



## 1. EXECUTIVE SUMMARY

### BACKGROUND

Evidence from the many initial studies following the *Exxon Valdez* oil spill (EVOS) indicated the importance of long-term ecosystem-based studies to understand impact and assess recovery of injured resources (Peterson et al. 2003). Since then, there have been numerous planning efforts to develop a coordinated, long-term monitoring strategy for the oil spill affected area (Schoch et al. 2002, Dean and Bodkin 2006, Coletti et al. 2016). All of these plans recognize that monitoring programs in this region face constraints from insufficient funding to meet all needs, the logistics of sampling in remote areas, and the challenge of monitoring a system known to experience broad ecosystem changes on decadal and multi-decadal scales. The recent tragedy of the Deepwater Horizon oil spill in the Gulf of Mexico further highlights the need for robust long-term observations of marine resources and conditions.

The EVOS Trustee Council (EVOSTC) initiated funding for the Gulf Watch Alaska (GWA) Long-term Monitoring Program in 2012 (McCammon et al. 2011). The program has been a consortium of 15 field projects, ten of which started before 2012 and several with data sets extending prior to the EVOS. A wide array of information and tools have been coordinated and synthesized by the GWA program to date (published datasets for public access online; Annual Reports, 2012-15; Synthesis Report in 2015; principal investigator (PI) authored publications in peer-reviewed journals, etc.). The program has fostered partnerships that include: professional administrative support (Prince William Sound Science Center [PWSSC]); advanced data housing (Alaska Ocean Observing System); large-scale nearshore ecological monitoring under the National Park Service (NPS) Southwestern Alaska inventory program; oceanographic monitoring through the University of Alaska Fairbanks (UAF)/Kasitsna Bay Laboratory/National Estuarine Research Reserve System/ PWSSC partnerships; multi-agency and North Gulf Oceanic Society pelagic ecosystem monitoring; and finally, a significant outreach capacity through the agency partners. Student participation has provided for deeper investigations into marine bird abundances, forage fish sampling methods, oceanography and sea otter diets. Collectively, this group represents extensive expertise and knowledge of the Gulf of Alaska (GOA) ecosystem and spill-affected region. A monitoring program of this size requires a cohesive management team to provide leadership, administration, coordination, science integration, and communication at all levels.

### OVERALL GOALS & OBJECTIVES

The overarching goal of the GWA program is to provide sound scientific data and products to inform management agencies and the public of changes in the environment and the impacts of these changes on injured resources and services. Specifically, the goals are to:

- A. *Collect and analyze long-term ecological monitoring information from the Gulf of Alaska Exxon Valdez Oil Spill affected region;*
- B. *Make monitoring data publicly available for use by stakeholders, managers, and in integrated analyses;*  
*and*
- C. *Assess monitoring data holistically in order to better understand the range of factors affecting individual species and the ecosystem.*

The program coordination and science synthesis efforts support these goals by: documenting the overall scientific information from the monitoring program, improving information sharing between program PIs and with other EVOSTC programs (Herring Research and Monitoring [HRM], Data Management, Lingering Oil, and

Cross-program Publishing Groups). There are three primary objectives for continuing the GWA program's coordination and science synthesis project:

1. *Provide communication and data sharing* – this includes internal GWA program as well as external/outside GWA
2. *Provide and document integration of monitoring results* – this includes cross program standardization of data collection, GWA science synthesis products, and publications.
3. *Provide communication of monitoring information to trustee agencies, other resource managers and the public* – this includes recent findings, reports, publications, and news releases

During the first 6 months of the FY17 period, the program coordination and science synthesis project has accomplished the following (for a complete cited list see section 7 – Recent Publications and Products):

- The program management team (PMT; Mandy Lindeberg, Katrina Hoffman, Robert Suryan, and Donna Aderhold met in April to plan GWA oversight activities for FY17 and beyond.
- Completed the FY12-16 Program and Science Synthesis final reports.
- GWA PIs in collaboration with the data management team successfully published 45 datasets to the public through the Research Workspace to the Gulf of Alaska Data Portal and DataONE.
- Two quarterly teleconferences were held, during which the GWA PMT updated PIs on deadlines and deliverables, while program PIs and the HRM program lead provided updates on field work and findings.
- Preliminary plans were made for the fall GWA program PI meeting which will be held in Cordova during the week of November 13-17 in conjunction with the HRM program PI meeting.
- The first two issues of the Quarterly Currents Newsletter, with highlights of GWA activities, were sent to EVOSTC staff.
- The program coordinator managed peer review of final reports from FY12-16 GWA projects and submitted 18 of 19 final reports to EVOSTC by July 1. One final report just completed peer review.
- Led discussions for Cross Program Publication Group proposal between GWA and HRM.
- Began work with lead authors for the Gulf of Alaska Ecosystem Considerations Report for the North Pacific Fisheries management Council to include additional GWA long-term indicators for informing ecosystem-based fisheries management. GWA currently supports three times series indicators used in the report for 2017 and we expect to add additional indicators in 2018.
- Leveraged GWA resources and contacts to facilitate collection of data during a summer NOAA Gulf of Alaska research cruise (seabird observations in the GWA study area) and additional forage fish samples from PWS (to continue GWA forage fish condition index).
- Worked with PIs to begin developing possible program synthesis manuscripts that could contribute to the year three science synthesis efforts.
- GWA program coordinator serves as lead guest editor for the upcoming Gulf of Alaska Ecology special issue in the journal Deep Sea Research Part II. The lead guest editor worked with 5 guest editors (GWA and HRM PIs) and authors from the GWA and HRM programs to finalize manuscripts and make recommendations on publication to the journal editor by July 31. Papers accepted or recommended for acceptance are listed below:
  - Lindeberg et al., Persistent *Exxon Valdez* oil on beaches in Prince William Sound 26 years later
  - Nixon and Michel, Distribution and quantity of lingering subsurface oil from the *Exxon Valdez* oil spill

- Bowen et al., Gene transcription patterns in response to low level petroleum contaminants in *Mytilus trossulus* from field sites and harbors in southcentral Alaska
- Esler et al., Timelines and mechanisms of wildlife population recover following the *Exxon Valdez* oil spill
- Campbell, Hydrographic trends in Prince William Sound, Alaska: 1960-2016
- Batten et al., Interannual variability in lower trophic levels on the Alaskan shelf
- McKinstry and Campbell, Seasonal variation in zooplankton abundance and communities in Prince William Sound, Alaska, 2009-2016
- Konar and Iken, The use of unmanned aerial vehicle imagery in intertidal monitoring
- Bodkin et al., Variation in abundance of Pacific blue mussel (*Mytilus trossulus*) in the northern Gulf of Alaska, 2006-2015
- Lewandoski and Bishop, Distribution of juvenile Pacific herring in relation to environmental and geospatial factors in Prince William Sound, Alaska
- Bishop and Eiler, Migration patterns of post-spawning Pacific herring in a subarctic sound
- Gorman et al., Spatio-temporal variation in winter condition and stable carbon and nitrogen isotope signatures of juvenile herring (*Clupea pallasii*) in Prince William Sound, Alaska: teleconnections with the Gulf of Alaska
- Sewall et al., Empirically-based models of oceanographic and biological influences on Pacific herring recruitment in Prince William Sound
- Stocking et al., Using spatial models to predict piscivorous bird distributions in a subarctic sound during the nonbreeding season
- Cushing et al., Patterns of distribution, abundance, and change over time in a subarctic marine bird community
- Moran et al., Seasonal distribution of Dall's porpoise in Prince William Sound, Alaska
- Straley et al., Seasonal presence and potential influence of foraging humpback whales upon Pacific herring wintering in the Gulf of Alaska
- Moran et al., Regional variation in the intensity of humpback whale predation on Pacific herring in the Gulf of Alaska
- Olsen et al., Seasonal pod-specific variation in habitat use by resident killer whales in the Northern Gulf of Alaska

During FY18, key directions of program coordination and science synthesis will include improving efficiencies and facilitating program reporting requirements for PIs, identifying GWA indicators from each project to contribute to annual ecosystem status and oil spill recovery assessments, standardize reporting, identifying main cross-program science synthesis products for GWA, HRM, and other Gulf of Alaska investigations, and planning for 3-year science synthesis and workshop.

## 2. COORDINATION AND COLLABORATION

### **A. Within an EVOSTC-funded Program**

The program coordination and science synthesis project supports the GWA program's goals by coordinating information sharing between program PIs and other EVOSTC programs, most notably the HRM and Data Management programs.

## COORDINATION AND COLLABORATION WITHIN GWA

The following outlines how the GWA leadership personnel will continue to achieve coordination and collaboration activities within the GWA program:

*Program Lead* - will be responsible for overseeing coordination of individual program components, science synthesis and integration, and ensuring a coordinated monitoring program that meets project milestones and deliverables. These duties include:

- Oversight of project synthesis efforts and coordinate preparation of scientific reports/ papers for the EVOSTC and the public
- Coordinating efforts of the GWA program with the data management program, the HRM program, Lingering Oil program, external programs, and resource agencies.
- Working with Outreach Coordinator and PIs to support outreach efforts

*Science Coordinator* - will provide program technical writing, review, and science coordination, including:

- Author and lead production of program synthesis products and promote integration of GWA projects
- Lead cross program publication groups
- Lead development of ecosystem indicators from GWA datasets
- Review and collation of reports and work plans
- Integrate GWA data and platforms with external programs such as HRM and NOAA's Gulf Survey
- Editorial review, website development/ updates, and assistance with coordination of outreach events for each project
- Attendance and presentation of program information at scientific meetings will be encouraged if funding opportunities arise to facilitate coordination of ideas and information outside of the program

*Program Coordinator* - will facilitate meetings, reporting, outreach, sharing, and publication of information from the various monitoring projects. These activities will include:

- Planning and documenting all quarterly teleconferences and meetings
- Tracking and assisting with data and metadata publication in the GWA Data Portal
- Tracking progress towards deadlines and program products
- Assisting with maintenance and updates for program website for purposes of conveying important program goals and information to the group
- Participate on Outreach Steering Committee and assist with outreach events

*Administration and Outreach: PWSSC*- The Program Lead and Science and Program Coordinators will work closely with the Program Management II project and PWSSC staff to assist with overall administrative activities of the program, including developing reports and planning meetings and outreach events.

## COORDINATION AND COLLABORATION BETWEEN PROGRAMS

*With Herring Research and Monitoring Program*

The following outlines how the GWA leadership personnel will continue to achieve coordination and collaboration activities between the GWA and HRM programs:

- Data from GWA projects are provided to the HRM program for their use and analysis.
- The GWA team regularly engages the HRM program lead, Scott Pegau, by phone, email, and in person.
- The HRM program lead is included on all GWA PI general correspondence. Likewise, the GWA PMT is included in all HRM general correspondence.
- The HRM program lead is invited to all PI teleconferences and meetings and given an opportunity to hear GWA PI updates and provide HRM updates to PIs.
- The GWA and HRM programs will collaborate on the 3-year synthesis products.

#### *With Data Management Program*

The GWA and Data Management programs are fully integrated and dependent on each other. The Program Lead and Science and Program Coordinators will work closely with AOOS and Axiom data management staff to maintain data access tools, providing data and feedback in the Gulf of Alaska Data Portal, and metadata generation tools. The Science and Program Coordinators will continue to work with all project PIs within the program to ensure new data are loaded to the Gulf of Alaska Data Portal, have undergone QA/QC measures, and have appropriate metadata available for public access.

#### *With Cross-Program Publication Groups*

The Science Coordinator will continue to work with PIs from the GWA and HRM programs to identify, refine, and propose publication concepts for the Cross-program Publication Groups. If EVOSTC chooses to fund development of a cross-program publication, the Science Coordinator will facilitate work leading to manuscript submission to a peer-reviewed journal.

#### **B. *With Other EVOSTC-funded Projects***

The GWA program does not have specific goals or objectives to support EVOSTC-funded projects that are not part of a program. However, data, reports, and publications from GWA projects are available and the Science and Program Coordinators are available to work with EVOSTC-funded projects where appropriate and applicable.

Recent efforts included GWA program managers coordinating with field crews from the Pigeon Guillemot restoration study in the Naked Island Complex to collect additional forage fish samples to maintain pelagic component time series and share seabird diet data.

#### **C. *With Trustee or Management Agencies***

The GWA program integrates ecosystem monitoring activities with the National Oceanic and Atmospheric Administration (NOAA), US Fish and Wildlife Service (USFWS), US Geological Survey (USGS), Bureau of Ocean Energy Management (BOEM), and NPS. We also coordinate with Alaska Department of Fish and Game researchers and managers through coordination on synthesis activities with the HRM program. Recent efforts included GWA program managers making arrangements for a last minute staffing of a seabird/mammal observer on the first leg of NOAA's Gulf of Alaska Survey, which covers the majority of the GWA study area (Janet Duffy-Anderson, National Marine Fisheries Service (NMFS) Alaska Fisheries Science Center (AFSC) Resource Assessment and Conservation Engineering Division, Recruitment Processes Alliance - EcoFOCI program).

GWA is also working with NOAA to develop and include GWA time series as indicators in ecosystem assessments and reports to the North Pacific Fisheries Management Council (Stephani Zador, NMFS AFSC Resource Ecology and Fisheries Management (REFM) Division, Resource Ecology and Ecosystem Modeling Program). In addition, the GWA PMT is collaborating with the North Pacific Research Board (NPRB) GOA Integrated Ecosystem Research Program (GOAIERP) synthesis and planning efforts (Olav Ormseth and Jamal Moss NMFS AFSC REFM - Status of Stocks and Multispecies Assessment Program; ABL-Ecosystem Monitoring and Assessment program), including planning a GOA focused workshop at the 2018 Ocean Sciences Meeting.

The GWA PMT also met with NOAA Alaska Region Protected Resources Division (Kate Savage and Sadie Wright) this year to coordinate reporting and sampling of marine mammal carcasses during GWA field operations. This coordination resulted in GWA PIs helping NOAA's marine mammal stranding network locate and obtain samples from four humpback whale carcasses so far in FY17.

### **3. PROJECT DESIGN – PLAN FOR FY18**

#### **A. Objectives for FY18**

*Objective 1: Provide communication and data sharing*

Program Lead, Science, and Program Coordinators will:

- a. Coordinate with the Administrative and Outreach Lead and program PIs on overall GWA planning, meetings, reporting, and evaluation.
- b. Collaborate on ways to provide schedules, deadlines, and field work to interested parties (e.g., Google calendar, Google sites, public website, shared workspaces, etc.).
- c. Facilitate quarterly PI meetings (teleconferences and gathering locations).
- d. Ensure quality control and timeliness of transferring data to the data management program.
- e. Work to coordinate with the HRM program Lead on program implementation and joint information needs.
- f. Communicate with other EVOSTC funded programs (e.g., Lingering Oil, Cross-Program Publication Groups).
- g. Collaborate with groups outside the GWA program (e.g., NPRB GOAIERP, NPS, Geographic Information Network of Alaska, USFWS Landscape Conservation Cooperatives) on joint synthesis of information.

*Objective 2: Provide and document synthesis and integration of monitoring results across programs*

Program Lead, Science and Program Coordinators will:

- a. Prepare and compile required NOAA semi-annual reports with Administrative Lead as part of cooperative agreement.
- b. Compile annual and final reports on overall science monitoring effort, working with the Administration Lead, PIs, data management provider, and outreach team.
- c. Prepare and compile Annual Work Plans with PIs and respond to EVOSTC review.
- d. Assist PIs with data synthesis, small working groups and publications within the program.
- e. Prepare a monitoring data synthesis report for Year 3 (8 years of monitoring) and/or special issue consideration with PIs for joint workshop between GWA and HRM programs.

- f. Collaborate with Administrative Lead and HRM Lead to plan Year 3 joint workshop between GWA and HRM programs with EVOSTC staff.
- g. Coordinate with PIs to improve integration of multi-disciplinary monitoring activities within geographic regions (PWS, outer Kenai Peninsula coast, lower Cook Inlet) and of monitoring within single disciplines between different regions.
- h. Collaborate with other Trustee programs (HRM, Lingering Oil, and Cross-Program Publication Groups) and non-Trustee organizations to share resources, data and foster partnerships to enhance monitoring efforts and cross-pollinate scientific knowledge.

*Objective 3: Provide communication of monitoring information to Trustee agencies, other resource managers, and the public*

Program Lead, Science and Program Coordinators will:

- a. Communicate directly with EVOSTC staff and their Science Review Panel upon request on program activities and progress.
- b. Work with PMT, outreach team, and PIs to communicate program progress to EVOSTC and the public by continuing to develop current content online, new presentations and create outreach opportunities.
- c. Work with data management team, outreach team and PIs to develop data exploration tools to better communicate technical and scientific information to stakeholders and the public.
- d. Network with other monitoring programs and regional stakeholders to identify information needs that may be met by adopting new ways to communicate information.

#### **B. Changes to Project Design**

There are no changes to the PMT from the previous fiscal year. However, the restructuring of the PMT for this second 5-year period has received positive feedback. The primary change from the first 5-year is that the Science Coordinator is now a separate position within the PMT and, thereby, has the ability to focus on data collection, analyses, internal and external science coordination, and leading intra- and inter-program science syntheses.

## **4. SCHEDULE**

### **A. Project Milestones for FY18**

#### Objective 1. Provide communication and data sharing

This objective is ongoing throughout the year and includes coordinated planning between PIs of the individual monitoring projects, as well as with other agencies and research organizations. Areas of focus to continue or initiate in FY18 include:

- Archiving and publishing data, including projects recently added to GWA such as Middleton Island seabird studies.
- Use of individual working groups to evaluate data collection, data synthesis, ecosystem and injured species recovery indicators, and assess future needs (gap analysis) for GWA and EVOS recovery efforts.
- Standardize reporting to increase efficiency for PIs.



Objective 2. *Provide and document integration of monitoring results across programs*

This objective is ongoing throughout the year and includes working with project PIs, data management, HRM, and Lingering oil teams as well as other agencies and research organizations. Areas of focus to continue or initiate in FY18 include:

- Plan for 3-year synthesis workshop and products
- Select cross program publication group(s)

Objective 3. *Provide communication of monitoring information to trustee agencies, other resource managers, and the public*

This objective is ongoing throughout the year and includes activities related to data management, data synthesis, presentation and outreach, as well as other agencies and research organizations. Areas of focus to continue or initiate in FY18 include:

- Partner with NPRB and GOAIERP synthesis team to hold a GOA synthesis workshop
- Identify additional GWA ecosystem indicators to be used in the NOAA Ecosystems Considerations report to the North Pacific Fisheries Management Council (GWA currently contributes time series from 3 projects annually, with the goal of 1 indicator for each project by FY21).
- Contribute to making GWA web content more dynamic and provide press releases to highlight GWA findings.
- Review synergies with all trustee agencies and evaluate how partnerships can be strengthened (e.g., partnerships with NOAA are very strong, but less so for U.S. Forest Service).

**B. Measurable Project Tasks for FY18**  
**FY 2018 (Year 7)**

**FY 18, 1st quarter** (February 1, 2018 - April 31, 2018)

*February: Compile and edit Year 6 annual report for EVOSTC and semi-annual report for NOAA*  
**March 1:** *Submit Year 6 annual report for EVOSTC and semi-annual report for NOAA*  
*April: Plan and coordinate quarterly program teleconference*

**FY 18, 2nd quarter** (May 1, 2018-July 30, 2018)

*May: Complete updates to program website and outreach materials*  
*Prepare and disseminate work plan templates to group*  
*June-July: Coordinate review and response to comments from proposal*  
*Plan and coordinate quarterly program teleconference*

**FY 18, 3rd quarter** (August 1, 2018 – October 31, 2018)

*July-August: Compile and edit work plans for Year 8 and semi-annual report for NOAA*  
**August 23:** *Submit annual program work plans and help prepare NOAA semi-annual report*  
*September 30: Audit PI data compliance on workspace*  
*October: Plan annual PI meeting and workshops*  
*Review EVOSTC work plan comments*

**FY 18, 4th quarter** (November 1, 2018- January 31, 2019)

*November: Annual PI meeting and workshops*

*December-January: Preparation for and attendance at Alaska Marine Science Symposium  
Plan and coordinate quarterly program meeting/teleconference  
Begin compilation of Year 7 annual report*

## **5. PROJECT PERSONNEL – CHANGES AND UPDATES**

Our FY17-21 proposal did not identify the science or program coordinators, but did include CVs for qualified candidates for each position. We are pleased to announce that the qualified candidates for the positions are now working on the project. Ms. Donna Robertson Aderhold is the Program Coordinator and Dr. Robert M. Suryan is the Science Coordinator. Ms. Aderhold has over 25 years experience conducting biological studies in Alaska. Her experience includes designing and conducting research studies on waterfowl and evaluating the impacts of proposed projects on terrestrial and marine environments as part of regulatory requirements under the National Environmental Policy Act, Endangered Species Act, Marine Mammal Protection Act, and other federal laws. She has 2 years experience with GWA serving as science and program coordinator. Dr. Suryan has over 25 years experience conducting marine research in the North Pacific, including 5-years early in his career as co-PI within the EVOSTC-funded Alaska Predator Ecosystem Experiment. He studies ecosystem processes and their effect on foraging ecology, reproduction, and population dynamics of marine organisms and has authored or co-authored 50 peer-reviewed publications. He specializes in integrated ecosystem studies and developing programs to integrate and model predator response to changing prey availability and ocean climate. He is currently an Associate Professor – Senior Research at Oregon State University and will be transitioned to NOAA and full time GWA science coordinator by the beginning of FY18.

## **6. BUDGET**

### **A. Budget Forms (See GWA FY18 Budget Workbook)**

Please see project budget forms compiled for the program.

### **B. Changes from Original Proposal**

No changes are proposed for this FY.

### **C. Sources of Additional Funding**

NOAA Alaska Fisheries Science Center is providing 0.5 FTE for Mandy Lindeberg to serve as Program Lead and ~0.3 FTE for Robert Suryan as the Science Coordinator.

## **7. RECENT PUBLICATIONS AND PRODUCTS**

### *Publications*

- Holderied, K., and D. Aderhold. 2017. Science coordination and synthesis for the long-term monitoring program. *Exxon Valdez Oil Spill Restoration Project Final Report (Restoration Project 16120114-H)*, NOAA/NOS/NCCOS Kasitsna Bay Laboratory, Homer, Alaska.
- McCammon, M., K. Hoffman, K. Holderied, D. R. Aderhold, and T. H. Neher. 2017. Long-term monitoring of marine conditions and injured resources and services. *Exxon Valdez Oil Spill Restoration Project Final Report (Restoration Project 16120114)*, Alaska Ocean Observing System, Anchorage, Alaska.

### *Published Datasets*

- Arimitsu, M.L., J.F. Piatt, and B. Heflin, 2017, Gulf Watch Alaska Forage Fish Component: Fish morph data in Prince William Sound, Alaska 2012-2015. Exxon Valdez Oil Spill Trustee Council Long-Term Monitoring program, Gulf Watch Alaska. Research Workspace. <https://doi.org/10.5066/F74J0C9Z>.
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- Bishop, M. A., 2017, Fall and Winter Seabird Abundance Data, Prince William Sound, 2007-2016, Gulf Watch Alaska Pelagic Component. Exxon Valdez Oil Spill Trustee Council Long-Term Monitoring program, Gulf Watch Alaska. Research Workspace. <https://doi.org/10.24431/rw1k1w>.
- Campbell, R. W. 2017. Oceanographic Conditions in Prince William Sound, CTD, Chlorophyll-a, and Zooplankton Data: 2013-2016, Gulf Watch Alaska Environmental Drivers Component. Dataset. Exxon Valdez Oil Spill Trustee Council Long-Term Monitoring program, Gulf Watch Alaska. Research Workspace. <https://doi.org/10.24431/rw1k19>.
- Coletti, H. J. Bodkin, B. Ballachy, D. Monson, D. Esler, M. Lindeberg, T. Dean, B. Weitzman, K. Kloeker, G. Esslinger. 2017. Gulf Watch Alaska Nearshore Component: Black oystercatcher nest density and chick diets from Prince William Sound, Katmai National Park and Preserve, and Kenai Fjords National Park, 2006-2016 Data. Exxon Valdez Oil Spill Trustee Council Long-Term Monitoring program. Research Workspace. <http://dx.doi.org/10.5066/F7WH2N5Q>.
- Coletti, H. J. Bodkin, B. Ballachy, D. Monson, D. Esler, M. Lindeberg, T. Dean, B. Weitzman, K. Kloeker, G. Esslinger. 2017. Gulf Watch Alaska Nearshore Component: Monitoring Site Locations from Prince William Sound, Katmai National Park and Preserve, and Kenai Fjords National Park. Dataset. Exxon Valdez Oil Spill Trustee Council Long-Term Monitoring program. Research Workspace. <https://doi.org/10.5066/F78S4N3R>.
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