

# DOWAS NEWS

2024

Vol.27 No.2



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海洋深層水利用学会

Report on the 28<sup>th</sup> DOWAS National Conference (Muroto Conference)

Research Presentation Planning Committee

The 28<sup>th</sup> DOWAS National Conference (Muroto Conference) for fiscal year 2024 took place over three days from October 17 (Thursday) to 19 (Saturday). The three-day event was held as requested jointly with a local deep ocean water event. This year's conference was also held as a hybrid of in person and online.

The total number of participants was 105 (91 members, 13 non-members, 1 student), with 83 participants in person, 18 web participants, 4 cancellations. From overseas, 3 people from Taiwan and 1 person from Korea participated in person.

Regarding research presentations, there were 22 general research presentations and zero poster presentations for a total of 22 presentations.

The general research presentations covered a wide range of topics, including energy resources, the environment, utilization concepts, aquaculture, and medicine.

As with last year, the research presentations were allotted 20 minutes per topic, including time for standby and questions, which resulted in a relatively smooth process.

The research presentations were completed in the afternoon of the second day, and related events, such as the Deep Ocean Water Summit 2024 Panel Session and outreach classes for Elementary and Junior High Schools Students were held. On the morning of the third day, a tour included the Muroto World Geopark Center, Muroto Aquarium (converted from a school building), and walk around Cape Muroto.

An onsite class for the general public was held on the morning of the third day and was completed well thanks to the local event (Muroto Deep Ocean Water Festival).

On the other hand, there was a problem throughout the conference from a typographical error in the publication. We would like to take this opportunity to apologize.

## [List of Typos and Additions]

- Journal Cover 28<sup>th</sup> National Conference (Sado Conference)  
⇒ 28<sup>th</sup> National Conference (Muroto Conference)
- Program Page 4 13:30~15:30··· (Sponsored by Utilization Promotion Committee)  
⇒··· (Co-sponsored by Kochi Prefecture, Muroto City, and the Utilization Promotion Committee)

In hosting this conference, Muroto City Mayor Soichiro Ueta and the Industrial Promotion Division not only provided the conference venue, but also worked hard on everything from preparation to operation and clean up. In addition, the Industrial Promotion Division of the Kochi Prefecture Department of Commerce,

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Industry, and Labor worked hard to host related events and tours. The Kochi Deep Ocean Water Business Club and Dr. Recella Co. provided drinking water for the conference. We would like to take this opportunity to thank everyone for their cooperation and support.



Opening Scene



From the left: Chair Otsuka, Executive Committee Chair Ueta, Promotion Supervisor Yamanaka, and Chair Machida



DHC・Yamada

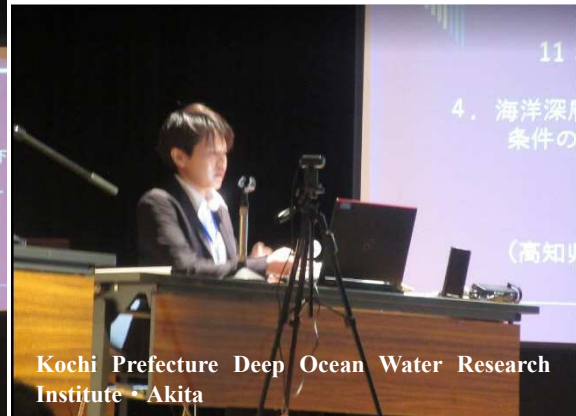


Akokasei・Tsunno

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NPO Ocean Roman21 • Inoue



Kochi Prefecture Deep Ocean Water Research Institute • Akita



Open University of Japan • Fukami



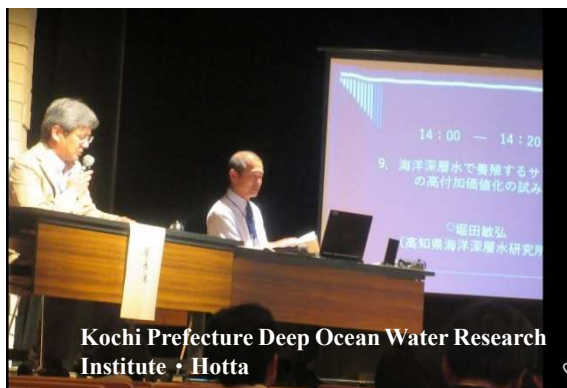
University of Tokyo • Imada



Shimizu Co. • Shiroeda



DHC • Shibata



Kochi Prefecture Deep Ocean Water Research Institute • Hotta



Osaka Aquarium Kaiyukan • Murata

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Saga University • Arima



Saga University • Kokubo



Kanazawa University • Suzuki



Japan Agency for Marine Earth Science and Technology • Kikuchi



Dr. Recella • Nagafune



JICA • Kuge



Osaka Metropolitan University • Otsuka



Taehui Yang • Oh

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Akokasei • Yasukawa  
Online Presentation



Osaka Electro-communication University • Yasunaga



GO Farm • Ito

Marino Forum 21 • Hinatano  
Online Presentation



Closing Remarks • Vice Chair Ikegami

※Photos of the “Deep Ocean Water Summit 2024 Panel Session” and “Outreach Classes for Elementary, Junior High School Students, and General Public” are omitted.

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## Report on the Panel Session of the Deep Ocean Water Summit 2024 at the Muroto Conference

Utilization Promotion Committee

Our Committee set out a three-year plan with the main theme of “Rediscover! Utilization of DOW” last year in Sado. This year, as the “DOW Summit 2024 Muroto Conference Panel Session” the title was “Rediscover! Reconsidering the Current State of DOW Utilization.” It was held for two hours at the Muroto City Health and Welfare Center Yasuragi from 13:30 on Friday, October 18, 2024, the second day of the DOWAS Muroto Conference. There were over 60 participants as well as 12 media companies from TV, Radio, and Newspapers from all over the nation. (A hybrid method of in person and online, co-sponsored by Kochi Prefecture, Muroto City, and our Society’s Utilization Promotion Committee)

First, the National council of Local Governments for Industrial Use of DOW kicked off with presentations by Kochi Prefecture, Shizuoka Prefecture, Toyama Prefecture, and Okinawa Prefecture on the stage to present the latest initiatives regarding utilization of DOW. Following, a panel discussion was held with four main themes as the pillars.

The first theme was “DOW in our daily lives.” In addition to wide usage of DOW in famous beverages we casually consume in our daily lives, and in shampoos and rinses we use in the bath, it was widely known that DOW is being implemented in our social lives, such as in farming and stocking of seafood such as oysters and seaweeds that are delicious to eat at the dinner table and in restaurants. The transportation of live fish using DOW to

maintain freshness has already become a reality.

The second theme was “Unique(!?) Research on DOW.” It was said that DOW is useful for maintaining the health of spider crabs, which are popular exhibits at aquariums. For shrimp and crabs, the molting behavior is said to be essential for growth and maintain their health. A new phenomena was introduced where DOW activates the molting behavior that slows down in aquarium environments. In Kochi Prefecture, the cultivation of “Satsukimasu” (a sea-run silver amago fish), using DOW is thriving. This “Satsukimasu Nigiri Sushi” won a special prize at this year’s “Japan’s World Treasures Conference 2024.” We learned that the utilization of DOW is beginning to attract global attention.

The third theme was “Increasing Presence in the Energy Field.” The utilization of cold is the true value of DOW. Each presenter and guest commentator Professor Takahashi (President of the Japan Science Society) held a realistic and passionate discussion on the economic effects of OTEC and SWAC, enlightening the significance of this panel session.

The final theme was proposed by Kochi Prefecture, the host municipality of this summit, as a “proposal for the future,” specifically “cooperation between local governments and mutual collaboration in research.” The session ended on a high note with the sentiment that this proposal will indeed be the key to opening the door to future DOW use across the country.

We would like to extend our heartfelt thanks to all the participants in this year’s event, the

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local government speakers, and the people of Kochi Prefecture and Muroto City, where the event was held.



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**Report on Educational Events conducted by the DOW Education Promotion Committee**

OTSUKA Koji (Osaka Metropolitan University), OKAMURA Shin (Xenesys Inc.), SHIROEDA Tetsuji (Shimizu Co.), TAKADA Tamae (Dr. Recella Co), YASUNAGA Takeshi (Osaka Electro-communication University), YAMAMOTO Hiroshi (Kochi Prefecture DOW Research Institute)

In October 2021 the DOW Education Promotion Committee was established with the aim of developing educational content for children and promoting educational events using the content. Following the national conference held in Sado in 2023, this committee held educational events at Muroto City's Muroto Elementary School in conjunction with the national conference held in Muroto in October 2024 and at the DOW Festival held at Muroto DOW Aqua Farm.

Thanks to the efforts of KATSURA Yamasaki and MASAKAZU Hazama of Muroto City, who attended the 2023 Sado City Hatano Elementary School Visit, and KONO Toshio, former director of the Kochi Prefecture DOW Research Institute, the visit was quickly arranged to target fifth graders at Muroto Elementary School, which is closest to the venue. Muroto Elementary school is located in the center of Muroto City, about a four-minute walk from Muroto City Hall, and has a total of 192 students. This outreach class was held in the science lab as a comprehensive class during fifth and sixth periods for all 5<sup>th</sup> graders (31 students) after the second day of the national conference on Friday, October 18<sup>th</sup>.

The outreach class was attended by a total of nine people, including the six authors and members of the education promotion committee, and three attendees (HOTTA Toshihiro, AKITA Monami of Kochi Prefecture DOW Research Institute) and TATE Takayuki (Furukawa Sangyo KAISHA, LTD.). First the students had a great time with a traditional opening true or false quiz by Chair Otsuka (photo 1). Many students answered all the questions correctly. The fifth

graders were very energetic and knowledgeable.

Next, students compared the taste of low-mineral water from Muroto with that of water with a hardness of 1000mg/L in cups. Compared to the last time in Sado, the students who drank the high-hardness water of 1000mg/L seemed to be okay (photo 2). There may have been differences in the environment and ease of drinking in addition to the hardness.

After that, students learned about ocean currents and undersea flows, including near Muroto, in a lecture by committee member Yamamoto. Then, it was finally time for the experiment. According to the desk arrangement in the science lab, the students were divided into six groups (six or seven students to each) to conduct experiments using aquariums.

First, they dissolved blue dye (food coloring) in hot water and poured it into a small tank of clear water to create thermal stratification. If they poured it roughly, the surface layer would spread and the colors would mix in the tank, so the students in each group poured it gently to create a beautiful blue surface layer (photo 4). After that, they immersed ice in the corner, and the blue water flowed rapidly to the bottom like a waterfall, visualizing in the tank the phenomena of surface seawater sinking, simulating ocean circulation. The students watched in wonder, shouting out loud (photo 5).

After a break, they learned about the basic properties of DOW, the products it is used in, sustainability, and then they repeated the experiment. This time, they poured blue high salinity water into the bottom of a clear water tank using a large straw to create stratification again. The new task was to remove only the water at the bottom using a small tube. After

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discussing in each group, they successfully used the siphon principle to move the blue water at the bottom of the tank to a plate (photo 6). After that, ice was placed on the plate and a Peltier element with a heatsink shaped as a pin stand was placed on it. A motor with propeller were attached to wiring of the Peltier element, and when the palm of a hand was pressed on the Peltier, electricity was generated by electromotive force and the propeller connected to the motor rotated. It seemed strange to generate electricity with one's own body heat, and everyone rubbed their hands to warm them, and then tried to generate electricity. They competed to see who could rotate the propeller the fastest (photo 7).

This time as well, the two-hour lesson flew by, and the very energetic children had a great time with big smiles on their faces as they thought about and devised experiments. In consideration of the continuity of education on DOW in the future, all the experimental equipment used this time was donated to Muroto Elementary School.

After the outreach class, 26 children answered a questionnaire. As shown in Figure 1, 96% of the students answered that the lesson was interesting. The remaining 4% (1 person) answered that it was fairly interesting. There were no answers that it was fair, not interesting, or not very interesting, so we assume the students were interested in the class. As shown in Figure 2, about 60% answered that the level of content implemented was just right, about 10% answered that it was too easy or a little too easy, and it seems that it was a little difficult for 30% of the students, however, no one replied that it was too difficult. The participants wrote their impressions which included "I was surprised that electricity could be generated by the temperature difference of the ocean (I didn't know)," "I thought it was amazing that the motor was moving and that we could generate electricity," (after learning the principal of siphons) "I learned water could be moved with a hose," "the sea is deeper than the land is

high (I didn't know), and "I would like to tell my family what I learned in the quiz."

In addition, we received advice on the content of future lessons, such as it would be better to use a slightly larger container, it would be better to draw real seawater, and it would be good to do more experiments. As interest is generated when it is fun, it may be necessary to find ways to conduct more experiments in a limited time.

On Saturday, October 19<sup>th</sup> we borrowed space at the Muroto DOW Aqua Farm to hold an education event as part of the DOW Festival. At the event, we displayed posters on topics such as thermohaline circulation, DOW Intake Sites in Japan and around the world, and the mechanism of OTEC. In addition to conducting experiments similar to those at Muroto Elementary School, we also conducted observations of algae using a stereo microscope (photos 8-10). Dozens of elementary school students, preschoolers, and their parents attended the event.

This educational event was the second time the committee has undertaken this event and the onsite education was carried out as scheduled. The experiment was mainly conducted based on the content created by committee member Okamura based on his past experience in Kumejima, and we feel that the other committee members who participated are also becoming comfortable with it. The next national conference will be held in Kumejima in 2025. It is easy to imagine that many elementary school children and ordinary citizens in Kumejima already know about DOW, so further ingenuity may be needed. We hope that educational events like this one will provide more people with opportunities to learn, leading to increased awareness and dissemination of DOW, helping to build a sustainable society.

As part of the activities of the Education Promotion Committee, we will need to continue to collect educational content and develop new education materials. We would be grateful if DOWAS members

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provide any information they may have in regards to education on DOW.

Finally, we would like to express our sincere gratitude to the people of Muroto City, who cooperated with this initiative, Muroto Elementary School Principal YAMAZAKI Misa and 5<sup>th</sup> grade teacher NAKAJIMA Kentaro for agreeing to the outreach class, and HOTTA Toshihiro and TATE Takayuki for their help with the event.



Photo 1: True or False Quiz at the Beginning

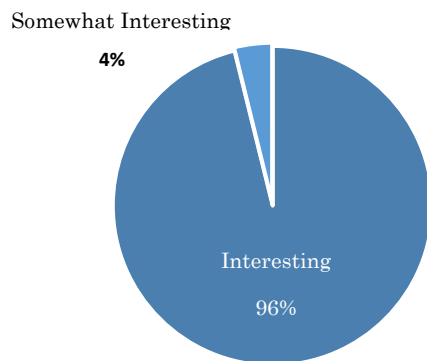


Figure 1: Was the DOW Class Interesting?  
(There were no responses of “fair,” “not interesting,” or “not very interesting”)



Photo 2: Water Tasting

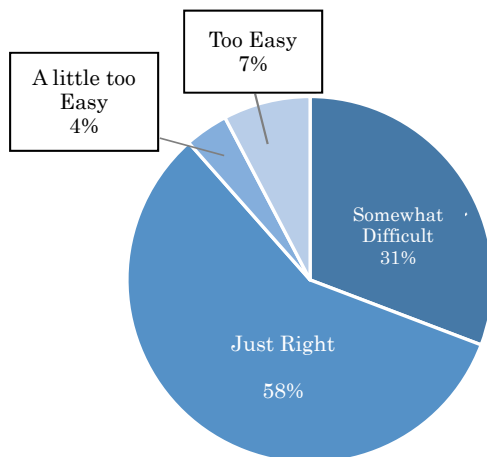


Figure 2: Was the DOW Class Difficult?  
(There were no responses of “too difficult,”)



Photo 3: Learning about Ocean Currents

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Photo 4: Thermohaline Circulation Simulation Experiment (Pouring warm blue water onto the surface)



Photo 7: Power Generation using Peltier Elements (Hand Rubbing to increase temperature difference!)



Photo 5: Thermohaline Circulation Simulation Experiment (the cold surface layer sinks to the bottom)



Photo 8: DOW Festival Education Event

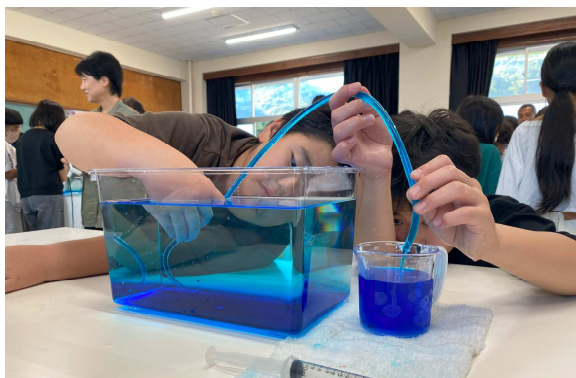


Photo 6: Water Intake using the Siphon Principle



Photo 9: DOW Festival Education Event

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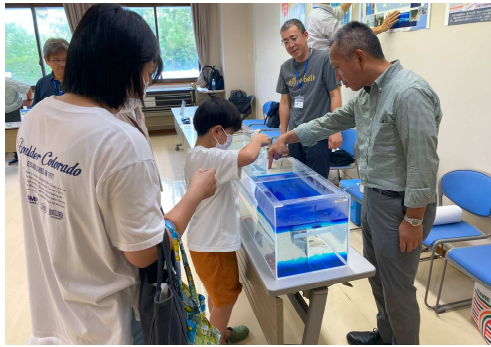


Photo 10: DOW Festival Education Event

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