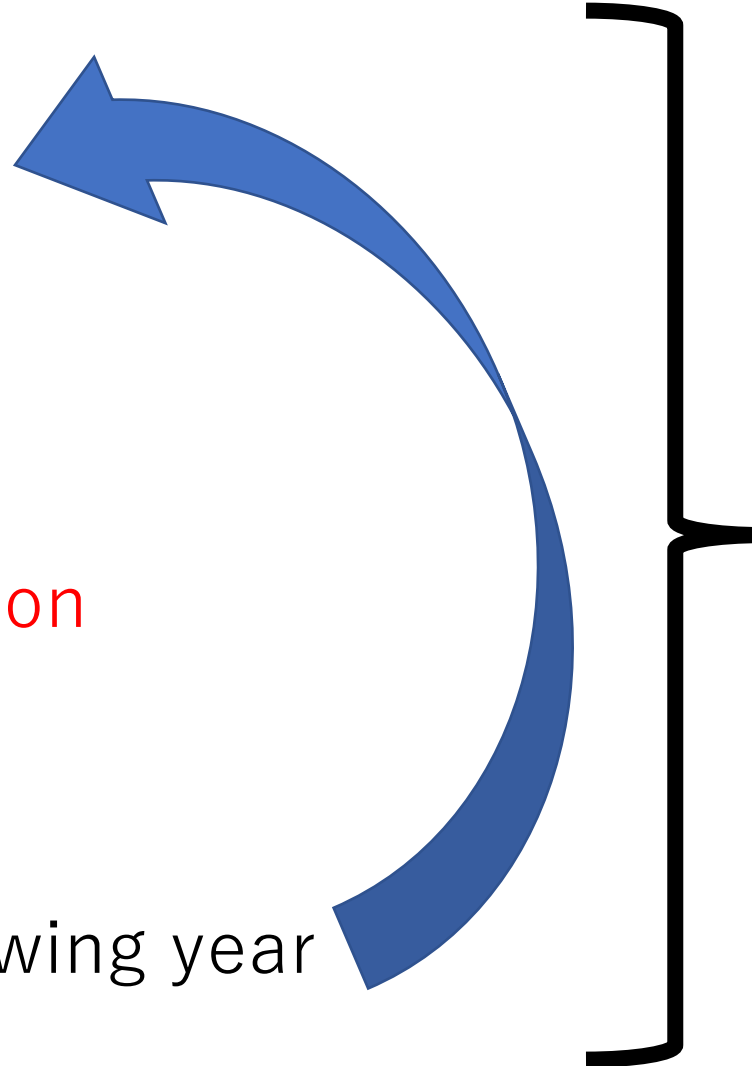
Seaweed bed creation



Profit from seaweed bed creation



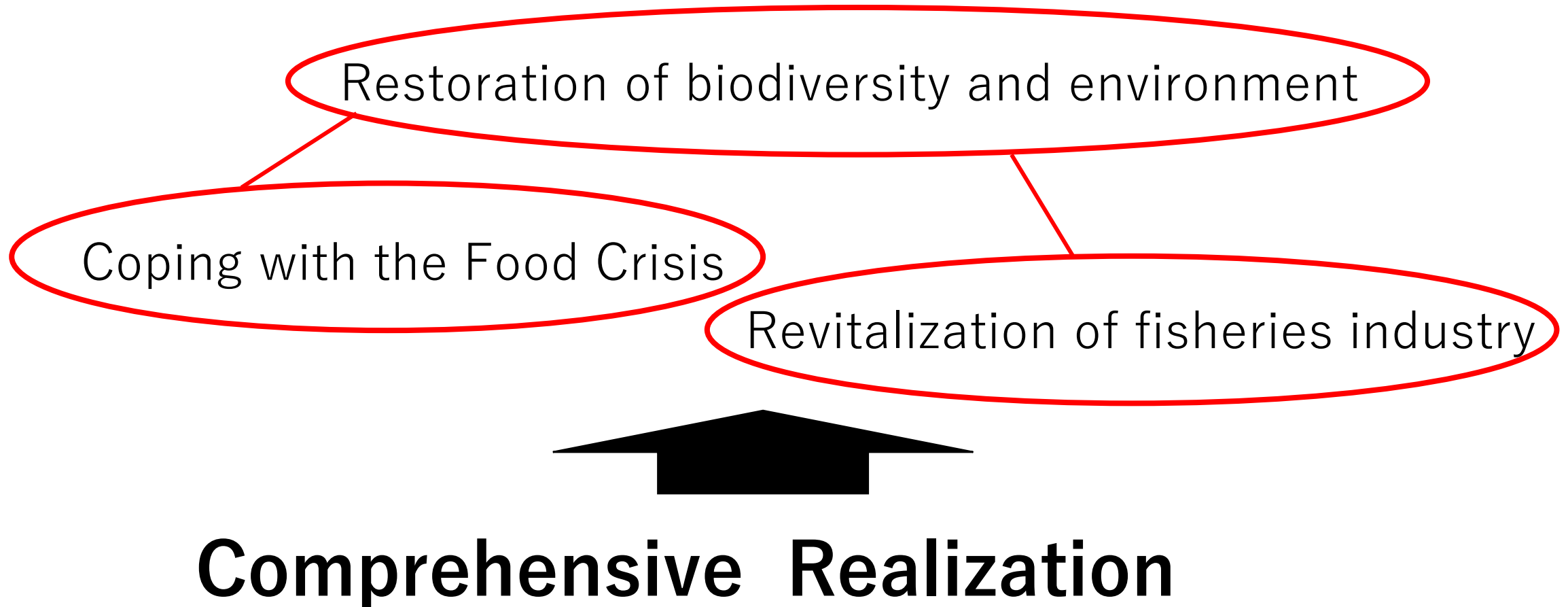
Expenses for activities in the following year



Complex
Sustainable
solutions

2. Purpose/ Hypothesis/ Significance of the Study

(2)Significance



3. Research methods

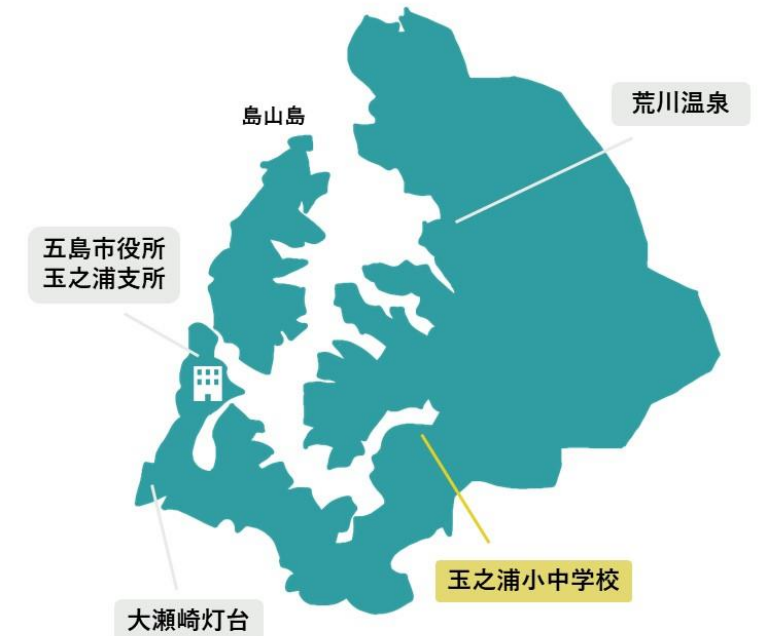
(1) The model of seaweed creation

- **Tamanoura District**, Goto City, Nagasaki

- ① Fishery is the main industry
- ② Sea desertification is in process
- ③ There is an inner bay



Seaweed bed creation project is likely to come true



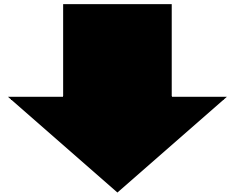
(Goto City Immigration and Settling Promotion Site)

3. Research methods

(2) Selection of target species

① Resistant to rising sea temperatures

② Resistance to food damage



Target species

Sargassum horneri



4. Results and Discussion

(1) Sargassum horneri

It is also found in the subtropics



Satisfying ①

Grows faster than it is eaten (about 30 cm in a day at its peak)



Satisfying ②

It is an annual herb that can grow up to 10 meters



Other Benefit

(Proliferation in a short period of time)

4. Results and Discussion

(1) Sargassum horneri

Objective

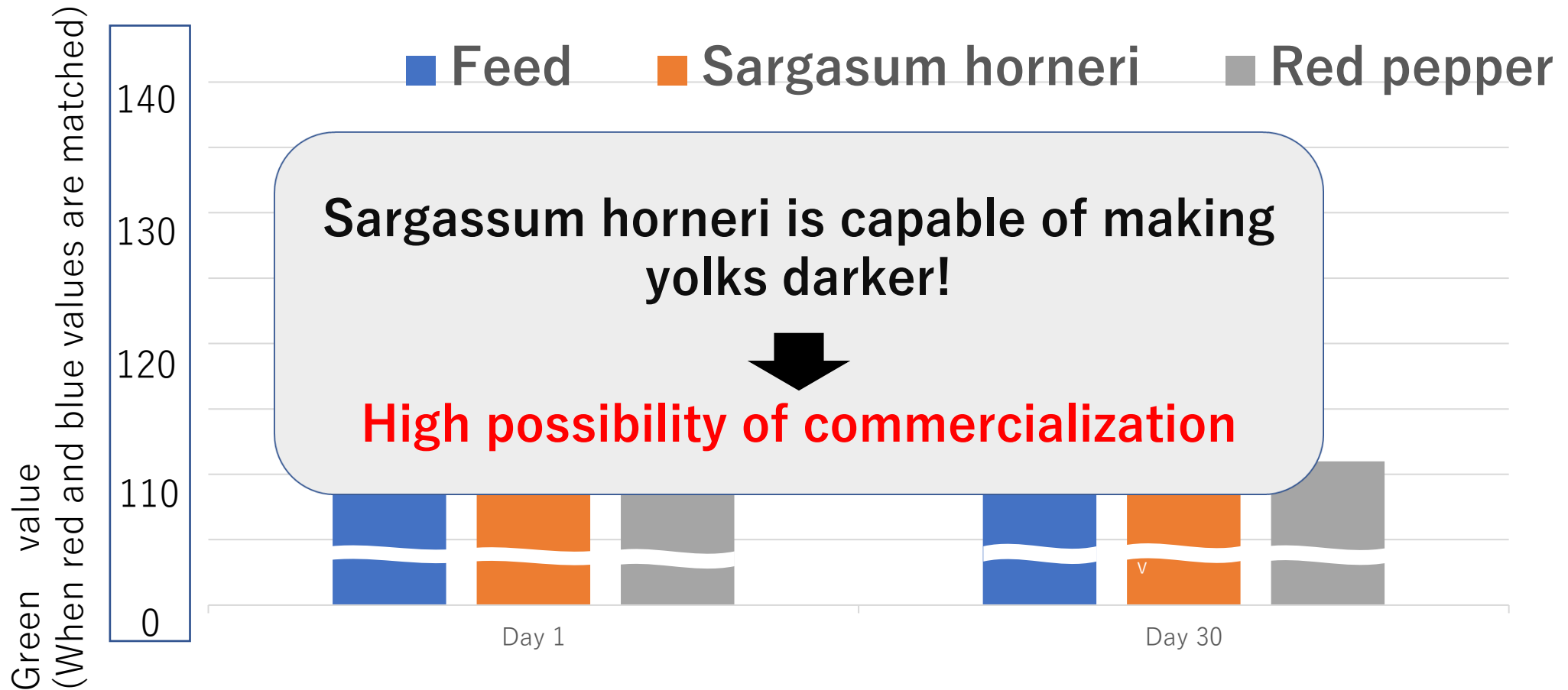
To find out if Sargassum horneri has the ability to darken the color of egg yolks.

Comparative Experiments

- Chicken breed.... *Goto Momiji*
- Period.....1 month
- feed.....
 - Normal feed(A)
 - Sargassum horneri 4% mixed bait(B)
 - Red peppers 1.5% mixed bait(C)
- Comparison method... Compare Green values

4. Results and Discussion

(1) Sargassum horneri



The possibility of
expanding
in Korea and China

=Factors=



Habitat area of the
Sargassum horneri



Culture in country
and Sargassum horneri



Effectiveness of value
added in Asia area

4. Results and Discussion

Seeding production expenses (this list express initial investment)

item	price	number	total cost
air-conditioning	285,416	1	285,416
Seawater pump	394,000	1	394,000
warehouse	5,000,000	1	5,000,000
land	849,694	1	849,694
lighting	10,500	54	567,000
lighting shed	8,459	27	228,393
Cultivation layer	50,000	83	4,150,000
sum			¥11,474,503

+ annual running costs
¥893,936

※ However, it may become less expensive through the use of patents (15-20 yen per seeding)

4. Results and Discussion

the method of cultivation in the sea



supply : Kuwano Kazuyoshi

stretch a rope surface of the sea

- simple structure
- low cost
- low yield per area



Quote : the Marine Center of the Kyoto Prefectural Agriculture

stretch a rope under the sea

- complex structure
- high cost
- high yield per area

4. Results and Discussion

Cultivation expenses in the sea (equipment costs)

- stretch a rope surface of the sea

Item	price	数	total cost
buoy	3,520	300	1,056,000
anchor	2,708	300	812,400
Rope (20 mm in diameter)	10,300	187.5	1,931,250
Rope (9 mm in diameter)	97,300	15	1,459,500
Total (per five-year)			¥5,259,150
Total (per year)	5,259,150	1/5	¥1,051,830

- stretch a rope under the sea

(Adapted from the Quarterly Report of the Kyoto Prefectural Agriculture, Forestry, Fisheries Technology and Marine Center)

per five-year ¥12,915,000

per year ¥2,583,000

4. Results and Discussion

Yield Forecast

Location : Tamanoura Bay, Goto City, Nagasaki

Area : 7.5 ha

= equivalent to 150 50-m ropes

= equivalent to 33,750 seedlings

= 168,750 kg harvested

= 27,000 kg dry weight

= Colored ingredients for 675 ton of feed
(4% blend)

4. Results and Discussion

Comparison with existing feed prices

- Cost per ton of feed (4% compound)

	Independent estimate (one seeding/¥45)	Using permission (one seeding/¥20)
stretch a rope surface of the sea	¥3808	¥2558
stretch a rope under the sea	¥6077	¥4827

- Price of colored ingredients per ton of existing feed
¥500~¥1800



No room for profit generation

5. Summary and Future Prospects

- We have found that "this idea is difficult to achieve."
- If the frequency of new equipment replacement can be reduced, costs can be cut.
- Not only this idea, but the concept of "producing onshore products or alternatives underwater" is likely to become more important in the future.

6. Research collaborators

- Iki Cultivation Center Mr. Yohei Hamano
- Nagasaki Fisheries Experiment Station Mr. Tatsufumi Hara
- Goto City Fisheries Division Mr. Kenichi Yanawaki, Tamanoura Branch Office
- Goto Fishery Association Goto City Oishi Poultry Farm
- Mr. Takeshi Abe, Department of Basic Research, Hokkaido University Museum
- Mr. Kazuyoshi Kuwano, Faculty of Fisheries, Graduate School of Fisheries Science and Environmental Studies
- Showa Sangyo Co.
- Kyoto Prefectural Marine Technology Center for Agriculture, Forestry and Fisheries

7. References

- 「日本水産資源保護協会季報第 11 巻台 4 号」 (公益社団法人日本水産資源保護協会/2009)
<https://www.fish-jfrca.jp/02/pdf/kihou/no558.pdf>
- 農林水産省統計情報(2022)
https://www.maff.go.jp/j/tokei/kekka_gaiyou/gyosan/r1/index.html
- 水産白書 (水産庁/2017 年度)
https://www.jfa.maff.go.jp/j/kikaku/wpaper/h29_h/trend/1/t1_2_2_3.html
- 「未利用海藻の飼料原料化調査」 (中田真一 上田浩三 竹田昌弘 三木正夫 鈴木啓一/2011)
https://www.hitachizosen.co.jp/hitz-tech/pdf/2011h23_2_04.pdf
- 「アカモクって、どんな海藻？」 (長谷川雅俊/2017)
<https://fish-exp.pref.shizuoka.jp/izu/0006/351/351-9.pdf>
- 日本食品標準成分表 2020 年版 (文部科学省/2020)
https://www.mext.go.jp/a_menu/syokuhinseibun/mext_01110.html

7. References

- 乾燥技術の違いによる食品中の有用成分の変化 (山口明子・西麗・廣瀬潤子・浦部貴美子・灘本知憲/2010) https://www.jstage.jst.go.jp/article/jafps/38/3/38_169/_pdf/-char/ja
- 海藻アカモクの養殖技術 (京都府農林水産技術海洋センター/2016) <https://www.pref.kyoto.jp/kaiyo/documents/kiho109-3.pdf>
- Red seaweed (*Asparagopsis taxiformis*) supplementation reduces enteric methane by over 80 percent in beef steers (Breanna M. Roque ,Marielena Venegas ,Robert D. Kinley ,Rocky de Nys ,Toni L. Duarte ,Xiang Yang ,Ermias Kebreab/2021) https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0247820&mkt_tok=ODQzLVlHQi03OTMAAAF8ahQA42wnutWKFTdDeG77SMNDjrL6AfFY0uuIV37XlrYfp0Q7xIJbpZpmceWyc7WY_rqWtilwvt5FY2-5ZqghSyF_0DpHGIGHtQUUDW3B4Yx7CTUM
- *Asparagopsis taxiformis* “*Ikimonozukinokatarusizensi*” (Masahiro Suzuki/2011) https://tonysharks.com/Tree_of_life/Eukaryote/Plantae/Rhodophyta/Asparagopsis_taxiformis/Asparagopsis_taxiformis.htm
- Nippon.com <https://www.nippon.com/en/features/h00267/>

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