



R/V Kairei & ROV Kaiko Cruise Report

KR21-09

Development of a research cruise program to raise awareness
and interest of the younger generation towards the ocean



Suruga Bay

July 17- July 18, 2021

Japan Agency for Marine-Earth Science and Technology

(JAMSTEC)

CONTENTS

1. Cruise Information.....	3
2. Researchers.....	4
3. Onshore Staff.....	5
4. Crew of the R/V <i>KAIREI</i> & ROV <i>KAIKO</i> Operation Team.....	6-7
5. Research/Development Activities.....	8-11
6. Notice on Using.....	12
7. Acknowledgements.....	13

1. Cruise Information

1.1. Cruise ID: KR21-09

1.2. Name of vessel: Kairei

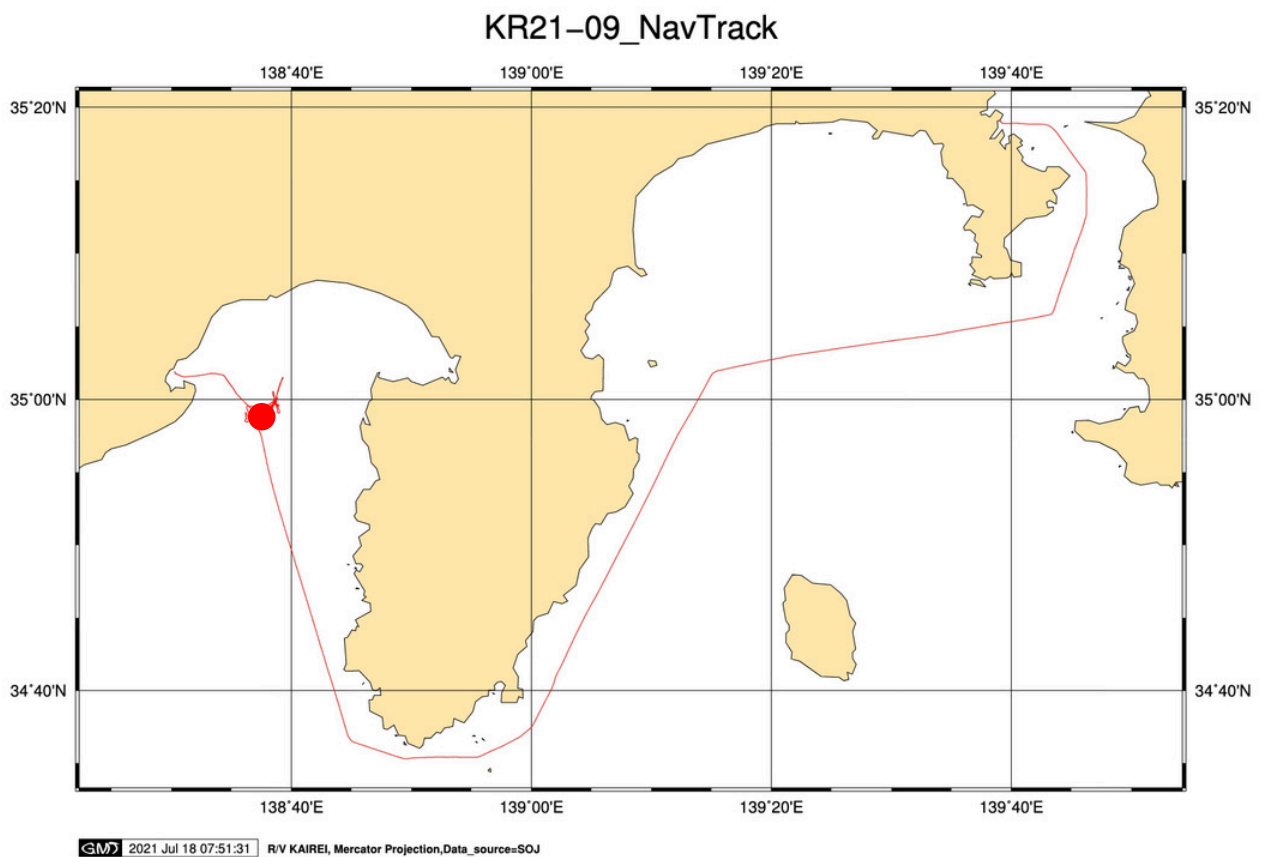
1.3. Title of the cruise: Development of a research cruise program to raise awareness and interest of the younger generation towards the ocean

1.4. Cruise period: July 17 – July 18, 2021

1.5. Ports of departure / arrival: JAMSTEC Yokosuka – Shimizu

1.6. Research area: Suruga Bay

1.7. Research map:



2. Researchers

2.1. Chief Scientist:

Takamasa Tamura [Public Relations Section, JAMSTEC]

2.2. Staff Scientists:

Hikari Nomura [Public Relations Section, JAMSTEC]

Tadashi Yoshizawa [Public Relations Section, JAMSTEC]

Yoshiyuki Ogita [Public Relations Section, JAMSTEC]

Tetsuya Yokota [Nippon Marine Enterprises, Ltd.]

Masaki Hayashi [Nippon Marine Enterprises, Ltd.]

Naoki Akimoto [DWANGO Co., Ltd.]

Takashi Ugajin [DWANGO Co., Ltd.]

Masahito Sagawa [DWANGO Co., Ltd.]

Toshiyuki Sugai [ANDERSSON Inc.]

Daisuke Ohki [ANDERSSON Inc.]

Hisashi Makabe [ANDERSSON Inc.]

Ryo Kamijoh [ANDERSSON Inc.]

Ken Yazaki [ANDERSSON Inc.]

Makoto Sugimura [Enoshima Aquarium]

Yuma Nishikawa [Enoshima Aquarium]

Hikari Kajihara [STU, Inc.]

Mariko Imamura [STU, Inc.]

Sayaka Harada [STU, Inc.]

Yuuna Kawamata [STU, Inc.]

3. Onshore Staff

Morio Ichihara [Public Relations Section, JAMSTEC]
Hidehiko Nakajoh [Public Relations Section, JAMSTEC]
Noriaki Fujimoto [Public Relations Section, JAMSTEC]
Ayako Yazawa [Public Relations Section, JAMSTEC]
Motoyo Kudoh [Public Relations Section, JAMSTEC]
Noriko Yada [Public Relations Section, JAMSTEC]
Ryu Asai [Nippon Marine Enterprises, Ltd.]
Katsutoshi Machiba [Supership Inc.]
Yuta Naito [Supership Inc.]
Takumi Serizawa [Supership Inc.]
Shigeta Asano [Supership Inc.]
Yuki Saijo [JOUER Ltd.]
Masanori Toba [JOUER Ltd.]
Yutaka Kanamori [Hakuhodo Inc.]

4. Crew of the R/V *KAIREI* & ROV *KAIKO* Operation Team

4.1. R/V *KAIREI*

Captain	T. AOKI
Chief Officer	T. EGASHIRA
2nd Officer	T. NOZAWA
3rd Officer	T. YAMAMOTO
Jr. 3rd Officer	R. NAKAMURA
Chief Engineer	E. SAKAGUCHI
1st Engineer	K. NOGUCHI
2nd Engineer	K. SHIMADA
3rd Engineer	Y. YOKOYAMA
Chief Radio Officer	T. NASU
2nd Radio Officer	K. UGAJIN
Boatswain	Y. YOSHINO
Able Seaman	Y. MATSUO
Able Seaman	K. HIRAI
Able Seaman	T. KUBOTA
Able Seaman	S. YAMAMOTO
No.1 Oiler	S. SUGI
Oiler	T. HIDAKA
Oiler	K. MATSUMURA
Oiler	A. DANTSUKA
Oiler	S. HAYASHIDA
Oiler	F. NAKASHIMA
Chief Steward	T. ONOUE
Steward	R. KUBOTA
Steward	M. YAMAMOTO
Steward	K. SATO
Steward	T. NAGATOMO
Steward	K. KASHIWAGI
Steward	H. HONDA

4.2. ROV *KAIKO*

Sub. Op. Manager	S. SHIGETAKE
1st Sub. Tec. Officer	T. KONDO
2nd Sub. Tec. Officer	S. IHARA
2nd Sub. Tec. Officer	A. TAKENOUCHI
3rd Sub. Tec. Officer	K. IWATA
3rd Sub. Tec. Officer	Y. OKUHIRA
3rd Sub. Tec. Officer	N. SATO



R/V KAIREI



ROV KAIKO

5. Research/Development Activities

5.1. Cruise Summary

Initially, the KR21-09 cruise was planned as a hands-on experience for elementary school students who won the "*Kaiyou no Yume* Contest" and their parents (six people in total) to board the R/V *KAIREI* to enjoy deep-sea exploration. However, due to the fact that the spread of the new coronavirus infection (COVID-19) has not been contained, the invitation of parents and children was cancelled. The original plan was changed to one that allows a wider range of people to experience the real deep-sea exploration of the ROV *KAIKO* online.

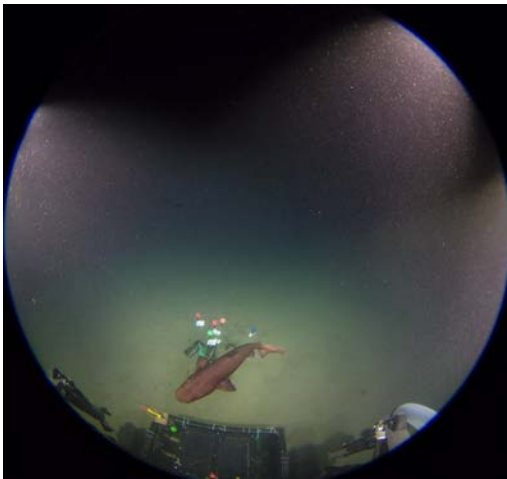
The specific projects that were implemented are as follows.

1. Real-time delivery of high quality VR images of the deep sea to a special venue at the Society 5.0 Expo

During the YK21-04 cruise in March 2021, the Public Relations Section of JAMSTEC had succeeded in capturing beautiful 8K-quality VR images of the entire deep-sea exploration by the *SHINKAI6500*. In the KR21-09 cruise, we took on the challenge of distributing the beautiful and realistic VR images of the deep-sea exploration to the land in "real time" and through VR goggles, providing many visitors of the Society 5.0 Expo the ultimate immersive experience as if they were in the deep sea.

The biggest technical challenge was to secure a high-capacity and high-speed communication method from the research vessel to the land. After several months of deliberation, the "LiveU" system, which bundles the lines of multiple mobile carriers, was adopted for this project. Mr. Ogita (Public Relations Section, JAMSTEC), who is also the developer of the 8K VR camera, taking the lead, and with the precise and dedicated support of Mr. Ugajin (DWANGO Co., Ltd.), we succeeded in distributing VR images of deep-sea exploration in 4K quality in "real time" to the Society 5.0 special venue at *Tokyo SKYTREE TOWN*. I suspect that this is an unprecedented attempt not only in Japan but also in the world.

Unfortunately, the "Future Ocean Days" event at the special venue was not attended due to the COVID-19 pandemic, and only the panelists on the stage were able to experience the immersive deep-sea exploration in real time using high-definition VR (for elementary school students who won the "*Kaiyou no Yume* Contest" and their parents (six people in total) who were supposed to be aboard the ship, we opened a limited public YouTube page and provided them with a VR viewing kit in advance to watch the 4K-quality real-time video at home).



Raw data of 8K-quality VR image



One panelist surprised by a real time image of a shark approaching towards him

2. Live broadcasting of two-day documentary of the research cruise on *niconico douga*

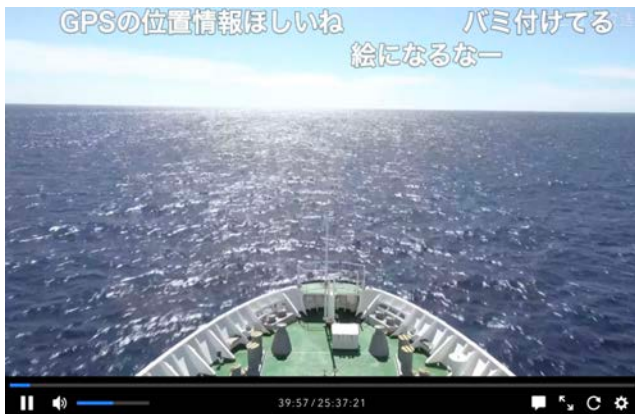
Apart from real-time delivery of high quality VR images (1.), the documentary of the two-day research cruise was broadcasted live for more than twenty-five hours in cooperation with *niconico douga*, one of Japan's largest video distribution services. Documentary included the departure of the research vessel, the image of *KAIREI* at sea, the professional work of crew members, meals on the ship, maintenance of the ROV, the setting sun seen from the research vessel, and footage of deep-sea exploration in *Suruga Bay*.

Navigators were Ms. Sayaka Harada from the idol group *STU48* (as a representative of younger viewers), Mr. Makoto Sugimura of the Enoshima Aquarium (as a commentator on biology), and Mr. Tetsuya Yokota of Nippon Marine Enterprises, Ltd. (as a commentator on technology), and their easy-to-understand and friendly commentary allowed more than 85,000 viewers to enjoy the entire research cruise in real time.

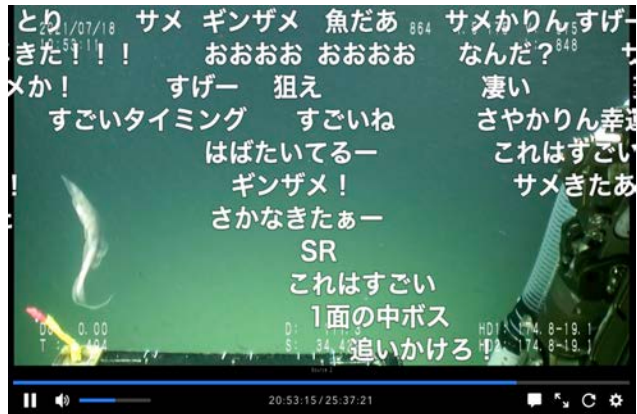
In the climax of the ROV *KAIKO* deep-sea exploration, for the first time, we succeeded in operating the ROV by responding interactively to viewer's requests, taking advantage of the comment function of *niconico douga*. We were able to provide viewers who are restricted from going out due to the COVID-19 pandemic with the enjoyment of participating in deep-sea exploration from their homes.

The live broadcast of the research cruise documentary, which lasted more than twenty-five hours, was brilliantly directed by Mr. Yoshizawa (Public Relations Section, JAMSTEC) and Mr. Akimoto (DWANGO Co., Ltd.). The beautiful full HD images produced by the "LiveU" system, which was also used in 1. above, were very well received by the viewers. The deep-sea sea cucumbers (*Enypniastes eximia*) collected by the ROV *KAIKO* were displayed at the

Enoshima Aquarium. This exhibit was a delight to many visitors.



The image of the fixed camera in front of R/V KAIREI



Enthusiasm and excitement of the viewers during deep-sea exploration

3. Recording and photographing on board

The highlight video of the research cruise by R/V KAIREI and ROV KAICO was recorded by six excellent film crew members (Mr. Sugai, Mr. Ohki, Mr. Makabe, Mr. Kamijoh, Mr. Yazaki, and Mr. Hayashi). The video, which also features Ms. Yuuna Kawamata from the idol group STU48, will be released on YouTube within this year.



that could never be shot again.

5.2. Dive Information

Dive: KK#864

Date: July 18, 2021(JST)

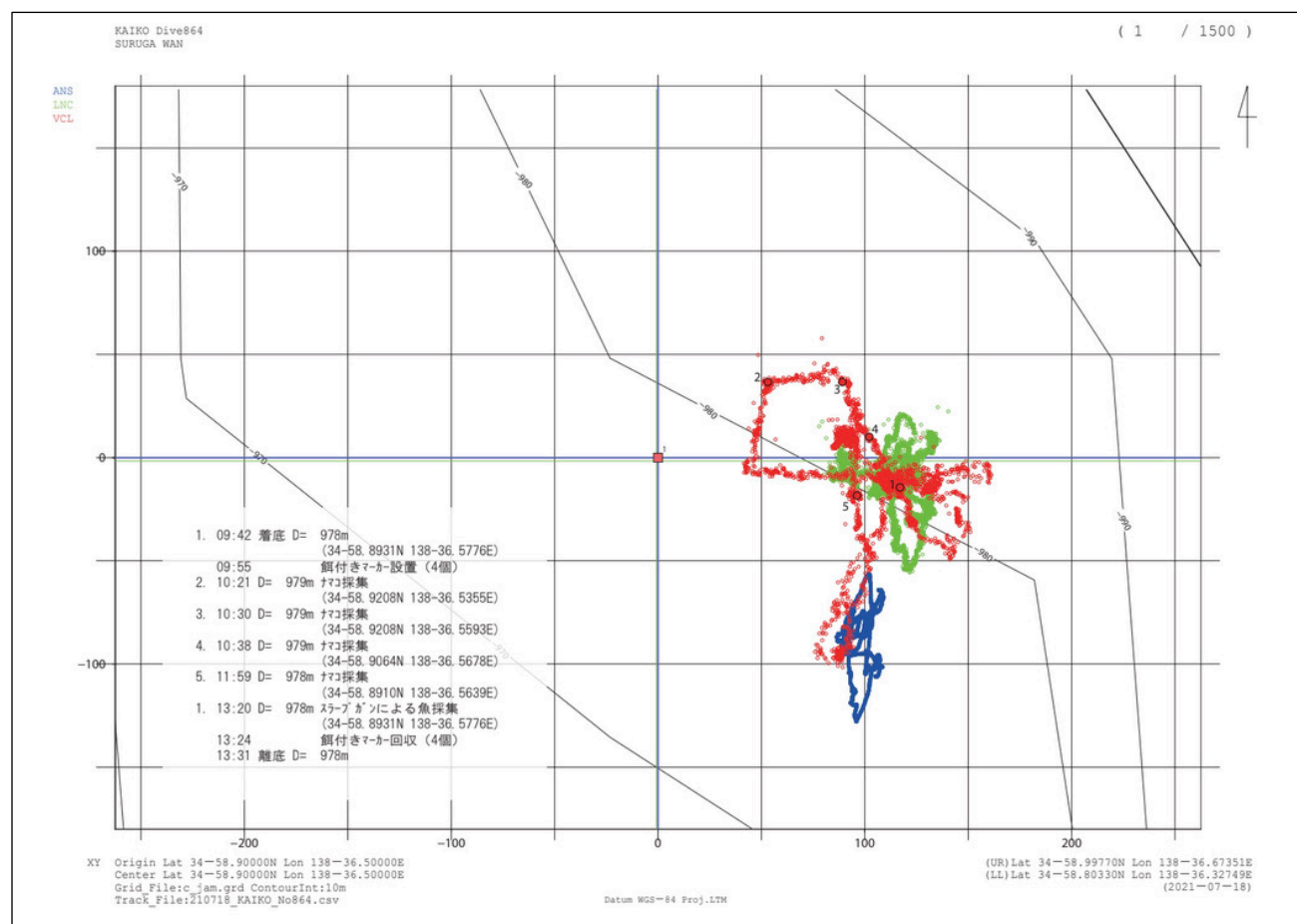
Site: Offshore of Miho Peninsula (34° 58.90N, 138° 36.50E)

Depth: 980m

Landing (Time, Depth): 09:42, 978m

Leaving (Time, Depth): 13:31, 978m

5.3. Cruise Track



6. Notice on Using

Insert the following notice to users regarding the data and samples obtained.

This cruise report is a preliminary documentation as of the end of cruise.
This report is not necessarily corrected even if there is any inaccurate description (i.e. taxonomic classifications). This report is subject to be revised without notice.
Some data on this report may be raw or unprocessed. If you are going to use or refer the data on this report, it is recommended to ask the Chief Scientist for latest status.
Users of information on this report are requested to submit Publication Report to JAMSTEC.

<http://www.godac.jamstec.go.jp/darwin/explain/1/e#report>

E-mail: submit-rv-cruise@jamstec.go.jp

7. Acknowledgements

We would like to express our gratitude to all involved in this research cruise, including: Nippon Marine Enterprises, Ltd. and Institute for Marine-Earth Exploration and Engineering (MarE3) for their full support in taking on multiple projects in one dive; STU, Inc. (in particular Mr. Sakai, Mr. Tokunaga, and Ms. Aratadani), who trustingly entrusted us with their idols for a two-day and one-night research cruise; Supership Inc. for their efforts in distributing the VR on land; Mr. Nomura and Ms. Yazawa (Public Relations Section, JAMSTEC) for their support in the extensive preparations for the research cruise; and Captain Aoki and all the crew members. Once again, I offer my heartfelt thanks to all on board who dedicated themselves and worked as hard as they could to make the project a success.