

HISATOMO WAGA

Visiting Postdoctoral Researcher
International Arctic Research Center
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RESEARCH INTERESTS

Reliable evidences of changes in the marine environment have been reported in the Arctic Ocean during the last several decades. Recent reductions in Arctic sea-ice cover have been most pronounced in the continental shelf region of the Pacific Arctic, accompanied by increased ocean temperature, freshwater content, and Pacific Water inflow. These variations influence on the phytoplankton community and subsequently, on the higher trophic levels.

My research interests lie at the impact of these environmental changes on polar marine ecosystems. In particular, my research uses satellite remote sensing to explore topics related to:

1. Phytoplankton community dynamics
2. Shifts in phytoplankton phenology
3. Physical-biological interactions

EDUCATION

Ph.D. in Fisheries Sciences

Graduate School of Fisheries Sciences, Hokkaido University, March 2018
Dissertation Title: Spatiotemporal variability in phytoplankton and benthic communities in the Pacific Arctic
Committee: Yutaka Watanuki (chair), Yasuzumi Fujimori, Toru Hirawake (advisor), Hiroto Abe, Amane Fujiwara

M.S. in Fisheries Sciences

Graduate School of Fisheries Sciences, Hokkaido University, March 2015
Thesis title: Distributional shifts in size structure of phytoplankton community: magnitude and direction
Committee: Sei-Ichi Saitoh (chair), Toru Hirawake (advisor), Atsushi Yamaguchi

B.S. in Fisheries Sciences

School of Fisheries Sciences, Hokkaido University, March 2013
Thesis title: Remote estimation of phytoplankton functional types in the western Arctic (*in Japanese*)
Advisor: Toru Hirawake

PROFESSIONAL EXPERIENCE

Visiting Postdoctoral Researcher (April 2020–present)

International Arctic Research Center, University of Alaska Fairbanks
Advisor: Hajo Eicken

- JSPS Overseas Research Fellowships (<https://www.jsps.go.jp/english/e-ab/>):
 - ✓ Simulating seasonal variations in the primary role of sea-ice leads on under-ice phytoplankton growth based the large-eddy simulation model
 - ✓ Examining the development processes of under-ice phytoplankton blooms in relation to sea-ice leads in the Arctic

Visiting Postdoctoral Researcher (August 2019–March 2020)

International Arctic Research Center, University of Alaska Fairbanks
Advisor: Hajo Eicken

- ArCS Overseas Visits by Young Researchers (<https://www.nipr.ac.jp/arcs/e/project/capacity/>):
 - ✓ Compared advantages and disadvantages of multiple satellite-based techniques for estimating sea-ice parameters such as ice thickness, and fractions of melt pond and lead in the Arctic
 - ✓ Assessed pan-Arctic distribution of sea-ice leads using Sentinel-1 SAR imagery

Postdoctoral Researcher (April 2018–March 2020)

Faculty of Fisheries Sciences, Hokkaido University
Advisor: Toru Hirawake

- ArCS project (<https://www.nipr.ac.jp/arcs/e/>):
 - ✓ Explored interannual variations in phytoplankton phenology using satellite data at the international DBO 1–3 sites in the Pacific Arctic
 - ✓ Reported recent changes in benthic macrofaunal community compositions in relation to physical

forcing at the international DBO 1–3 sites in the Pacific Arctic

- JAXA GCOM-C project (https://global.jaxa.jp/projects/sat/gcom_c/):
 - ✓ Developed and validated an ocean color algorithm for estimating phytoplankton size structure based on inherent optical properties varying with phytoplankton cell size
 - ✓ Demonstrated latitudinal variations in influences of cyclonic/anticyclonic mesoscale eddies on surface phytoplankton size structure within eddies
- OMIX project (<http://omix.aori.u-tokyo.ac.jp/en/>):
 - ✓ Investigated oceanographic dynamics and those impacts on phytoplankton communities in the Arctic and sub-Arctic oceans using satellite and field data
 - ✓ Clarified impacts of variations in phytoplankton size structure on biomass and distributions of benthic macrofaunal at the international DBO 1–3 sites in the Pacific Arctic

TEACHING EXPERIENCE

Teaching Assistant

School of Fisheries Sciences, Hokkaido University

- Shipboard Training II (Spring 2016, Winter 2016, Fall 2017)
- Laboratory Work on Marine Resources III (Winter 2015, Autumn 2016)

HONORS & AWARDS

- [4] **Outstanding Student Presentation Award**
Japan Geoscience Union, July 2017
- [3] **Early Career Scientist Travel Award**
North Pacific Marine Science Organization, July 2017
- [2] **Young Scientist Travel Award**
Japan Marine Science Foundation, November 2016
- [1] **Young Researcher Presentation Award**
The Oceanographic Society of Japan, March 2016

RESEARCH GRANTS

- [3] **JSPS Overseas Research Fellowships** (April 2020–March 2022) 12,400,000 JPY (US\$ 116,000)
Japanese Society for the Promotion of Science
PI: Hisatomo Waga
Title: Understanding of spatiotemporal variations in under-ice phytoplankton bloom using remote sensing techniques
- [2] **Overseas Visits by Young Researchers** (August 2019–February 2020) 1,800,110 JPY (US\$ 16,800)
Arctic Challenge for Sustainability Project
PI: Hisatomo Waga
Title: Monitoring of sea ice variability based on SAR satellite imagery
- [1] **Sasakawa Scientific Research Grant** (April 2015–March 2016) 520,000 JPY (US\$ 4,800)
The Japan Science Society
PI: Hisatomo Waga
Title: Response of marine ecosystems on climate changes in the Pacific Arctic (*in Japanese*)

PEER-REVIEWED PUBLICATIONS

- [11] **Waga, H.**, Eicken, H., Hirawake, T., and Fukamachi, Y. (*in preparation*). Timing of sea-ice retreat drives spring phytoplankton bloom variations in the Pacific Arctic. *PLoS One*.
- [10] **Waga, H.**, Fujiwara, A., Hirawake, T., Suzuki, K., Yoshida, K., Abe, H., and Nomura, D. (*submitted*). Spatial patterns in primary productivity and phytoplankton community structure in surface waters off the western subarctic Pacific and Bering Sea during summer. *Prog. Oceanogr.*
- [9] Nishio, S., Sasaki, H., **Waga, H.**, and Yamamura, O. (*available online*). Effects of the timing of sea ice retreat on demersal fish assemblages in the northern Bering and Chukchi Seas. *Deep-Sea Res. II*. doi:10.1016/j.dsr2.2020.104910
- [8] **Waga, H.**, Hirawake, T., and Nakaoka, M. (*available online*). Influences of size structure and post-bloom supply of phytoplankton on growth and physiological variations in a common Pacific Arctic bivalve (*Macoma calcarea*). *Polar Sci*. doi: 10.1016/j.polar.2020.100554

- [7] Hirawake, T., Uchida, M.M., Abe, H., Alabia, I.D., Hoshino, T., Masumoto, S., Nishioka, J., Nishizawa, B., Oki, A., Takahashi, A., Tanabe, Y., Tojo, M., Tsuji, M., Ueno, H., **Waga, H.**, Watanabe, Y., Yamaguchi, A., and Yamashita, Y. (*available online*). Response and biodiversity status of Arctic ecosystem under environmental change: Findings in the ArCS project. *Polar Sci.* doi:10.1016/j.polar.2020.100533
- [6] **Waga, H.**, and Hirawake, T. (2020). Changing occurrence of fall bloom and its impact on phytoplankton size structure in the Pacific Arctic. *Front. Mar. Sci.* 7, 6207. doi:10.3389/fmars.2020.00209
- [5] **Waga, H.**, Hirawake, T., and Grebmeier, J.M. (2020). Recent change in benthic macrofaunal community composition in relation to physical forcing in the Pacific Arctic. *Polar Biol.* 43, 285–294. doi:10.1007/s00300-020-02632-3
- [4] **Waga, H.**, Hirawake, T., and Ueno, H. (2019). Impacts of mesoscale eddies on phytoplankton size structure. *Geophys. Res. Lett.* 46. doi:10.1029/2019GL085150
- [3] Abe, H., Sampei, M., Hirawake, T., **Waga, H.**, Nishino, S., and Ooki, A. (2019). Sediment-Associated Phytoplankton Release From the Seafloor in Response to Wind-Induced Barotropic Currents in the Bering Strait. *Front. Mar. Sci.* 6, 243. doi:10.3389/fmars.2019.00097
- [2] **Waga, H.**, Hirawake, T., Fujiwara, A., Grebmeier, J. M., and Saitoh, S.-I. (2019). Impact of spatiotemporal variability in phytoplankton size structure on benthic macrofaunal distribution in the Pacific Arctic. *Deep-Sea Res. II* 162, 114–126. doi:10.1016/j.dsr2.2018.10.008
- [1] **Waga, H.**, Hirawake, T., Fujiwara, A., Kikuchi, T., Nishino, S., Suzuki, K., Takao, S., and Saitoh, S.-I. (2017). Differences in Rate and Direction of Shifts between Phytoplankton Size Structure and Sea Surface Temperature. *Remote Sens.* 9, 222. doi:10.3390/rs9030222

CONFERENCE PRESENTATIONS

- [26] Fujiwara, A., Nishino, S., Shiozaki, T., Sugie, K., **Waga, H.**, Abe, Y., Tokuhiko, K., Fukai, Y., Matsuno, K., Yamaguchi, A., Hirawake, T., Harada, N., Kikuchi, T., Yabuki, M., and Aas, Wenche., Response of lower trophic organisms to recent environmental changes in the Arctic, The 11th Symposium on Polar Science, Online Meeting, December 2020. (Oral)
- [25] **Waga, H.**, and Hirawake, T., Evident fall phytoplankton blooms in the Pacific Arctic, ISAR-6 Online Meeting, Online Meeting, April 2020. (Poster)
- [24] **Waga, H.**, and Hirawake, T., Changing occurrences of fall phytoplankton blooms associated with variations in phytoplankton size structure in the Pacific Arctic Region, Ocean Sciences Meeting, San Diego Convention Center, San Diego, USA, February 2020. (Poster)
- [23] **Waga, H.**, and Hirawake, T., Remote estimation of phenological shifts in phytoplankton community in the Pacific Arctic Region, JpGU Meeting, Makuhari Messe, Chiba, Japan, May 2019. (Poster)
- [22] Hirawake, T., Shiozaki, T., **Waga, H.**, and Suzuki, K., Improvement of absorption-based primary production model for SGLI/GCOM-C, JpGU Meeting, Makuhari Messe, Chiba, Japan, May 2019. (Poster)
- [21] **Waga, H.**, Hirawake, T., and Ueno, H., Latitudinal and temporal variations in phytoplankton size structure within mesoscale eddies from space, JpGU Meeting, Makuhari Messe, Chiba, Japan, May 2019. (Poster)
- [20] **Waga, H.**, and Hirawake, T., Satellite-observed phenological shifts in phytoplankton community in the Pacific Arctic Region, ESSAS Annual Science Meeting, Wedgewood Resort, Fairbanks, USA, June 2018. (Oral)
- [19] Abe, H., Sampei M., Hirawake T., **Waga, H.**, Nishino S., and Ooki A., Spring phytoplankton bloom and sediment resuspension in the Bering Strait, ESSAS Annual Science Meeting, Wedgewood Resort, Fairbanks, USA, June 2018. (Oral)
- [18] Fujiwara, A., Matsuoka, A., Nishino, S., **Waga, H.**, Hirawake, T., and Kikuchi, T., Optical tracer method to distinguish freshwater sources in the Pacific Arctic region, JpGU Meeting, Makuhari Messe, Chiba, Japan, May 2018. (Poster)
- [17] **Waga, H.**, Hirawake, T., and Grebmeier, J.M., Time-series variations in benthic macrofaunal communities in the Pacific Arctic, Ocean Science Meeting, Oregon Convention Center, Portland, USA, February 2018. (Poster)
- [16] Abe, H., Sampei, M., Hirawake, T., **Waga, H.**, Nishino, S., and Ooki, A., Spring phytoplankton bloom at Bering Strait in 2017, Fifth International Symposium on Arctic Research, Hitotsubashi Hall, Tokyo, Japan, January 2018. (Poster)
- [15] Sampei, M., Abe, H., Nishino, S., Ooki, A., **Waga, H.**, and Hirawake, T., Fate of particulate matter in the epi-benthic layer around the Bering Strait during autumn, Fifth International Symposium on Arctic Research, Hitotsubashi Hall, Tokyo, Japan, January 2018. (Poster)
- [14] **Waga, H.**, Hirawake, T., and Grebmeier, J.M., Species invasion and diversity in benthic macrofaunal communities in the Pacific Arctic, ESSAS Open Science Meeting, The Radisson Blu Hotel in Tromsø.,

- Tromsø, Norway, June 2017. (Oral)
- [13] Hirawake, T., **Waga, H.**, Kaneko, T., Suzuki, K., Yamashita, Y., and Nishioka, J., Effect of optical properties variability on retrieval of chlorophyll a from ocean color data in Oyashio and coastal Oyashio waters in early spring, JpGU-AGU Joint Meeting, Makuhari Messe, Chiba, Japan, May 2017. (Oral)
- [12] **Waga, H.**, Hirawake, T., and Grebmeier, J.M., Species invasion and diversity in benthic macrofaunal communities in the Pacific Arctic, JpGU-AGU Joint Meeting, Makuhari Messe, Chiba, Japan, May 2017. (Oral)
- [11] **Waga, H.**, Hirawake, T., Fujiwara, A., Grebmeier, J.M., and Saitoh, S.-I., Impact of spatiotemporal variability in phytoplankton size structure on benthic infaunal distribution in the Pacific Arctic, Gordon Research Seminar, Ventura Beach Marriott, Ventura, USA, March 2017. (Oral)
- [10] **Waga, H.**, Hirawake, T., Fujiwara, A., Grebmeier, J.M., and Saitoh, S.-I., Impact of spatiotemporal variability in phytoplankton size structure on benthic infaunal distribution in the Pacific Arctic, Gordon Research Conference, Ventura Beach Marriott, Ventura, USA, March 2017. (Poster)
- [9] **Waga, H.**, Hirawake, T., Fujiwara, A., Grebmeier, J.M., and Saitoh, S.-I., Spatiotemporal variability of satellite derived phytoplankton size structure and its impact on benthic infaunal distribution in the Pacific Arctic, Ocean Optics XXIII, Victoria Conference Centre, Victoria, Canada, October 2016. (Oral)
- [8] **Waga, H.**, Hirawake, T., Fujiwara, A., Grebmeier, J.M., and Saitoh, S.-I., The relationship between phytoplankton and benthic community in the Pacific Arctic region, First International RACArctic Workshop in Hakodate, Hakodate Research Centre for Fisheries and Oceans, Hakodate, Japan, March 2016. (Oral)
- [7] **Waga, H.**, Hirawake, T., Fujiwara, A., Kikuchi, T., Nishino S., Suzuki, K., Takao, S., and Saitoh, S.-I., Distributional shifts in size structure of phytoplankton community, AGU fall meeting, San Francisco, USA, December 2015. (Poster)
- [6] **Waga, H.**, Hirawake, T., Fujiwara, A., and Saitoh, S.-I., The global distribution of phytoplankton size spectrum derived from satellite ocean color data, Hokkaido University-University of Bremen Inter-University Exchange Seminar, Bremen, Germany, December 2014. (Oral)
- [5] Fujiwara, A., Hirawake, T., **Waga, H.**, Suzuki, K., Nishino, S., Kikuchi, T., and Saitoh, S.-I., Deriving of major algal pigment concentrations using spectral absorption coefficient in the western Arctic Ocean, The 5th Symposium on Polar Science, Tokyo, Japan, December 2014. (Oral)
- [4] Sasaki, H., Matsuno, K., Nakano, T., **Waga, H.**, Onuka, M., Yamaguchi, A., Yamamoto, J., Ueno, H., Hirawake, T., Watanuki, Y., and Sakurai, Y., The environmental factors affecting the spatial variance of zooplankton and fish density in the Chukchi Sea, Arctic Change, Ottawa, Canada, December 2014. (Poster)
- [3] Sasaki, H., Matsuno, K., **Waga, H.**, Onuka, M., Yamaguchi, A., Ueno, H., Hirawake, T., and Watanuki, Y., The environmental factors affecting the abundance of Zooplankton in the Chukchi Sea, The 5th Symposium on Polar Science, Tokyo, Japan, December 2014. (Oral)
- [2] **Waga, H.**, Hirawake, T., and Fujiwara, A., Deriving of phytoplankton size spectrum using absorption property, Ocean Optics XXII, Maine, USA, October 2014. (Poster)
- [1] Hirawake, T., Yamashita, Y., **Waga, H.**, Fujiwara, A., and Hirata, T., Examination on the methodologies of CDOM absorption measurement, Asian Workshop on Ocean Color, Tainan, Taiwan, December 2013. (Oral)

OUTREACH

- [2] Interviewed by Overseas Fellowship Program committee of the ArCS II Project for experiences about Overseas Visits by Young Researchers funded by the ArCS Project, December 7, 2020.
- [1] Presented a talk on experiences about Overseas Visits by Young Researchers funded by the ArCS Project on *The 11th Symposium on Polar Science*, December 1, 2020.

PROFESSIONAL MEMBERSHIPS

- Japan Geoscience Union (2017–present)
- American Geophysical Union (2015–present)
- The Oceanography Society (2015–present)
- The Oceanographic Society of Japan (2014–present)

CRUISE EXPERIENCE (283 total days to date)

- [13] Mu18, R/V Professor Multanovskiy, North Pacific and Arctic, July 23–September 13, 2018 (53 days)
- [12] KS-18-6, R/V Shinsei-maru, North Pacific, May 20–31, 2018 (12 days)
- [11] OS044, T/S Oshoro-maru, North Pacific, September 25–30, 2017 (6 days)
- [10] OS040, T/S Oshoro-maru, Arctic, July 2–August 1, 2017 (31 days)

- [9] OS036, T/S Oshoro-maru, North Pacific, February 22–28, 2017 (7 days)
- [8] MR16-06, R/V Mirai, Arctic, August 22–October 5, 2016 (45 days)
- [7] OS023, T/S Oshoro-maru, North Pacific, February 22–28, 2016 (7 days)
- [6] OS014, T/S Oshoro-maru, North Pacific, July 21–August 7, 2015 (18 days)
- [5] KH-15-1, R/V Hakuho-maru, North Pacific, March 6–21, 2015 (16 days)
- [4] Mu14, R/V Professor Multanovskiy, North Pacific, June 2–July 8, 2014 (37 days)
- [3] OS255, T/S Oshoro-maru, Arctic, June 23–August 6, 2013 (45 days)
- [2] US263, T/S Ushio-maru, Funka Bay, August 6–8, 2012 (3 days)
- [1] US260, T/S Ushio-maru, Funka Bay, June 17–19, 2012 (3 days)