

DOWAS NEWS

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Deep Ocean Water Applications Society

Report on the 29th DOWAS National Conference (DOW 2025 Kumejima)**Katsunori Shimizu****Research Presentation Planning Committee**

To our esteemed members and all readers of this newsletter, I would like to report an overview of the annual national conference held by our society.

The 29th National Conference was held on Thursday, November 6, and Friday, November 7, 2025 (Reiwa 7), at the Gushikawa Rural Environment Improvement Center in Kumejima Town, Okinawa Prefecture. The program featured 26 general research presentations and 1 poster presentation. Regarding attendance, there were 145 applicants (90 members, 48 non-members, 2 students, and 5 absentees). Specifically, there were 115 on-site participants, 18 web participants, and 16 local staff members.

Research presentations were conducted with a 20-minute time slot per person (including Q&A). For details on the content, please refer to the society's website; however, presentations covered topics such as fisheries-related utilization, agricultural-related utilization, health and medical-related utilization, and conceptual developments based on practical use. Notably, there were four presentations regarding "damage to and recovery of the intake facility caused by the earthquake" and "development of large-capacity deep sea water intake technology," which highlighted new challenges for the future.

Furthermore, a technical tour was held at 1:30 PM on Friday, November 7. Starting with the OTEC (Ocean Thermal Energy Conversion) demonstration facility and the broodstock tiger prawn rearing tanks at the Okinawa Deep Seawater Research Institute, participants visited various facilities utilizing deep sea water. The tour included the Spirulina cultivation facility of Rohto-F-Okinawa Co., Ltd., the sea grape farm of Kumejima Deep Sea Water Development Co., Ltd., the cosmetics factory of Point Pyuru Co., Ltd., and the oyster farming facility of GO Farm Co., Ltd. I would like to express my gratitude to the staff of each facility for their kind cooperation during these visits.

Other related events included an "on-site lesson" for a local elementary school conducted by our society's Learning Promotion Committee on the afternoon of Friday, November 7. From 5:00 PM that same day, the "Mensore (Welcome) to Kumejima / Deep Sea Water Utilization Case Sharing Session" (co-sponsored by the Utilization Promotion Committee) was hosted by Kumejima Deep

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Seawater Council, with over 50 participants enjoying the event.

Additionally, starting at 9:00 AM on Saturday, November 8, an "Optional Tour" was held. This bus tour of local spots recommended by residents was made possible through the dedicated efforts of volunteers from Kumejima Town and the Council. Although I have visited the island several times over nearly 20 years, these were places I had never been before, making the tour very interesting.

In closing, I would like to extend my gratitude to Mayor Hideo Toubaru of Kumejima Town, the various town departments, and the member companies of the Council for their efforts in providing the venue and assisting with everything from preparation to operation and cleanup. I would like to use this space to thank everyone for their cooperation and support.

The venue for the next national conference has been decided as "Uruoi Kan" in Nyuzen Town, Toyama Prefecture" at the second Board of Directors meeting of this fiscal year. We look forward to your participation.

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Katsunori Shimizu,

Research Presentation Planning Committee

General Research Presentations



Venue Setup



Marine Organism Exhibition



Research Presentation Session (1)



Research Presentation Session (2)

Deep Ocean Water Forum



Opening Address by President Ohmichi of the Council



Presentation of Research Outcomes

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Special Achievement Award Ceremony

Networking Reception



Remarks by President Otsuka of DOWAS



Remarks by Mayor Tōbaru, Executive Committee Chair

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Toast by President Ohmichi (Council Chair)



Remarks by Mayor Kasajima of Nyuzen Town, Next Host Municipality



Over 100 Participants Joined the Dance Accompanied by Mayor Tōbaru's Sanshin Performance



Technical Tour



Okinawa Deep Seawater Research Institute



Facility Briefing

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Deep Ocean Water Intake Pipe Sample



OTEC Demonstration Model



Broodstock Tank for Kuruma Shrimp



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Katsunori Shimizu,

Research Presentation Planning Committee

“Mensore Kumejima” – Event Highlights



Opening Remarks by President Ohmichi
(Council Chair)



Taiko Drum Performance
by Local Preservation Society

Optional Tour



View from the Park Behind the Site



Facility Donated by Mr. Hayao Miyazaki

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Session Chair Report (General Presentations 1): DOW 2025 Kumejima

Hiroyuki Nakamura

Okinawa Deep Seawater Research Institute

The 29th National Conference of the DOWAS was held in Kumejima Town, Okinawa Prefecture, from November 6 to 7, 2025. I was honored to serve as the chair for "General Presentations 1" on the first day. As this was my first time participating in this conference—and having only had experience with fisheries and fishing industry-related academic groups—I approached the conference with some trepidation, wondering what types of presentations would be given and whether I could manage the proceedings smoothly.

【General Presentations 1: Titles and Presenters】

1. **Cultivation Test of *Ulva prolifera* II.**
Shinichiro Kakuma (Institute of Ocean Energy, Saga University)
2. **PR Activities for Deep Sea Water by the Local Revitalization Cooperation Corps in Muroto City**
Yuko Oiwa (Industrial Promotion Division, Muroto City Hall)
3. **Recovery from the "2024 Noto Peninsula Earthquake" at the Nyuzen Town Deep Sea Water Intake Facility (Part 1: Marine Area Survey)**
Tsuyoshi Funamoto (Nyuzen Town, Toyama Prefecture)
4. **Recovery from the "2024 Noto Peninsula Earthquake" at the Nyuzen Town Deep Sea Water Intake Facility (Part 2: Temporary Restoration)**
Tsuyoshi Funamoto (Nyuzen Town, Toyama Prefecture)
5. **Effects of Magnesium-rich, High-hardness Adjusted Deep Sea Water Intake on Feed Intake, Weight Gain, and Glucose Tolerance Decline Associated with Aging in Type 2 Diabetes Model Rats**
Kazuki Nagasawa (Department of Hygienic Chemistry, Kyoto Pharmaceutical University)

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Session Chair Report: General Presentations 1

Hiroyuki Nakamura

Okinawa Deep Seawater Research Institute (Board Member, DOWAS)

6. **Challenge from the Deep Sea: Search for Disease-Targeted Drug Discovery Seeds Using Actinomycetes Derived from Deep Sea Water**

Chiaki Imada (Atmosphere and Ocean Research Institute, The University of Tokyo / Institute of Ocean Energy, Saga University)

I served as the chair for the six presentations listed above. Regarding the *Ulva prolifera* (Sujiao-nori), further progress is highly expected as cultivation is also conducted within Okinawa Prefecture. The activities of the Local Revitalization Cooperation Corps in Muroto City provided very useful insights for deep sea water initiatives in Kumejima Town as well.

The reports on the recovery from the Noto Peninsula Earthquake in Nyuzen Town showed the incredibly difficult and steep path they have overcome. As a new intake pipe is set to be installed, I would like to express my deepest respect for the efforts of everyone involved and expect for the further development of Nyuzen Town through the creation of new industries and the entry of new businesses.

While some of the presentations in the medical and health-related fields were a bit complex for me, they were deeply interesting and allowed me to once again feel the potential and allure of deep sea water.

Although there were many points where my performance as chair may have been inadequate, I would like to express my sincere gratitude to everyone for their cooperation, which allowed for many meaningful discussions.

In closing, I would like to thank DOWAS, the Kumejima Town Hall, the Kumejima Deep Sea Water Council, and all those involved in the management of this conference. I wish for the continued success of everyone involved with deep sea water.

Session Chair Report (General Presentations 2): DOW 2025 Kumejima**Hiroshi Yamamoto****Kochi Prefectural Deep Seawater Laboratory**

I am Hiroshi Yamamoto from the Kochi Prefectural Deep Seawater Laboratory, and I served as the chair for "General Presentations 2" held in the afternoon. This session featured 10 presentations covering a wide range of perspectives, including biology/fisheries, energy, environmental resources, infrastructure technology, and international cooperation. The content allowed us to once again consider the multifaceted utility of deep sea water.

A common theme I felt throughout the presentations was that the characteristics of deep sea water—such as its low temperature, nutrient-richness, and purity—can serve as solutions to many challenges facing modern society.

As specific examples in the biology and fisheries fields, the potential of the low-dissolved oxygen environment of deep sea water as a new resource was demonstrated through its ability to promote the growth of specific diatoms. Furthermore, there was a presentation on sustainable, circular food production systems, such as land-based aquaculture of sockeye salmon and salmon aquaponics.

In the energy sector, presentations on CO₂ capture and Ocean Thermal Energy Conversion (OTEC) highlighted how clean energy technologies utilizing deep sea water can contribute to the realization of a decarbonized society.

Furthermore, the Okinawa Deep Seawater Research Institute shared specific success stories of utilizing deep sea water to promote local industries, such as the farming of tiger prawns and sea grapes. I was surprised to learn that the number of registered land-based aquaculture sites has reached 186—the highest in Japan—and the discussion regarding future developments was highly informative.

Additionally, the presentation from Taiwan provided a very valuable report, stating that the

DOWAS NEWS 2025 Vol.28 No.4**Session Chair Report: General Presentations 2****Hiroshi Yamamoto, Kochi Prefectural Deep Seawater Laboratory (Board Member, DOWAS)**

deep sea water intake facility in Taitung withstood a magnitude 7.2 earthquake and has continued to maintain stable water intake and quality.

What left a particularly strong impression on me was the research on rare metal recovery using deep sea water, which followed up on a presentation from last year. This is a visionary study with the potential to take deep sea water utilization to a new stage. Although it is still in the basic research phase, I look forward to the continuation of this long-term research over the next 10 to 20 years toward practical application.

Finally, I would like to express my deepest gratitude to all the presenters for sharing such a wide range of insights. Please accept my apologies for not being able to introduce every detail of all the presentations here.

I would also like to sincerely thank all the conference participants for their active participation in the Q&A sessions. Although I am an inexperienced chair, I was able to conclude the session successfully thanks to everyone's cooperation. Thank you very much.

Session Chair Report (General Presentations 3): DOW 2025 Kumejima**Shin Okamura, Xenesys Inc.**

General Presentations 3, held on the second day of the conference, was organized such that the third presentation onwards functioned as a "Host Site Special Session," centralizing presentations related to the utilization of deep sea water in Kumejima. This session also doubled as the 3rd "Kumejima Deep Sea Water Forum," an event held annually since 2023.

The session featured a diverse group of speakers, including two from universities, two from joint university-industry collaborations, three from the private sector, and one from a government-affiliated international organization (JICA).

From the academic side, Saga University presented research on "cold energy utilization" for cooling data centers—a topic of significant recent interest. In contrast, Osaka Metropolitan University presented research on "heating deep sea water using external unutilized heat" for aquaculture purposes. These two presentations were both contrasting and complementary, effectively illustrating the complex resource potential of deep sea water.

The presentation by the Mitsui O.S.K. Lines-University of Tokyo-9Brains group focused on concrete research using diffusion simulations regarding the discharge of deep sea water, which is an environmental impact challenge during large-scale water intake. Another joint presentation between NTT and Waseda University introduced a futuristic vision aimed at creating a ripple effect across all of Kumejima, centered on deep sea water. All presentations addressed essential elements required for the upcoming scaling-up of deep sea water utilization in Kumejima.

The three companies, as you may be familiar with, are currently operating or constructing facilities using deep sea water in Kumejima. Insights into deep sea water utilization technologies and future visions were shared by GO Farm (land-based oyster farming),

DOWAS NEWS 2025 Vol.28 No.4**Session Chair Report: General Presentations 3****Shin Okamura, Xenesys Inc. (Board Member, DOWAS)**

Rohto Pharmaceutical (microalgae)—which opened its "Algae Farm Farmo" in April 2025—and Veggie Dream (hydroponics), which is scheduled to begin facility operations this spring. These presentations were highly suggestive of how private businesses can adapt to recent rapid changes in the global environment and society.

The final presentation by JICA covered a survey for deploying a deep sea water multi-use model in Palau. For Pacific island nations in particular, the supply of energy, food, and water, as well as the creation of industries for self-reliance, are common challenges. As I am involved in this field, it is very encouraging to see JICA and island nations like Palau focusing on deep sea water as a potential solution to these issues.

As the impact of climate change on human society becomes more pronounced, the importance of and attention toward deep sea water utilization are undoubtedly increasing in the pursuit of a sustainable world. Reflecting this trend, the Kumejima Deep Sea Water Forum session received more inquiries and applications than expected, leading to several presentations being turned away. I understand that the application deadline for the entire conference had to be moved forward as well. Furthermore, to secure enough time, the start of the second day (General Presentations 3) was moved earlier. I would like to apologize (though it is a "happy problem") that the presentation regarding the physiological effects of Noto Deep Sea Water on aquaculture—which has garnered much attention since the previous conference—had to begin so early in the morning.

I look forward to follow-up reports on all these presentations at the next conference.

**Mensore (Welcome to) Kumejima /Deep Sea Water Utilization Case Sharing Session
(Cooperated by the Utilization Promotion Committee) Report
on the DOW 2025 Kumejima Conference**

Utilization Promotion Committee

Under the grand theme of "Rediscovering Deep Sea Water Utilization," our committee launched a three-year plan starting with the Sado Conference two years ago and the Muroto Conference last year. While this year's session was originally scheduled for the Nyuzen Conference, the venue was changed to Kumejima. Consequently, the planning for this year's event was entrusted to the Kumejima Deep Sea Water Council. The committee's original plan for Nyuzen is now scheduled to take place at next year's Nyuzen Conference.

With this background, on the second day of the Kumejima Conference (Friday, November 7, 2025), a "Welcome to Kumejima" event was held at the Eef

Information Plaza, hosted by Kumejima Town and the Kumejima Deep Sea Water Council. The Utilization Promotion Committee cooperated by hosting a session within this event titled the "Deep Sea Water Utilization Case Sharing Session," which commenced at 5:00 PM. The event was a grand success, attended by over 80 participants, including conference attendees and local people concerned. Amidst a festive atmosphere featuring traditional Kumejima performing arts, opening remarks, and a buffet showcasing local Kumejima products, the presentations began at 6:00 PM.

First, a presentation was given by Mr. Yamane of the Noto Town Hometown Promotion Division (presented by Ms.

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Report on the DOW 2025 Kumejima Conference

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Washiashi of the Utilization Promotion Committee on his behalf). She provided an overview of the Noto Deep Sea Water facility, "Aguas Noto," which opened in August 2005 and marks its 20th anniversary this year. As the only deep sea water facility in Ishikawa Prefecture, it supplies raw water as well as concentrated water, desalinated water, and Noto salt. The presentation also introduced current applications in fisheries and agriculture, as well as its use by private companies, tourism, and the general public. She concluded with a passionate message from Noto Town: "The potential of Noto Deep Sea Water is a ray of hope toward recovery from the Noto Peninsula Earthquake."

The second presentation was by Mr. Funamoto from the Nyuzen Town Kirakira Business, Industry, and Tourism Division. Titled "Town Development Utilizing Deep Sea Water: Contribution to Industrial Promotion and

Decarbonization—The Challenge of the SDGs," his talk introduced cases in Nyuzen Town where deep sea water is used to add high value to marine products, maintain freshness and hygiene, and store oysters and abalone using heated deep sea water. Regarding non-fishery applications, he provided a detailed explanation of the multi-stage use of deep sea water facilitated at Wuke Inc., a manufacturer of packaged rice. He also reported on the significant damage to the intake pipes caused by the Noto Earthquake, the status of their restoration, the progress of the third and fourth intake pipes (currently under construction and scheduled for completion in 2025/Reiwa 7), new initiatives in deep sea water business, and land-based salmon aquaculture. It was a highly promising presentation for next year's host location.

Thirdly, a presentation was given by the Kumejima Fisheries Cooperative Association (also presented by Ms.

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Washiashi on their behalf). The report highlighted examples such as the use of low-temperature deep sea water in the shipping process at tiger prawn farms and the active development of new products utilizing deep sea water.

The fourth scheduled presentation, "Enhancing the Appeal of Science through Collaboration with Education" by Global Ocean reSource and Energy Association Institute, was omitted. This was because many participants had already attended the "on-site lesson" held at a local elementary school during that afternoon's tour.

The session took place amidst lively conversation among the participants. We would like to express our heartfelt gratitude to all those who traveled from afar to participate and to all relevant parties for their support.

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Group Photo of All Participants



Scenes from the Networking Session



The event concluded on a high note with a lively Kachāshī dance

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Activity Report on Learning Events
by the Deep Ocean Water Learning Promotion Committee

Koji Otsuka (Osaka Metropolitan University), Shin Okamura (Xenesys Inc.), Tamae Takada (Doctor Recella Co., Ltd.), Takeshi Yasunaga (Osaka Electro-Communication University), Hiroshi Yamamoto (Kochi Prefectural Deep Seawater Laboratory)

In October 2021, the Deep Ocean Water Learning Promotion Committee was established with the aim of developing learning materials for children and promoting learning events using those materials. Following Sado Conference in 2023 and Muroto Conference in 2024, we held an outreach class at Misaki Elementary School in Kumejima Town in conjunction with the national conference held on Kumejima in November 2025.

For this outreach class, after the second day of the national conference ended on Friday, November 7, we conducted the program during the 5th and 6th periods as part of an integrated studies class. The participants were 29 fifth- and sixth-grade students from three schools—Misaki Elementary School, Kumejima Elementary School, and Hiyajo Elementary School—and the class was held in the science laboratory of Misaki Elementary School. Misaki Elementary School is located closest to the Okinawa Deep Seawater Research Institute, about 1 km away.

A total of 15 people participated in the outreach class: the five committee members listed above as instructors; Yoko Asakura (Japan Science Association), Toshihiro Hotta, Monami Akita (Kochi Prefectural Deep Seawater Laboratory), Tetsushi

Otsuka (East Japan Sekisui Shoji Co., Ltd.), and Koji Kimura (Nansei Kosan Co., Ltd.) as experiment support staff; and five observers. First, everyone got excited with the opening true/false (○×) quiz led by President Otsuka (Photo 1) as usual. Many students answered all questions correctly. They were very energetic and knowledgeable. President Otsuka then talked about deep-sea circulation in the Earth's oceans and deep ocean water. The students knew well about the names of ocean currents around Japan and answered the quiz correctly. Then it was time for experiments.

Following the layout of the laboratory tables, the students were divided into eight groups (3–4 students each), mixing students from the different schools, and conducted experiments using small tanks. First, they dissolved blue dye (food coloring) into warm water and gently poured it into a small tank filled with clear water to create thermal stratification. If poured roughly, the surface layer spreads and the colors mix in the tank; however, each group carefully poured the water and successfully formed a blue surface layer (Photo 4). Next, when ice was placed in a corner, the blue water quickly flowed down to the bottom like a waterfall, visualizing a phenomenon analogous to

the sinking of surface seawater in the ocean's large-scale circulation. The students watched with great curiosity, raising their voices in surprise (Photo 5).

After a short break, the students learned about the basic characteristics of deep ocean water, products that use it, and sustainability including the SDGs, and then moved on to another experiment. This time, they first dissolved salt into water, added blue coloring, and prepared high-concentration saltwater. Then they used a large straw to inject the blue high-salinity water into the bottom of a tank filled with clear water, creating stratification again. They were then given the task of drawing out only the bottom water using a small tube. After discussing within each group and observing other groups, they successfully used syringes and other tools to apply the siphon principle and transfer the blue bottom water onto a dish (Photo 6).

After that, they put ice into the dish and placed a Peltier element with a heat sink shaped like a "kenzan" (needle-point bed) on top. The wiring of the Peltier element had a motor and blades attached. When a student placed the palm of their hand on the Peltier element, electricity was generated by electromotive force, and the propeller connected directly to the motor began to spin. The students tried generating electricity while competing to spin the propeller as fast as possible—rubbing their hands to warm them or warm-

ing their hands by placing them on an electric kettle (Photo 7).

As usual, the two-hour class passed quickly. The students, full of energy, enjoyed the session throughout with bright smiles, thinking through ideas, devising approaches, and experimenting. In the review session, students mentioned points such as the difference in size between the sea and land, that warm water is lighter and cold water is heavier, that electricity can be generated from a temperature difference, and the relationship between deep ocean water and the SDGs—showing that they were able to review what they learned. Also, in consideration of continuing deep ocean water education in the future, we donated all experimental equipment to Misaki Elementary School, Kumejima Elementary School, and Hiyajo Elementary School.

After the outreach class, all students answered a questionnaire. As shown in Fig. 1, 93% of students responded that the lecture was "Interesting" or "Fairly interesting," while the remaining 7% responded "Neutral." There were no responses of "Not interesting" or "Not very interesting," suggesting that the students were able to learn with interest. Regarding the difficulty level (Fig. 2), 61% responded "About right," and 14% responded "Too easy" or "A bit too easy," while 25% responded "Somewhat difficult," indicating some variation in perceived difficulty.

In the free-response comments, students wrote impressions such as: "I understood that cold water

sinks and warm water rises,” “I understood that deep ocean water is related to and contributes to the SDGs,” and “It was the first time I heard the term ‘siphon principle.’” As advice for improving future outreach classes, students wrote comments such as: “I want to pump up actual deep ocean water,” “I want to tour the deep ocean water facility and actually see where electricity is produced,” and “It would be better to do more fun things.” Although we conduct experiments using water that simulates deep ocean water, bringing actual deep ocean water to the outreach class may be a topic to consider in the future. We would also like to devise even more enjoyable classes.

This was the committee’s third learning-event initiative, and we were able to conduct as scheduled. The experiments conducted this time were prepared based on experiments that Committee Member Okamura had previously carried out in Kumejima. Therefore, we were concerned that conducting them again in Kumejima might result in overlapping content. However, thanks to Committee Member Okamura’s thorough preparation, it appears the students experienced it as a first-time activity.

Here we compare the questionnaire results after the outreach classes conducted over three years—2023 (Sado), 2024 (Muroto), and 2025 (Kumejima)—all for upper-grade elementary school students. For the deep ocean water lecture overall, the percentage of students who responded “interesting” or “fairly interesting” exceeded 90% in all

locations (Fig. 3). Approximately 60% felt the difficulty was “About right,” while about 30% felt it was “Somewhat difficult,” and about 10% felt it was “A bit too easy” or “Too easy”; this variation was a common trend across all events (Fig. 4). Interestingly, in all regions there were students who wrote questions in the free-response section that went beyond simply “warm water is light and rises, cold water is heavy and sinks,” and instead led to deeper consideration, such as why cold water is heavier and why saltwater is heavier. We expect that drawing out many of these “why” questions from students may lead to active learning. In Sado and Muroto, many students responded that they did not know electricity can be generated using a temperature difference, but this was not the case in Kumejima. This suggests that ocean thermal energy conversion (OTEC) is already familiar to children in Kumejima. Also, in Sado and Muroto there were comments asking to conduct more experiments, but such comments were not seen in Kumejima. This may be because, in the Kumejima experiments, the activities were conducted relatively by the students, and the supporting adults did not intervene much—in other words, I believe the difference can be attributed to changes in our behavior as a result of experience.

In FY2026, the national conference will be held in Nyuzen Town, Toyama Prefecture. We plan to

continue conducting outreach classes for elementary school students as well as learning events for the general public. We hope that providing learning opportunities to more people and promoting awareness and dissemination of deep ocean water will contribute to the development of DOWAS and to building a sustainable society. As part of the committee’s activities, we will need to continue collecting learning content and also develop new learning materials. We would be grateful if you could share information and ideas or “learning topics” related to deep ocean water.

Finally, we would like to express our sincere gratitude to the people of Muroto City who cooperated in this initiative; to Principal Ganeko of Misaki Elementary School for kindly accepting the outreach class, and to Teacher Toyosato who was in charge; to Principal Omine of Kumejima Elementary School, and to Teacher Kayo and Teacher Takara who were in charge; to Teacher Shimoji of Hiyajo Elementary School; and to everyone who willingly supported the experiments even though they participated as observers.

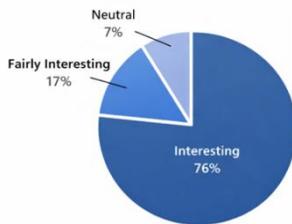


Fig. 1. Was the deep ocean water lecture interesting?
(No responses of “not interesting” or “not very interesting.”)

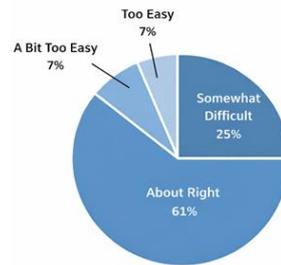


Fig. 2. Was the deep ocean water lecture difficult?
(No responses of “too difficult.”)

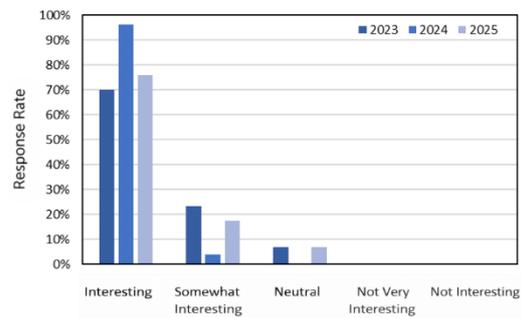


Fig. 3. Was the deep ocean water lecture interesting?

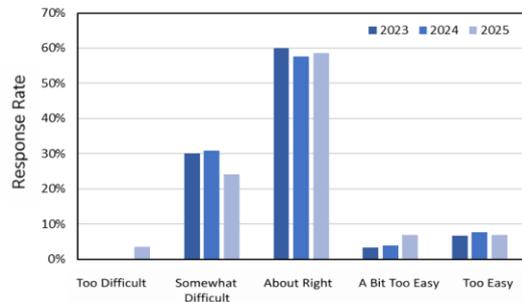


Fig. 4. Was the deep ocean water lecture difficult?



Photo 1. Opening true/false (○×) quiz



Photo 2. Opening true-or-false (○×) quiz



Photo 5. Experiment simulating thermohaline circulation (cooled surface water sinking to the bottom)



Photo 3. Students learning about ocean



Photo 6. Gently introducing blue high-salinity water



Photo 4. Experiment simulating thermohaline circulation (pouring warm blue water into the surface layer)

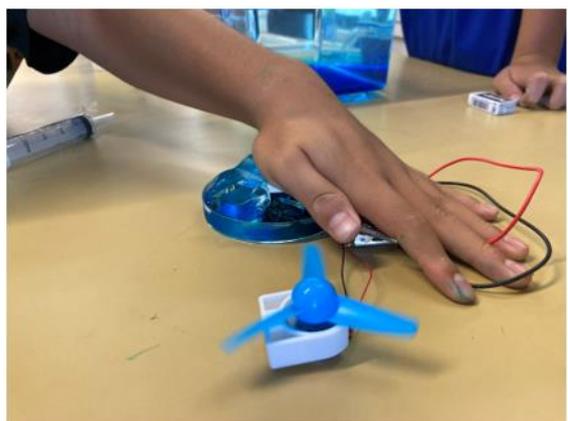


Photo 7. Power generation using a Peltier element layer