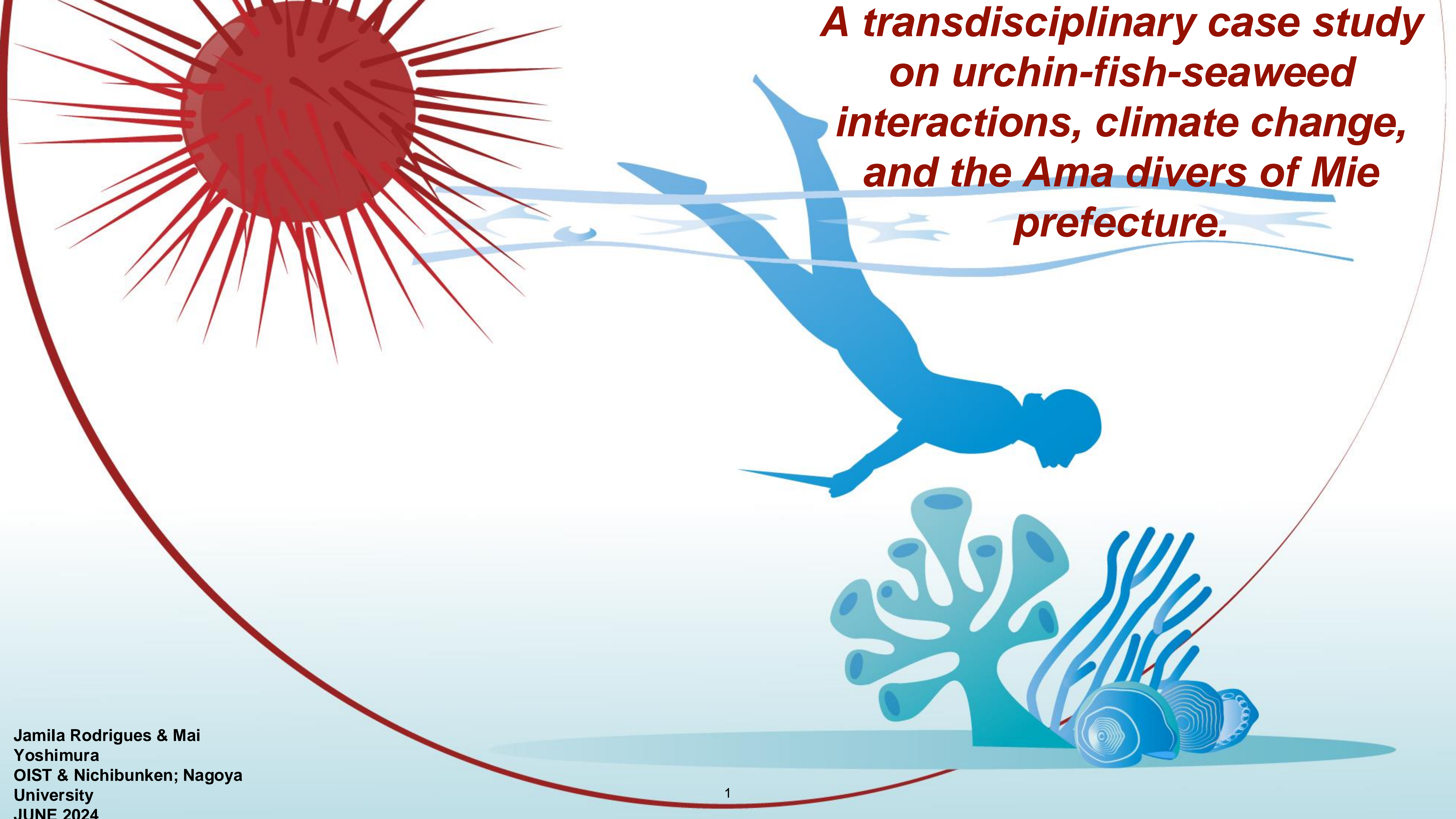


***A transdisciplinary case study
on urchin-fish-seaweed
interactions, climate change,
and the Ama divers of Mie
prefecture.***





「磯焼け」対策、ガンガゼの駆除進める 志摩市、海女の作業公開

2021年7月14日 05時00分 (7月14日 14時14分更新)



海女が駆除したガンガゼ=志摩市志摩町御座周辺で

志摩市は、海藻が減って海産物の収量に影響を及ぼす「磯焼け」対策で、アワビやサザエのえさとなる海藻を過剰に食べてしまうとされるウニの仲間「ガンガゼ」の駆除を進めている。十三日、同市志摩町御座周辺の海域で海女が行う作業が公開された。市の対策事業は本年度が初めて。漁協を通じて希望を募り、作業対象地を決めている。市は駆除作業にあたる海女らに日当を支給する形で事業を進め、六月下旬から八月にかけ十地区ほどで駆除する。

【動画】「ガンガゼ」の駆除作業

市によると、磯焼けは二～三年前から大王崎（大王町）以南の太平洋岸を中心に確認され、二〇一九年度に四十トンあった市内のアワビの漁獲量は二〇年度に十四トンと激減。ガンガゼの増殖は、黒潮の大蛇行に伴う海水温の上昇などさまざまな背景があるとみられる。

この日は海女六人が海中の岩場に潜り、...

海藻消え食害生物で真っ黒... 海女や漁師を悩ます「黒潮大蛇行」

有料記事

白井昭仁 2022年7月19日 17時00分

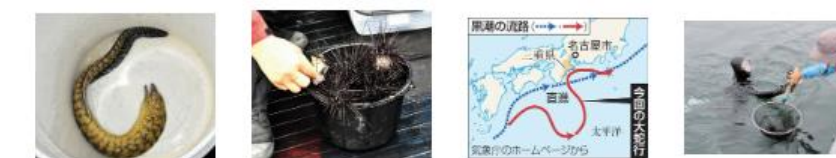


駆除作業中に海底で潰したガンガゼを見せる海女=2022年6月21日午前9時27分、三重県志摩市志摩町御座、白井昭仁撮影

三重県 志摩市 の沿岸で、海藻を食害して「磯焼け」を引き起こす生物が大発生し、深刻な不漁となっている。漁師らは駆除に懸命だが、要因とされる「黒潮大蛇行」が続いており、漁獲の回復には時間がかかりそうだ。

アワビの漁獲量激減、あまさん「一個も取れない」 原因は「磯焼け」 →

6月21日朝、志摩市 志摩町 御座の御座漁港。黒いウェットスーツを着た海女ら7人が集まった。小舟で沖へ行くと、水深2～3メートルの海底に潜り、ウニ類のガンガゼを工具類で潰した。この日午前だけでガンガゼを計8千個、前後の3日間計で2万3千個を駆除した。



Estimation of the feeding pressure of a sea urchin (*Diadema setosum*) population on a barren ground in a temperate region of Japan

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Received 29 May 2019; Accepted 26 January 2020 Responsible Editor: Masakazu Aoki

doi: 10.3800/pbr.15.112

Abstract: This study aimed to estimate the feeding pressure of a *Diadema setosum* population on a barren ground in Kata Bay, Mie Prefecture, Japan, which is a temperate region. We combined data of the feeding rate of *D. setosum* from tank experiments and of the *D. setosum* population dynamics obtained from monthly surveys. We conducted tank experiments to clarify the relationships between the feeding rate of *D. setosum* and the water temperature and test diameter of the sea urchins. The feeding rate and water temperature were positively correlated over the range of 15°C to 30°C. The test diameter composition of the *D. setosum* population in Kata Bay was stable throughout the study period (June 2014 to May 2015). The results revealed distinct seasonal changes in the feeding pressure of the *D. setosum* population owing to temperature variations.

Key words: *Diadema setosum*, sea urchin, barren ground, feeding pressure

三重県早田浦におけるガンガゼ除去に伴う海藻植生の変化

石川達也,^{1,2} 戸瀬太貴,³ 阿部真比古,⁴ 岩尾豊紀,⁵
森田晃央,¹ 前川行幸,¹ 倉島 彰^{1*}

(2016年11月30日受付, 2017年3月30日受理, 2017年6月27日J-STAGE 早期公開)

¹三重大学大学院生物資源学研究科, ²尾鷲市役所, ³和歌山県立串本古座高等学校,
⁴(国研)水産研究・教育機構水産大学校, ⁵鳥羽市水産研究所Changes in algal flora by removing *Diadema* in Haidaura Bay, Mie PrefectureTATSUYA ISHIKAWA,^{1,2} TAIKI TOSE,³ MAHIKO ABE,⁴ TOYOKI IWAO,⁵
TERUWO MORITA,¹ MIYUKI MAEGAWA¹ AND AKIRA KURASHIMA^{1*}¹Graduate School of Bioresources, Mie University, Tsu, Mie 514–8507, ²Owase City Office, Owase, Mie 519–3696, ³Wakayama Prefectural Kushimoto Koza Senior High School, Higashimuro, Wakayama 649–3503, ⁴National Fisheries University, Shimonoseki, Yamaguchi 759–6595, ⁵Toba City Fisheries Research Center, Toba, Mie 517–0005, Japan

Changes in algal flora by removing the sea urchin *Diadema* spp. were studied in Haidaura Bay, Mie Prefecture, central Japan in 1999, 2004 and 2014. The algal flora and distribution of seaweed beds and barren ground were surveyed by skin diving at 10 sampling sites. Thirteen species of Chlorophyceae, 30 species of Phaeophyceae and 67 species of Rhodophyceae were observed during the study period. In the mouth of the bay, seaweed beds were stable and the number of algal species did not show remarkable changes from 1999 to 2014. As a result of the recovery of seaweed beds from barren grounds by removing *Diadema* spp., the number of algal species drastically increased in the inner parts of the bay. Consequently, removing *Diadema* spp. increased the number of algal species including various small algae in *Diadema*-dominated barren grounds.

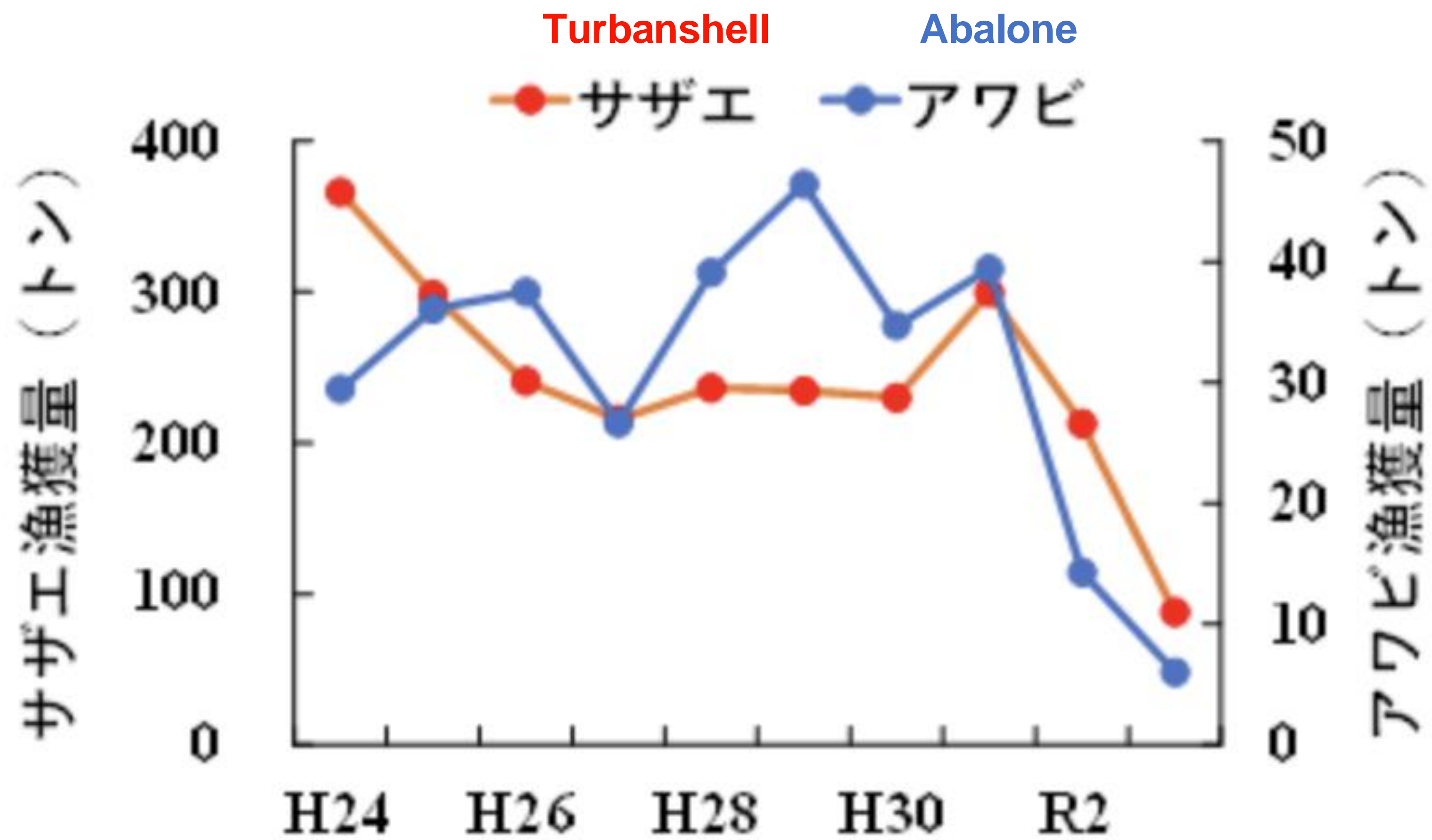
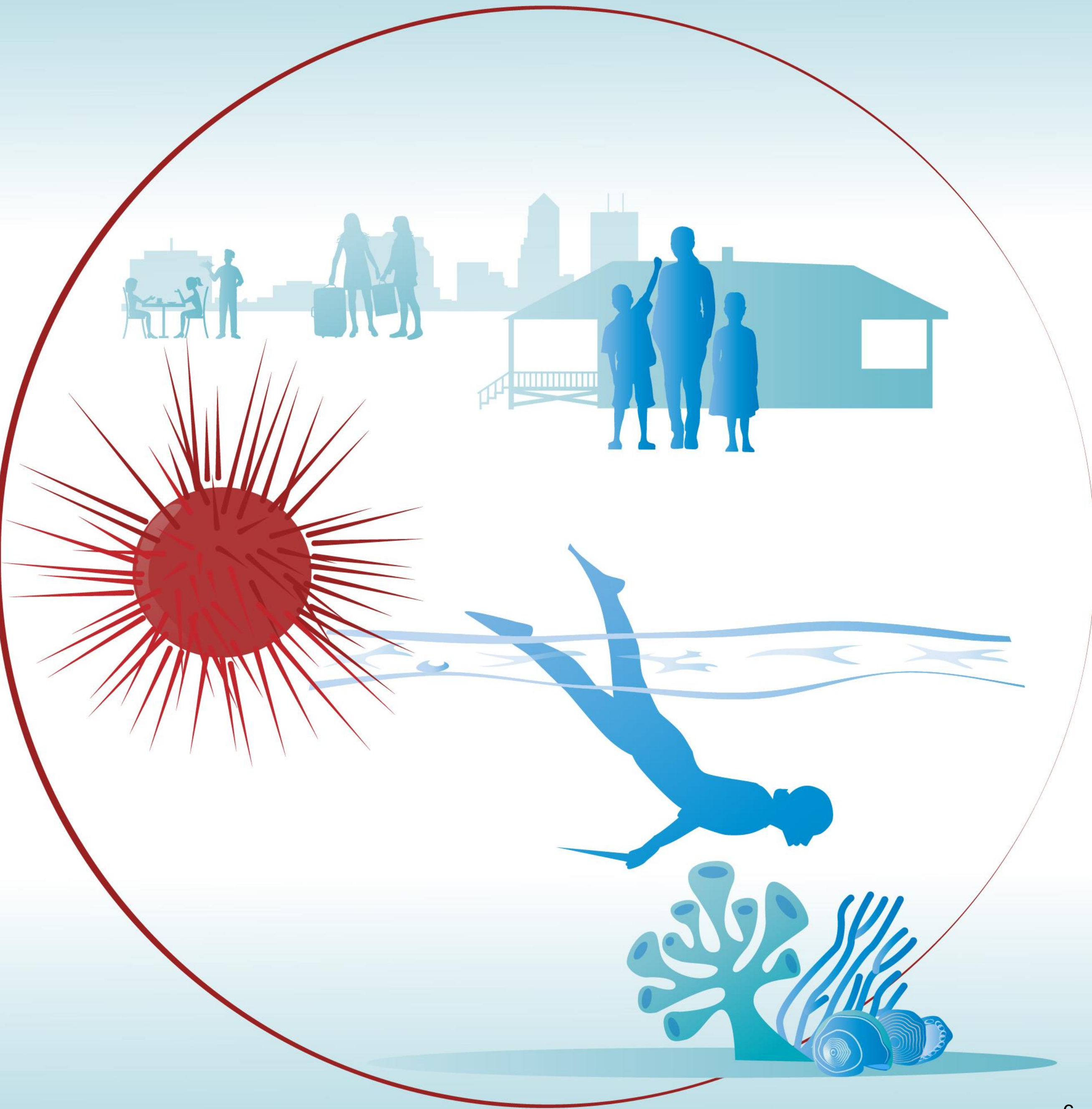


Figure 1 Changes in the catch of turban shells and abalone in Shima City



Mai Yoshimura, Akihito Tachikawa, Akira Kurashima, Jamila Rodrigues



Aoki Masakazu



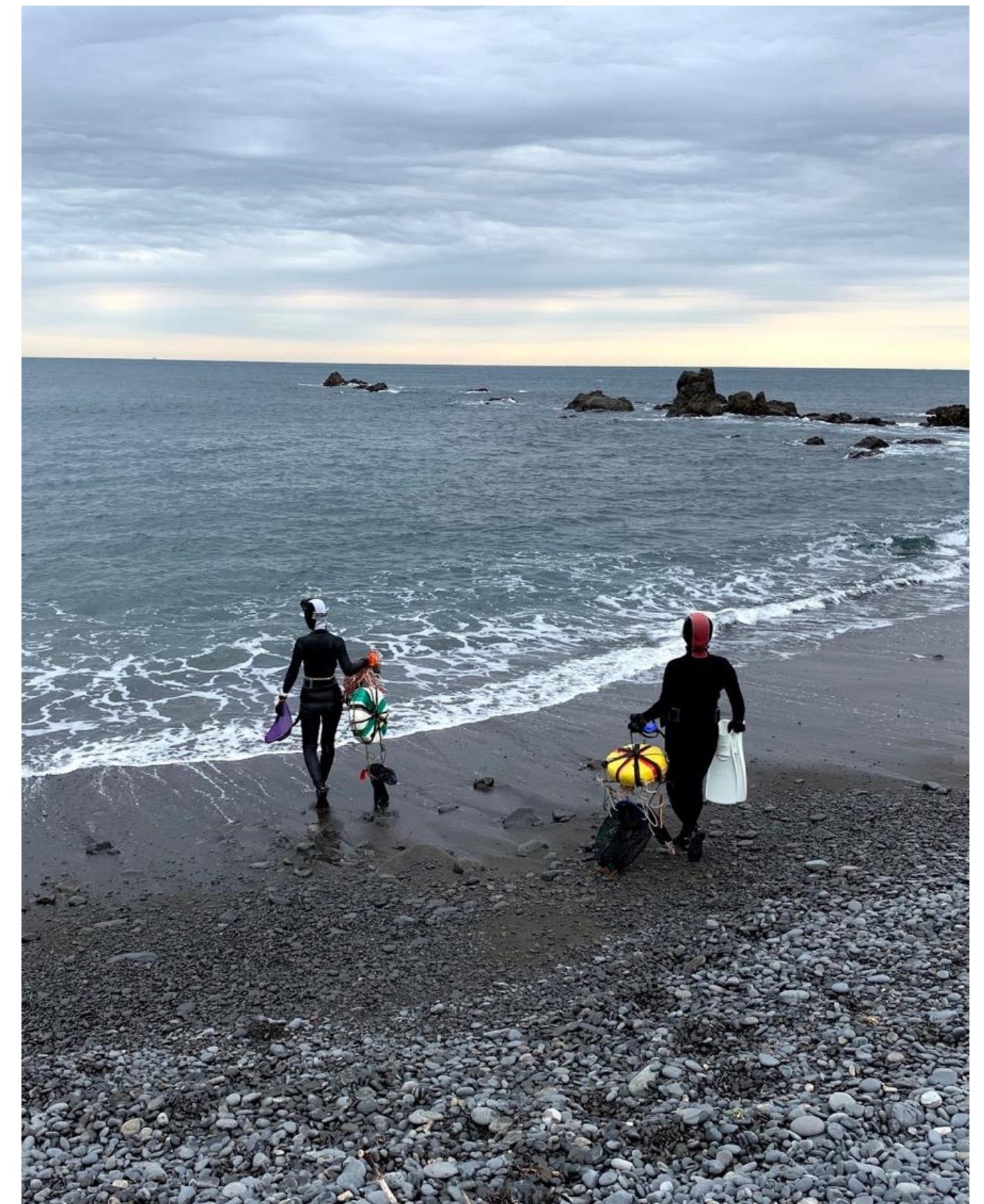
Callum Hudson

Ama Divers in Japan

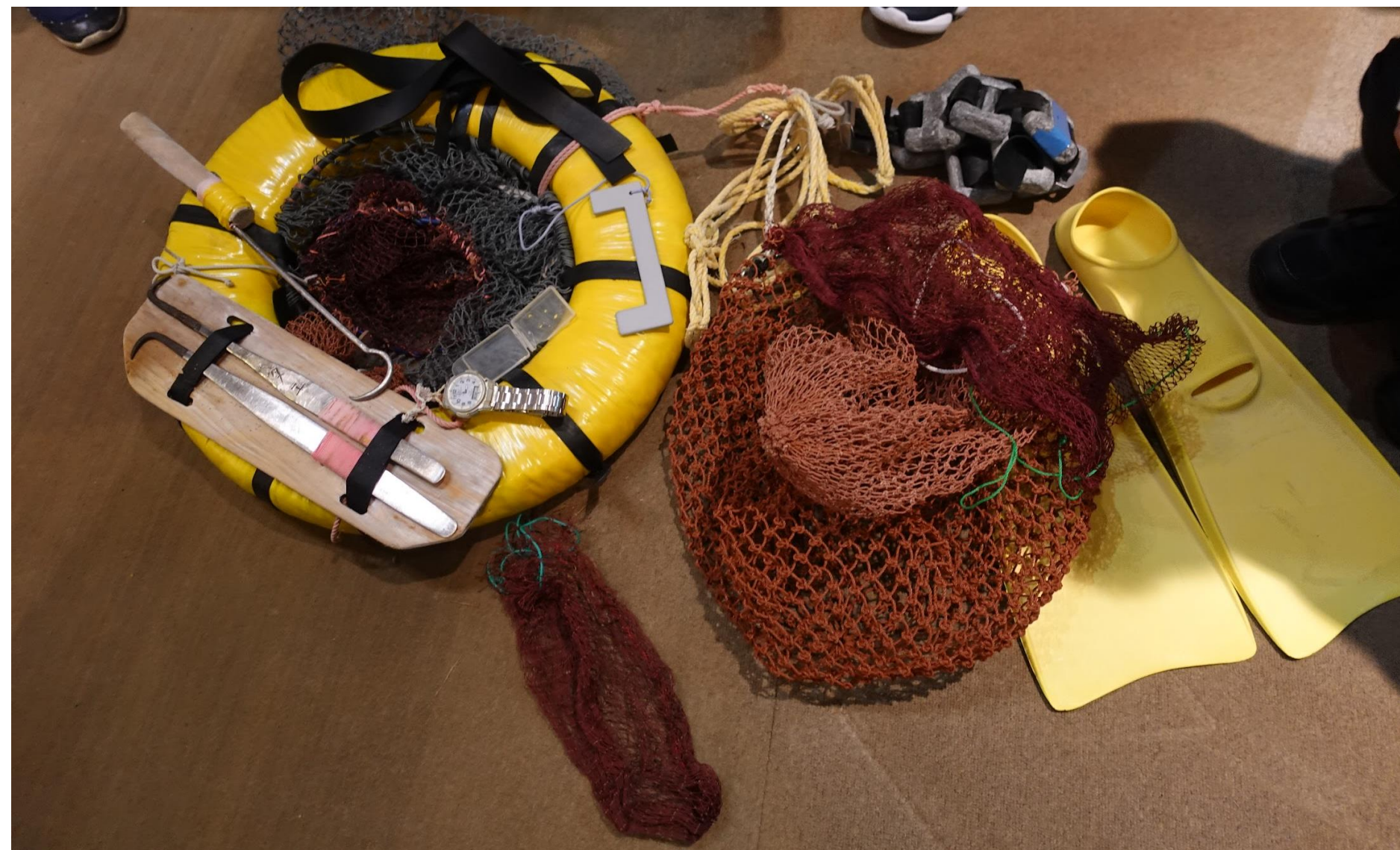
Traditional subsistence activity

Breath-holding diving

Catch shells and seaweed with simple tools



Ama divers



Tools of Ama fishing



Abalone

LEK of Ama Divers

Seafloor topography

Habitat of marine life

Flows of water, winds and clouds etc...



Ama diver



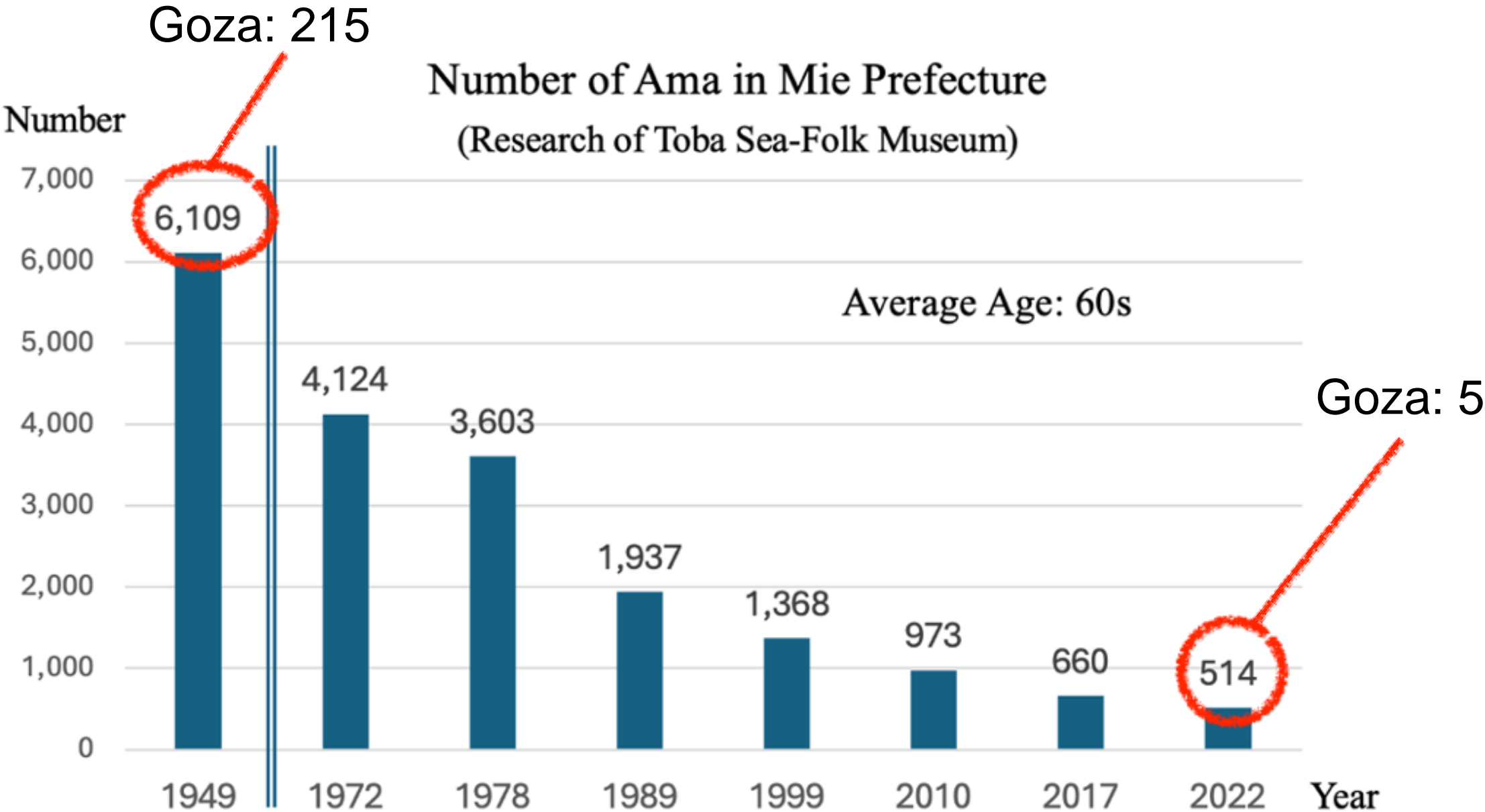
One of the fishing ground

Field information

Goza in Shima City, Mie

Coastal fishing and Ama fishing

One of the fishing villages with severe sea desertification



By Google Map

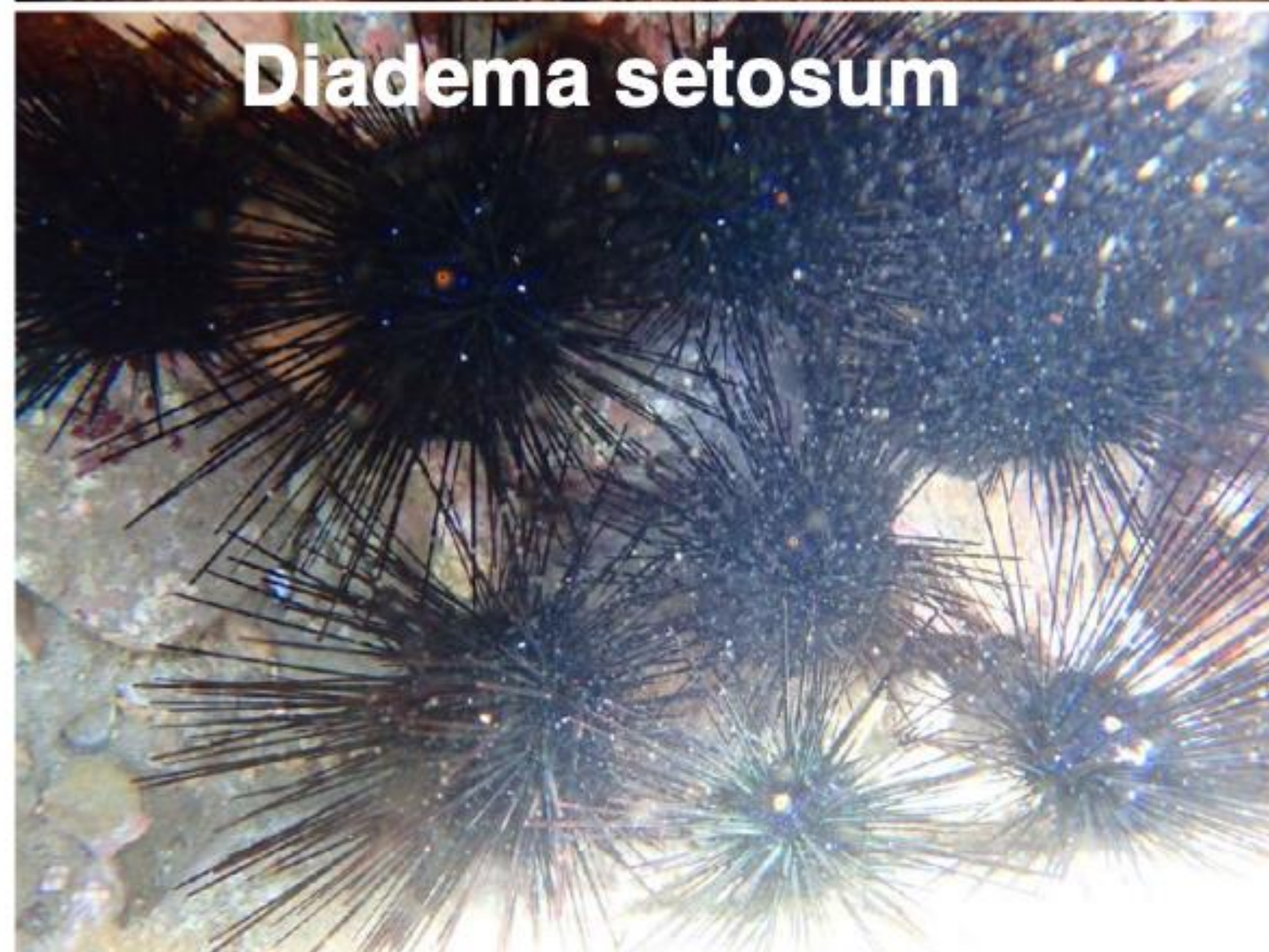
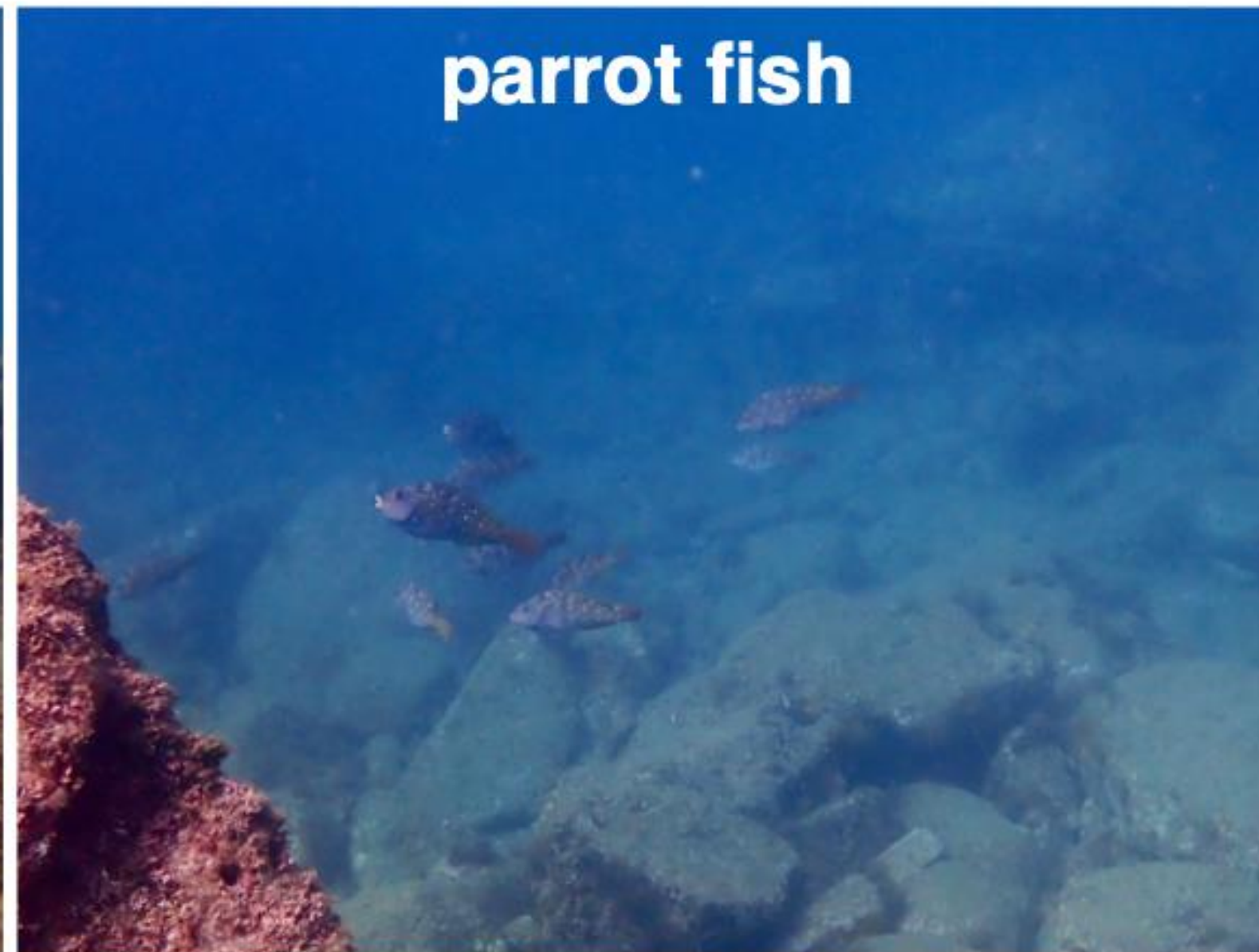
Goza, Shima city

2004/6/11



Goza, Shima city

2023/10/30



Stakeholder Ama diver in this experiment

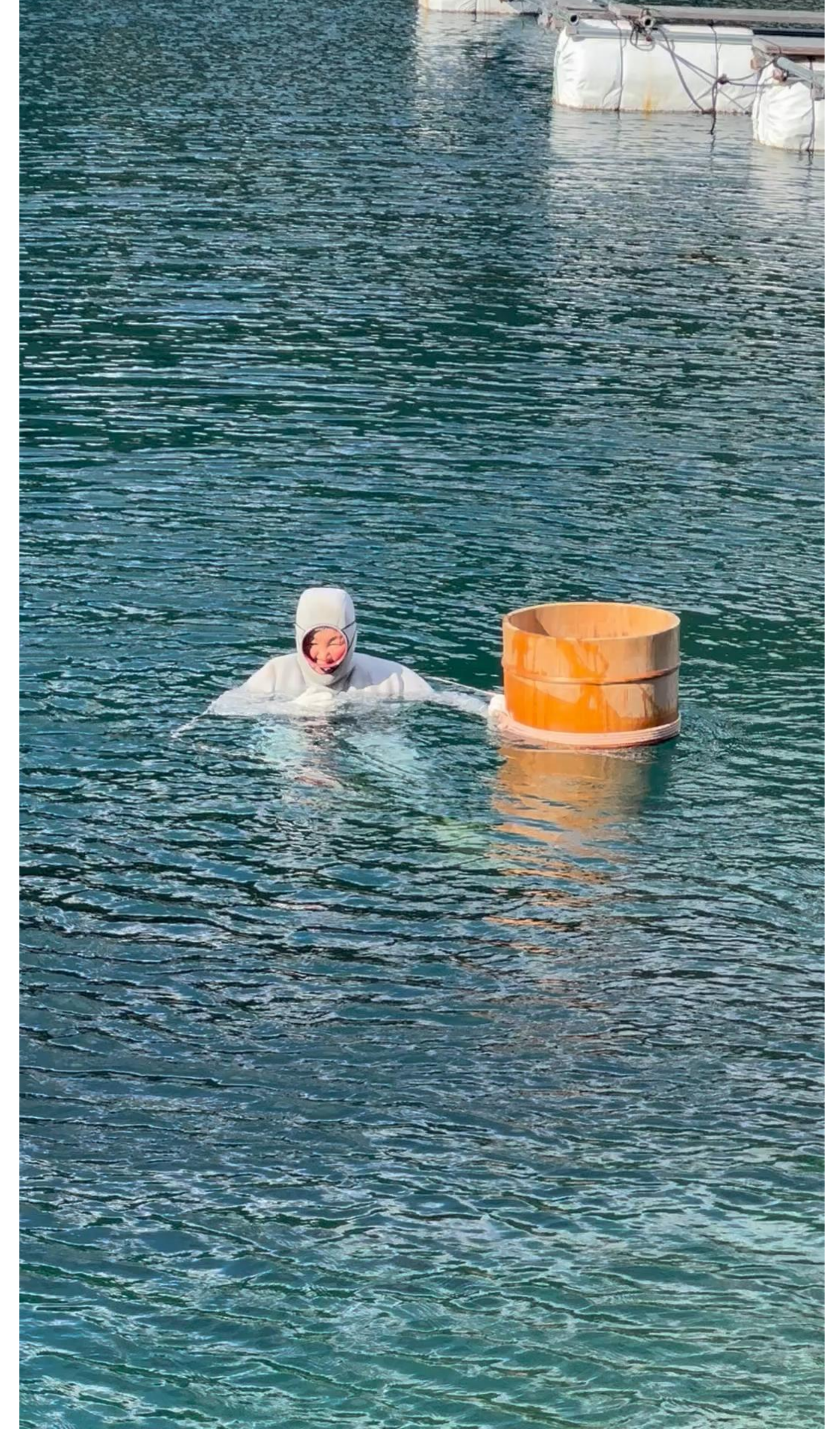
Ms. Machiyo Yamashita

74 years old

49 years as Ama diver

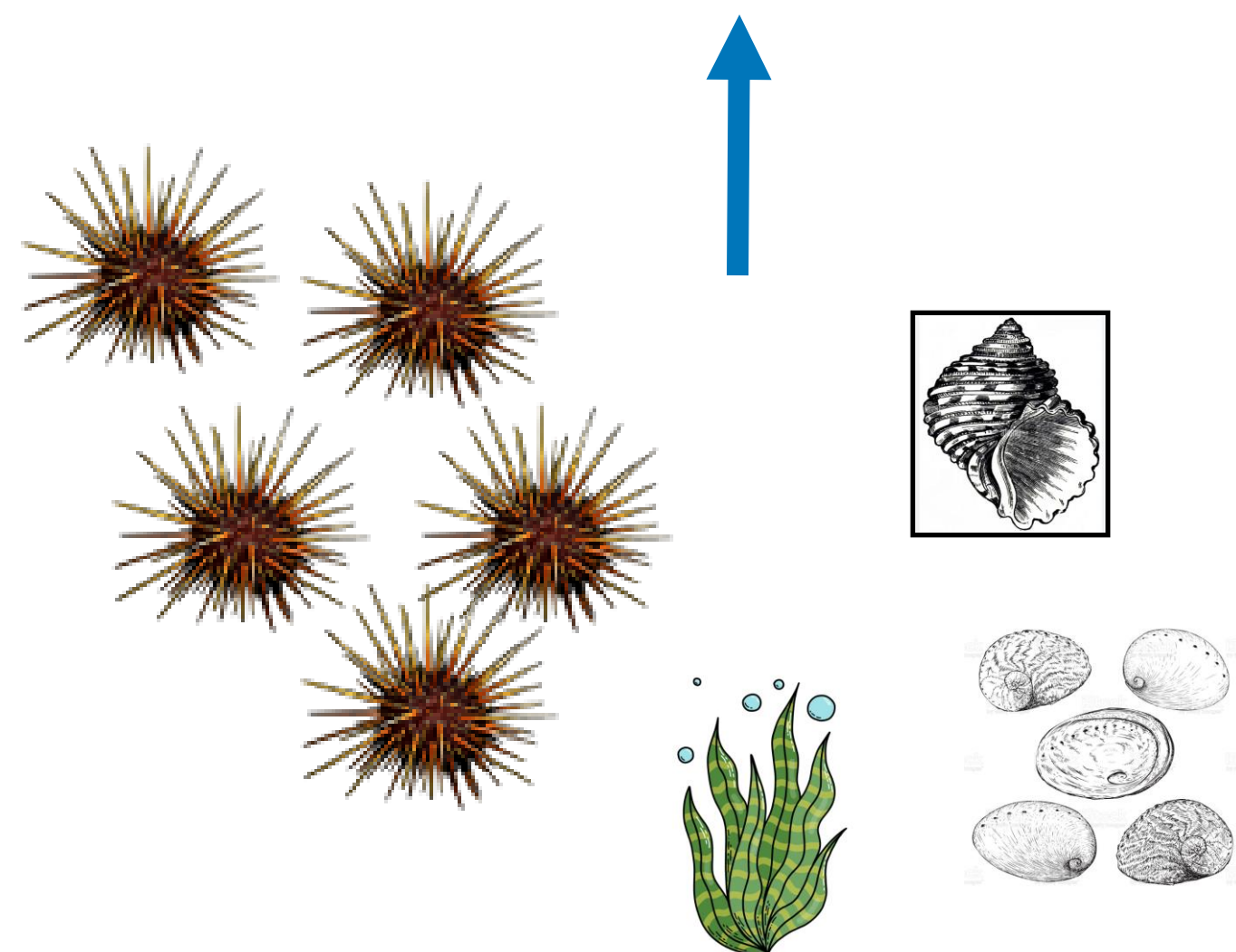
Leader of Goza Ama divers

Activities: dives for living, works in her restaurant, head of the organization of Ama divers in Shima City, etc....





LOCAL AGENCY: Ama divers and Mie locals are at the centre of the problem but also become the providers of the solution.



Too many urchins threaten marine biodiversity!!!

How is local climate change perceived by the Ama communities in Goza village? (e.g., changes in biodiversity, weather patterns)

How do local communities and scientists share knowledge and strategies to address climate change impacts?

Framework: Knowledge transmission

Resilient Resource Management

自然資源管理のゆらぎを許容する地域社会 ——沖縄県今帰仁村古宇利島のウニ漁を事例として——

高崎 優子
(北海道大学)

現在、さまざまな理由から資源管理主体としての地域社会に期待が高まっている。これまで多くの研究が地域社会による資源管理の合理性を実証し、管理の場における地域社会の重要性を後押ししてきた。これに対し、本稿で扱うのは、一見合理的ではない地域社会による資源管理の事例である。沖縄県今帰仁村古宇利島で行われているウニ漁は、地域社会による資源管理の成功例という評価を受けながらも、実際は意図的な失敗や後退を含んだ不安定さ（ゆらぎ）のなかで行われており、かつそのようなゆらぎを許容する態度を見せていた。しかし彼らはまた、資源が危機に陥るたびに回復する力（資源管理の弾力性）も備えることで、資源とのかかわりを持続している。考察を通して明らかになったのは、人びとは互いのさまざまな事情を考慮したり、資源との間に経済的動機だけではない強いつながりをもっていたり、刻々と変化する自然の状態を受けたりしながら、資源管理のおとしどころを探っているということであった。このような「おとしどころ」は、彼ら自身にしか見出せない。ここに地域社会が資源管理の主体となるべき理由がある。

キーワード：自然資源管理、地域社会の主体性、資源管理の弾力性、古宇利島、ウニ漁

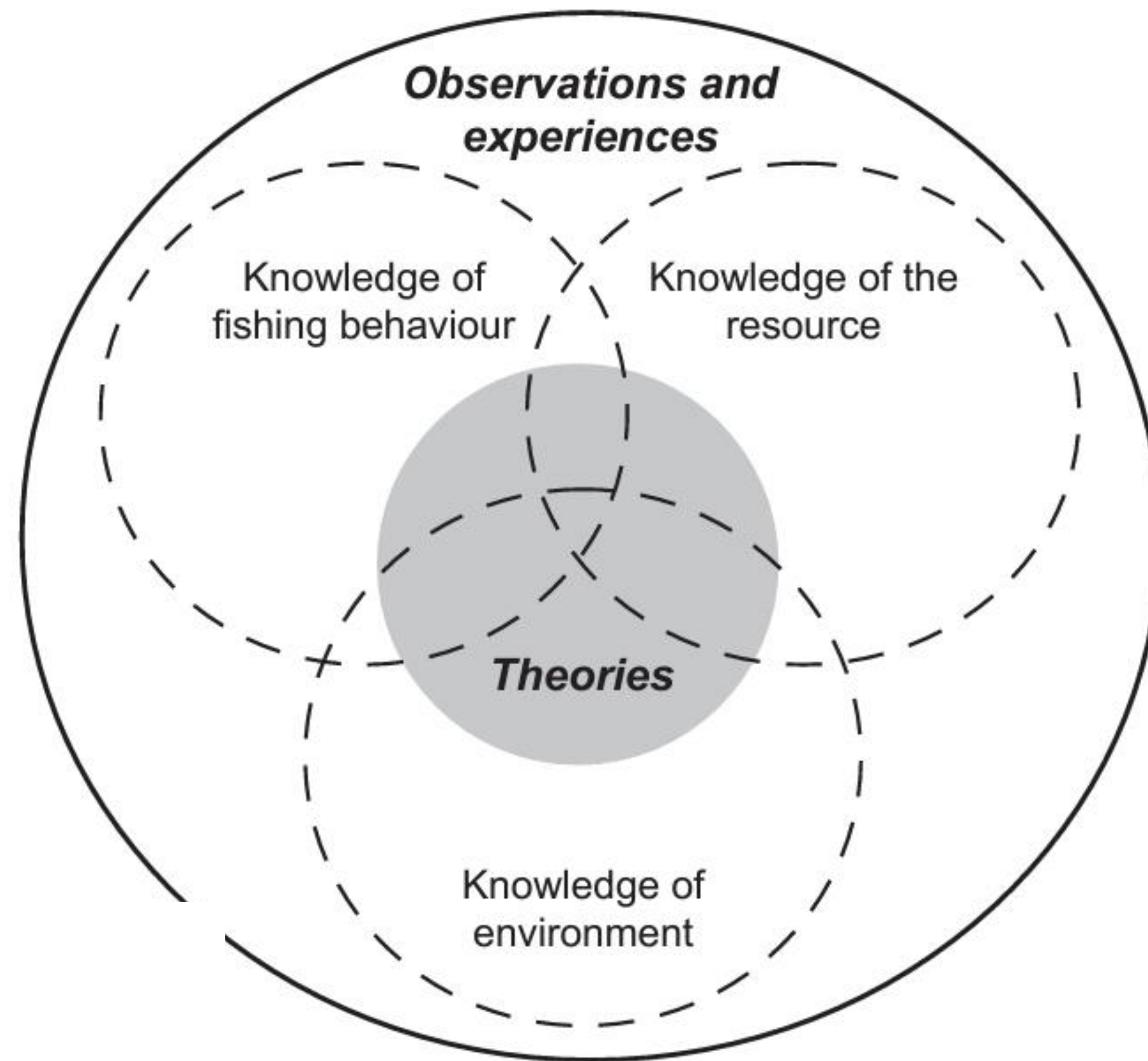


Fig. 2. Characterisation of Local Ecological Knowledge. Theories are based on observations and experiences. Components of LEK can be broken down into knowledge of fishing behaviour, the resource and the environment.



Fishers' Local Ecological Knowledge (LEK) on Connectivity and Seascape Management

Charlotte Berkström^{1,2*}, Myron Papadopoulos¹, Narriman Saleh Jiddawi³ and Lina Mtwana Nordlund⁴

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Neotropical Ichthyology, 10(1): 133-147, 2012
Copyright © 2012 Sociedade Brasileira de Ictiologia

Fishermen's local ecological knowledge on Southeastern Brazilian coastal fishes: contributions to research, conservation, and management

Renato A. M. Silvano^{1,4} and Alpina Begossi^{2,3,4}

Maritime Studies (2019) 18:189–203
<https://doi.org/10.1007/s40152-019-00136-3>

RESEARCH



Feedback between fisher local ecological knowledge and scientific epistemologies in England: building bridges for biodiversity conservation

Jeremy Anbleyth-Evans¹ · Shaw Nozaki Lacy²

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RESEARCH ARTICLE

“Once upon a Time in the Mediterranean” Long Term Trends of Mediterranean Fisheries Resources Based on Fishers' Traditional Ecological Knowledge

Dimitrios Damalas^{1,2*}, Christos D. Maravelias², Giacomo C. Osio¹, Francesc Maynou³, Mario Sbrana⁴, Paolo Sartor⁴

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* shark@hcmr.gr

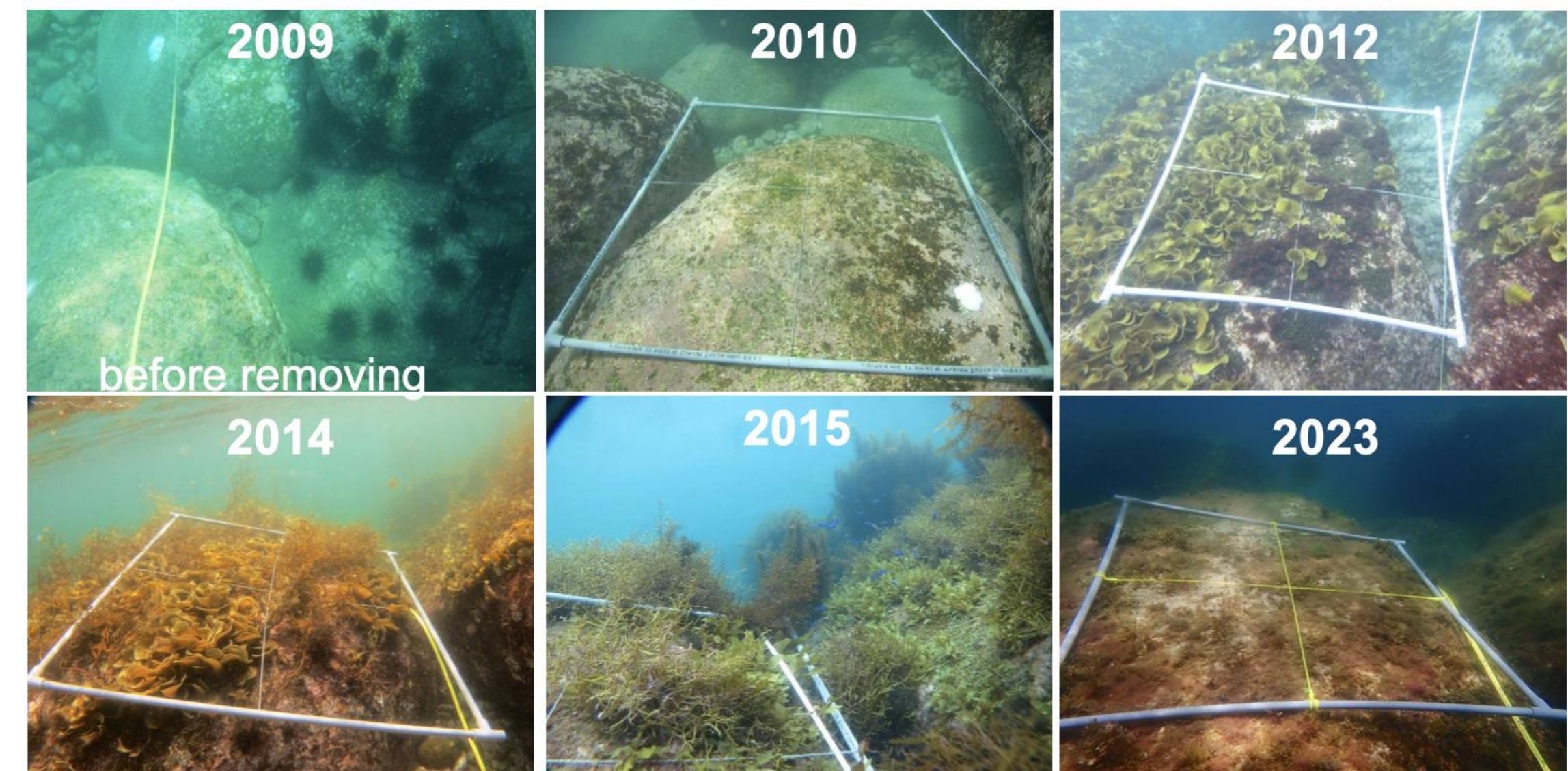


Before the experiment: the scientists' hypothesis

Rising of seawater temperature leads to:

- High activity of fish and urchin
- High feeding pressure on seaweed
- Through scientific research

Effects of removing *Diadema* in Haidaura Bay



From Prof. Kurushima

Before the experiment: the Ama diver's hypothesis

Rising of seawater temperature causes:

- Seaweed rottens
- Compare the current situation based on past experience and everyday dive practice
- Shared interpretation between Ama divers
- Distrust scientists' initial hypothesis



Ama diver



One of the fishing ground

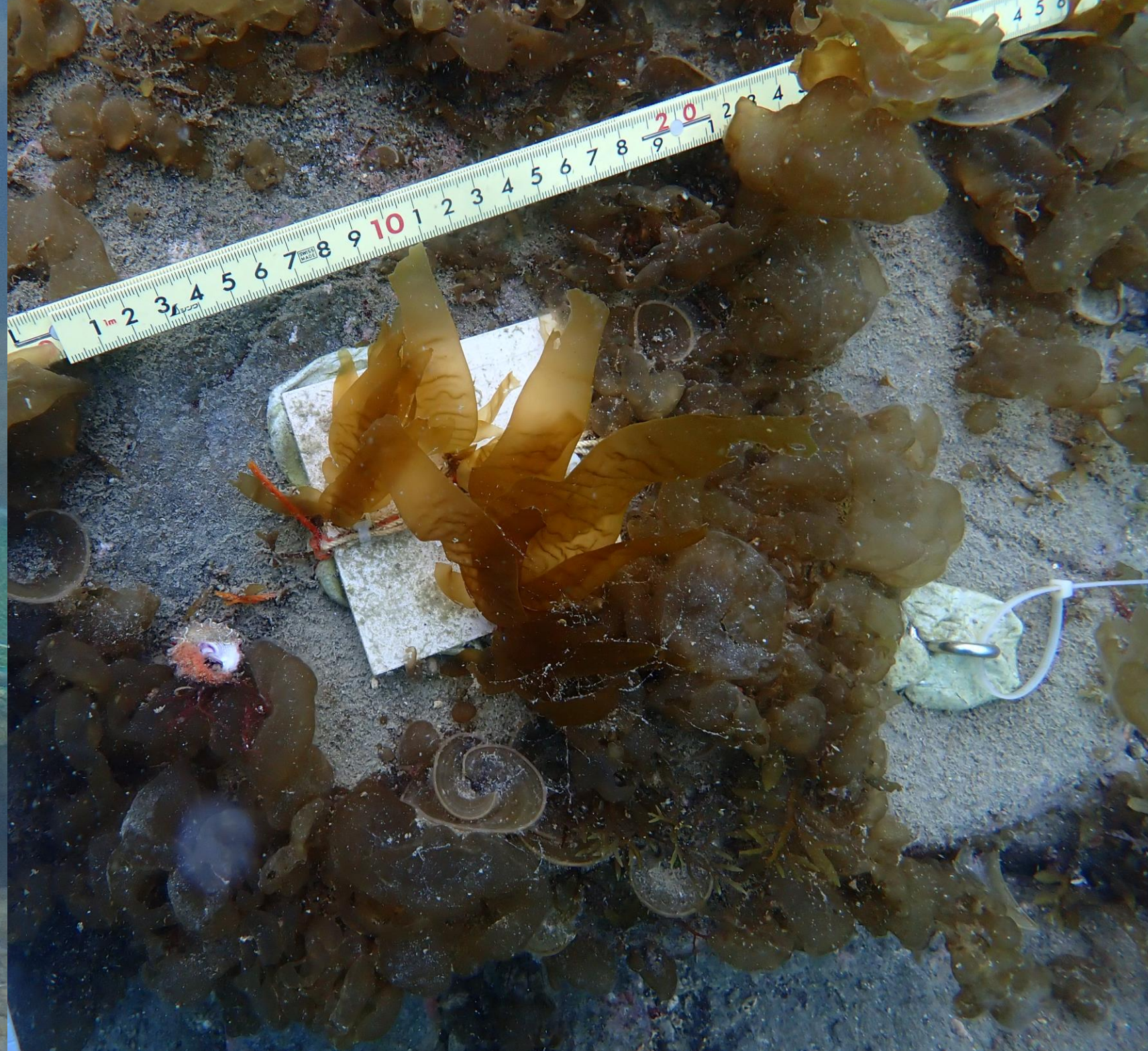
First steps- discussing with researchers and Machiyo-san





	全面フェンス					上面開き (側面フェンス)			
	N1	N2	N3	N4	N5	F1	F2	F3	F4
1 藻体長	6.5			4					
茎長	/			/					
摂食痕	/			/					
2 藻体長	6.0			4					
茎長	/			/					
摂食痕	/			/					
3 藻体長	4.0			4.0					
茎長	/			0.5					
摂食痕	/			/					
4 藻体長	5.5			4.5					
茎長	0			0					
摂食痕	/			/					
5 藻体長	3.5			3.5					
茎長	/			/					
摂食痕	/			/					
6 藻体長	4.0			2.0					
茎長	/			/					
摂食痕	/			/					
7 藻体長	3.0			3.0					
茎長	/			/					
摂食痕	/			/					
8 藻体長	3.0			2.0					
茎長	/			/					
摂食痕	/			/					
9 藻体長	3.5			2.5					
茎長	/			/					
摂食痕	/			/					
10 藻体長	3.0			5.4					
茎長	/			/					
摂食痕	/			/					

1) タグを撮影, 2) ケージ内部を撮影, 3) 魚の大きさ





Interpreting what they see and experience...

“ At first I assumed the opposite of this result - that F (fish entry) and U (urchin entry) would not grow and N (no entry) would grow the most. But I think that U and F will continue to decrease or even disappear in the future because the grazing pressure between fish and sea urchins is higher in spring and summer. But I don't know, I can't predict. It's summer when the impact will be felt”. (Kurashima, marine biologist)

“It is hot in July, the sun shines so much that you sweat when you dive in a wetsuit. First, we dive 5-6 metres, but then we dive to 10 metres. The sea changes at around 7-8am and there is a layer of cold tide at around 2m. We call that the bottom tide. If it's hot and sweaty above, it's nice and cold at the bottom. I think the sagarame were saved by that bottom tide. However, since the change of the Kuroshio Current, this cold bottom tide has disappeared, and the bottom has become hotter” (Machiyo, AMA diver)

“The bottom tide used to come every summer, but the bottom tide has disappeared from the the sudden change of Kuroshio. So, the fact that the sagarame have disappeared from the deeper areas doesn't mean that the fish are eating them. I think the tide was too warm and they rotted” (Machiyo, AMA)

“ I think it will grow until June. The problem is August-September. At that time, it either grows or rots, or the fish eat it. If it remains perfectly enclosed, it means the fish have eaten it. You can also tell by the color. The healthy ones are black and get bigger day by day. When it loses its vigor, it turns brown or whitish.” (Machiyo, AMA diver)

“That is what I predicted when I was a student. That was what my doctoral thesis was about. If the water temperature was the same from top to bottom, it would definitely die from the place with less light (Kurashima, marine biologist)

Some reflections as conclusion

- * For the first time in Mie region, Ama divers accept scientists to work together to develop a project related to resilient coastal resource management.
- * **Recognition of knowledge:** researchers and locals learn how to build ecological experiments together, based on each others knowledge and methods.
- * **Non- verbal communication:** communication goes beyond talking but happens in the ocean (both AMA and researchers dive in the some place) as opposed of, for example, government inviting locals to their offices for discussion.
- * **Sensorial experience:** AMA san and Marine Biologists live and experience the same seascape.



THANK YOU
ありがとうございました