

HISATOMO WAGA

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International Arctic Research Center
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RESEARCH INTERESTS

Reliable evidence 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

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

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*)

PROFESSIONAL EXPERIENCE

Research Assistant Professor (April 2023–present)
International Arctic Research Center, University of Alaska Fairbanks

Project Assistant Professor (November 2023–present)
International Polar and Earth Environmental Research Center, National Institute of Polar Research

Postdoctoral Researcher (April 2022–March 2023)
International Arctic Research Center, University of Alaska Fairbanks

Researcher (April 2020–October 2023)
Arctic Research Center, Hokkaido University

JSPS Overseas Research Fellow (April 2020–March 2022)
International Arctic Research Center, University of Alaska Fairbanks

Postdoctoral Researcher (April 2018–March 2020)
Faculty of Fisheries Sciences, Hokkaido University

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)

AWARDS & FELLOWSHIPS

- [4] **Overseas Research Fellowships**
Japanese Society for the Promotion of Science, April 2020

- [3] **Overseas Visits by Young Researchers**
Arctic Challenge for Sustainability Project, August 2019
- [2] **Outstanding Student Presentation Award**
Japan Geoscience Union, July 2017
- [1] **Young Researcher Presentation Award**
The Oceanographic Society of Japan, March 2016

RESEARCH GRANTS

- [5] **Bureau of Ocean and Energy Management** USD209,284
PI: Hisatomo Waga; Co-I: Mark Johnson September 2022–August 2025
Title: Satellite ocean color remote sensing of water mass dynamics in Cook Inlet
- [4] **North Pacific Research Board** USD216,230
PI: Hisatomo Waga; Co-I: Seth Danielson September 2022–August 2025
Title: Long-term monitoring of shifting patterns in phytoplankton blooms in the Pacific Arctic: Satellite and in situ datasets
- [3] **Arctic Challenge for Sustainability II** JPY3,000,000 (≒USD23,000)
PI: Hisatomo Waga; Co-I: Amane Fujiwara April 2022–March 2024
Title: Assessing the roles of sediment-laden sea ice on spring bloom development
- [2] **JSPS Grant-in-Aid for Early Career Scientists** JPY3,600,000 (≒USD33,300)
PI: Hisatomo Waga April 2021–March 2024
Title: Evaluation of phytoplankton bloom dynamics focused on sea-ice types
- [1] **Sasakawa Scientific Research Grant** JPY520,000 (≒USD4,800)
PI: Hisatomo Waga April 2015–March 2016
Title: Response of marine ecosystems on climate changes in the Pacific Arctic (*in Japanese*)

PEER-REVIEWED PUBLICATIONS

- [15] Futsuki, R., Hirawake, T., Fujiwara, A., **Waga, H.**, Kikuchi, T., Nishino, S., Isada, T., Suzuki, K., and Watanabe, Y. (2022). Algorithm for estimating primary production in the Pacific Arctic using absorbed radiation by phytoplankton. *Journal of Oceanography* 78, 311–335. doi:10.1007/s10872-022-00646-5
- [14] Park, J.-W., Kim, Y., Kim, K.-W., Fujiwara, A., **Waga, H.**, Kang, J.J., Lee, S.-H., Yang, E.-J., Hirawake, T., (2022). Contribution of small phytoplankton to primary production in the Northern Bering and Chukchi Seas. *Water* 14, 235. doi:10.3390/w14020235
- [13] **Waga, H.**, Eicken, H., Light, B., and Fukamachi, Y. (2022). A neural network-based method for satellite-based mapping of sediment-laden sea ice in the Arctic. *Remote Sensing of Environment* 270, 112861. doi:10.1016/j.rse.2021.112861
- [12] **Waga, H.**, Fujiwara, A., Hirawake, T., Suzuki, K., Yoshida, K., Abe, H., and Nomura, D. (2022). Primary productivity and phytoplankton community structure in surface waters of the western subarctic Pacific and the Bering Sea during summer with reference to bloom stages. *Progress in Oceanography* 201, 102738. doi:10.1016/j.pocean.2021.102738
- [11] **Waga, H.**, Eicken, H., Hirawake, T., and Fukamachi, Y. (2021). Variability in spring phytoplankton blooms associated with ice retreat timing in the Pacific Arctic from 2003–2019. *PLOS ONE* 16, e0261418. doi:10.1371/journal.pone.0261418
- [10] Hirawake, T., Oida, J., Yamashita, Y., **Waga, H.**, Abe, H., Nishioka, J., Nomura, D., Ueno, H., and Ooki, A. (2021). Water mass distribution in the northern Bering and southern Chukchi seas using light absorption of chromophoric dissolved organic matter. *Progress in Oceanography* 197, 102641. doi:10.1016/j.pocean.2021.102641
- [9] **Waga, H.**, Hirawake, T., and Nakaoka, M. (2021). Influences of size structure and post-bloom supply of phytoplankton on body size variations in a common Pacific Arctic bivalve (*Macoma calcaria*). *Polar Science* 27, 100554. doi:10.1016/j.polar.2020.100554
- [8] Hirawake, T., Uchida, 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. (2021). Response and biodiversity status of Arctic ecosystem under environmental change: Findings in the ArCS project. *Polar Science* 27, 100533. doi:10.1016/j.polar.2020.100533
- [7] Nishio, S., Sasaki, H., **Waga, H.**, and Yamamura, O. (2020). Effects of the timing of sea ice retreat on demersal fish assemblages in the northern Bering and Chukchi Seas. *Deep-Sea Research II* 181–182, 104910. doi:10.1016/j.dsr2.2020.104910
- [6] **Waga, H.**, and Hirawake, T. (2020). Changing occurrence of fall bloom and its impact on phytoplankton size structure in the Pacific Arctic. *Frontiers in Marine Science* 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 Biology* 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. *Geophysical Research Letters* 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. *Frontiers in Marine Science* 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 Research 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 Sensing* 9, 222. doi:10.3390/rs9030222

CONFERENCE PRESENTATIONS

- [31] **Waga, H.**, Satellite-based monitoring of phytoplankton phenology using a parametric modeling approach in the Northern Gulf of Alaska, ESSAS Annual Science Meeting, University of Washington, Seattle, USA, June 2022. (Poster)
- [30] Oida, J., Hirawake, T., Yamashita, Y., Abe, H., Nishioka, J., **Waga, H.**, Nomura, D., Kakehi, S., Detection of biologically productive water mass from ocean color satellite using chromophoric dissolved organic matter (CDOM), ESSAS Annual Science Meeting, University of Washington, Seattle, USA, June 2022. (Oral)
- [29] **Waga, H.**, Eicken, H., Light, B., Fukamachi, Y., A neural network-based method for satellite mapping of sediment-laden sea ice in the Arctic, International Circumpolar Remote Sensing Symposium, University of Alaska Fairbanks, Fairbanks, USA, May 2022. (Oral)
- [28] **Waga, H.**, Eicken, H., Light, B., Fukamachi, Y., A neural network-based method for satellite-based mapping of sediment-laden sea ice in the Arctic, Ocean Sciences Meeting, Online Meeting, February 2022. (Oral)
- [27] **Waga, H.**, Eicken, H., Hirawake, T., and Fukamachi, Y., A parametric modeling approach for satellite-based monitoring of phytoplankton bloom features in the Pacific Arctic, Alaska Marine Science Symposium, January 2022. (Oral)
- [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., Response of lower trophic organisms to recent environmental changes in the Arctic, Symposium on Polar Science, Online Meeting, December 2020. (Oral)
- [25] **Waga, H.**, and Hirawake, T., Evident fall phytoplankton blooms in the Pacific Arctic, International Symposium on Arctic Research, 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 Sciences 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, 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, 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, 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 Conference, 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, 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, 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 Conference, 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 at the Symposium on Polar Science, December 1, 2020.

CRUISE EXPERIENCE (294 total days to date)

- [15] PB22, R/V Ukpik, Prudhoe Bay, August 19–25, 2022 (7 days)
- [14] PB21, R/V Ukpik, Prudhoe Bay, August 12–15, 2021 (4 days)
- [13] Mu18, R/V Professor Multanovskiy, North Pacific and Bering Sea, 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, Bering, Chukchi, and Beaufort Seas, 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, Bering, Chukchi, and Beaufort Seas, 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, Bering, Chukchi, and Beaufort Seas, 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)

SYNERGISTIC ACTIVITIES

- [1] **Seminar Organizer:** Actively involved in organizing the International Joint Seminar on Arctic Sciences between the International Arctic Research Center at the University of Alaska Fairbanks and the Arctic Research Center at Hokkaido University (2021–present; five seminars to date).
- [2] **Grant and Journal Reviewer:** National Science Foundation (1); Journal of Geophysical Research Oceans (2); Remote Sensing (5); Deep-Sea Research II (1); Progress in Oceanography (2); Frontiers in Marine Science (2); Elementa (1); Land (1); ISPRS Journal of Photogrammetry and Remote Sensing (1); and Remote Sensing of Environment (2).
- [3] **Professional Societies:** The Oceanography Society (2015–present); American Geophysical Union (2018–present); The Oceanographic Society of Japan (2015–present); and Japan Geoscience Union (2020–present).
- [4] **Conference Presentations:** Presented and attended at national and international conferences, including Ocean Sciences Meeting (2018, 2020, 2022), Alaska Marine Science Symposium (2022), AGU Fall Meeting (2015), Symposium on Polar Science (2014, 2020), International Symposium on Arctic Research (2018, 2020, 2023), ESSAS Annual Science Meeting (2017, 2018, 2022), International Circumpolar Remote Sensing Symposium (2022), and JpGU Meeting (2017, 2018, 2019).
- [5] **Fieldworks:** Joined fieldworks 294 total days to date; Bering Sea (2013, 2016–2018); Chukchi Sea (2013, 2016–2017); Beaufort Sea (2013, 2016–2017); Alaska North Slope (2021–2022); and North Pacific (2012–2018).

