County: **Skagit County**
Grant No: **SEANWS-204-SkCoPW-0003**

PROJECT TITLE: **Northwest Straits Project: Skagit County MRC Operations and Projects**

TASK NUMBER: **8: Pinto Abalone Restoration**

DELIVERABLE: **8.5: Pinto Abalone Monitoring Plan, Protocols, and QAPP**

PERIOD COVERED: **Jan 1, 2015 – March 31, 2015**

DATE SUBMITTED: **April 16, 2015**

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Puget Sound
RESTORATION FUND

Pinto Abalone Seeding and Monitoring
Puget Sound Restoration Fund
Prepared for the Skagit County Marine Resources Committee
This project was funded in part by the Environmental Protection Agency through the Puget Sound Partnership and Northwest Straits Commission

April 14th, 2015

Pinto Abalone Monitoring Plan, Protocols & Abbreviated QAPP

Project Monitoring Plan

Pinto abalone are in serious decline. Since 2009, outplanting of genetically diverse hatchery reared juvenile abalone has been the primary restoration tool to combat this decline. In 2014, 1,500 juvenile pinto abalone were introduced at four locations around Burrows and Allan Islands in Skagit County as part of a collaborative restoration effort. This brought the total number of animals outplanted at restoration sites throughout Skagit and San Juan Counties to approximately 6,000 abalone. A critical component in the restoration effort around Burrows and Allan Islands is the post-outplant monitoring that will be used to evaluate the level of success and provide information for adaptive management. Skagit MRC will coordinate with the Puget Sound Restoration Fund (PSRF) to monitor growth, density, and survivorship of this most recent introduction. It will take an estimated four days of survey work including vessel charter, two PSRF divers and associated travel expenses, equipment and supplies and project oversight.

In addition, the four sites at Burrows and Allan Islands will receive additional outplanting of genetically diverse juvenile abalone seed from the conservation aquaculture hatchery during the late winter or early spring 2015. An additional outplant will continue to build a sustainable population here by increasing both the density and genetic diversity of abalone on the site. Outplanting will require an estimated two days of field work and include vessel charter, two PSRF divers and associated travel expenses, equipment and supplies and project oversight.

In 2013, PSRF divers initiated a field trial with 50 sub-adult abalone tagged with Passive Integrated Transponders that were introduced onto the Shannon Point Marine Center (SPMC) seawater intake reef system. PSRF divers will survey the 50 tagged abalone to collect data on long-term tag recovery and survival along with continued testing of several different underwater tag readers. These data will be provided to the Washington State Department of Fish and Wildlife and NOAA to build upon ongoing research and restoration efforts.

Project Monitoring Protocols

Restoration Site Surveys

During the late winter or early spring, 2015, PSRF divers will participate in dive surveys investigating survival, growth and emergence of hatchery reared pinto abalone introduced to restoration sites within the SJA, including the four sites established surrounding Burrows and Allan Islands in Skagit County. All restoration sites will be surveyed prior to additional 2015 outplant/overseeding activities. Each site will require one full day to complete the survey, including 3-4 hrs of dive time and sufficient surface intervals between dives. Each site is located using precise GPS coordinates to drop a weighted buoy next to the outplant plot. Survey set-up includes locating the four plot corners which are marked by permanent pitons and floating poly line, using detailed site maps that include corrected (MLLW) corner depths, distances and compass headings between corners along with described visual landmarks. A survey tape measure is extended around the plot to establish a perimeter, and weighted lead lines are installed to distinguish 2 meter survey lanes across the plot. Divers will meticulously conduct non-invasive (boulders are not moved or flipped over) surveys of each lane. Dive lights are used to investigate cracks, crevices and overhangs. Shell length and presence/absence of numbered tags are recorded on dive slates for all abalone observed.

Juvenile Abalone Outplant Protocols

A complete disease screening of the hatchery population is completed prior to conducting any abalone outplant work. Live juvenile abalone (n=60) representing multiple families are sampled from the Mukilteo hatchery and dissected for pathology. Histology slides are screened by a pathologist. Results to date have indicated no presence of pathogens or infectious disease at the restoration hatchery. After confirmation that hatchery stocks are free of known infectious pathogens, an annual shellfish transfer permit is obtained from Brady Blake, WDFW, for moving abalone from the Mukilteo facility into the field.

Outplant modules are constructed from PVC pipe (6” ID) cut into approximately 18” long sections. Tubes recovered from previous outplants are also reused. Each outplant tube is conditioned in flow-through tanks at the Mukilteo lab for several weeks prior to being loaded with animals. One day prior to seeding, abalone are transferred from their holding tanks into the PVC outplant tubes. Fiberglass window screen (2 mm mesh size) is secured with rubber bands to close the outplant modules. Approximately 35-50 abalone are loaded into each tube based on the total density for a particular site. All tubes were housed overnight in flow through tanks in the Mukilteo greenhouse.

The outplant tubes are transported from Mukilteo directly to Anacortes in a large fish tote filled with seawater in the back of a truck. To aerate the tote during transport, a 12V battery with a DC to AC inverter is used to power an aquarium pump with two large air stones placed in the tote. Fish totes are drained at the Skyline Marina and loaded onto the research vessel, driven into Burrows Channel and refilled with seawater and then transported out to the restoration locations. Once on site, tubes are carried to depth in bungee-corded bundles of three or four

by divers and placed within the delineated outplant plots in areas with suitable substrate and cryptic habitat onto which juvenile abalone will exit. Tubes are wedged amongst cobble and boulders to secure them against current and surge. Twenty four hours after the tubes are delivered to the sites, divers remove the mesh from the tubes and the abalone are free to move from the modules out onto the surrounding substrate. PVC outplant modules are removed from the sites approximately one month after the introduction.

Abbreviated QAPP Form

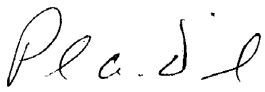
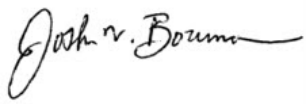
Title and Approval Page

Pinto Abalone Seeding and Monitoring

Puget Sound Restoration Fund

Washington State Department of Ecology Grant SEANWS-2014-SkCoPW-00003
Skagit County Contract Number C20140521

April 14th, 2015

Project Manager Signature	
Name/Date	Paul Dinnel, 4/14/2015
Project Manager Signature	
Name/Date	Josh Bouma, 4/14/2015

Project/Task Organization

Name	Project Title/Responsibility
Paul Dinnel, WWU/SPMC-retired	Project Manager, MRC Advisor
Josh Bouma, PSRF	Biologist, Field/Hatchery Project Manager
Betsy Peabody, PSRF	Executive Director, Project Oversight
Robert Sizemore, WDFW	WDFW Subtidal Shellfish Lead, Project Oversight
Michael Ulrich, WDFW	WDFW Shellfish Biologist, Field Oversight

Problem Definition/Background

The Pinto abalone (*Haliotis kamtschatkana*), a charismatic and ecologically important marine gastropod, is in severe decline in Washington state waters. Index stations managed by the Washington Department of Fish & Wildlife for monitoring population trends within the San Juan Archipelago have revealed a decline in abalone abundance greater than 90% at those sites

between 1992 and 2014. Five of the ten index sites have been extirpated since the surveys began. In response to petitions received in 2013 suggesting necessity for listing Pinto abalone as either Threatened or Endangered under the ESA, the National Marine Fisheries Service conducted a status review of Pinto abalone in 2014. While data here in Washington clearly indicate that densities are well below the minimum threshold for successful reproduction, NMFS determined that there is not enough information across the range of the species from Mexico to Alaska to warrant an uplisting for Pinto abalone at this time.

Recovery here in Washington State without human intervention appears unlikely. Puget Sound Restoration Fund leads a strong collaborative team of organizations, government agencies, universities and tribes pursuing recovery strategies for Pinto abalone. Since 2003, this restoration group has been investigating tools including conservation aquaculture and captive breeding, juvenile and larval outplanting, aggregation and other strategies. Hatchery methods for production of genetically diverse pinto abalone have been established and juvenile seeding has become a primary recovery tool since the first introduction of hatchery raised pinto abalone to rocky reef habitat in the San Juan Archipelago in 2009.

Data collected during the scope of this project will be used to inform the success of juvenile outplanting as a recovery tool and to guide next steps in restoration efforts here in Washington.

Project/Task Description

Since 2009, outplanting of genetically diverse hatchery reared juvenile abalone has been the primary restoration tool to combat this decline. In 2014, 1,500 juvenile pinto abalone were introduced at four locations around Burrows and Allan Islands in Skagit County as part of a collaborative restoration effort. This brought the total number of animals outplanted at restoration sites throughout Skagit and San Juan Counties to approximately 6,000 abalone. A critical component in the restoration effort around Burrows and Allan Islands is the post-outplant monitoring that will be used to evaluate the level of success and provide information for adaptive management. Skagit MRC will coordinate with the Puget Sound Restoration Fund (PSRF) to monitor growth, density, and survivorship of this most recent introduction.

In addition, the four sites at Burrows and Allan Islands will receive additional outplanting of genetically diverse juvenile abalone seed from the conservation aquaculture hatchery during the late winter or early spring 2015. An additional outplant will continue to build a sustainable population here by increasing both the density and genetic diversity of abalone on the site.

In 2013, PSRF divers initiated a field trial with 50 sub-adult abalone tagged with Passive Integrated Transponders that were introduced onto the Shannon Point Marine Center (SPMC) seawater intake reef system. PSRF divers will survey the 50 tagged abalone to collect data on long-term tag recovery and survival along with continued testing of several different underwater tag readers. These data will be provided to the Washington State Department of Fish and Wildlife and NOAA to build upon ongoing research and restoration efforts.

Data Collection & Management

Data collection for this project is focused on measuring survival, growth, movement, density and aggregation of hatchery reared juvenile abalone once introduced to recovery sites in the field. Quality control of the data collected begins with the divers who will be completing the surveys. All personnel involved in data collection will have significant past experience on this project and familiarity with juvenile abalone observation and data collection methods. The number of abalone observed, shell length measures using calipers, tag number/color identification, abalone mortalities recovered during surveys and any other observations noted are all recorded on dive slates during each dive. This data is transferred to data sheets on board the research vessel. Survey data is ultimately entered into a database. All juvenile abalone outplant data collected since this project was initiated in 2009 is co-managed by WDFW and PSRF. Abalone project biologists from both organizations are currently developing an Access database to be housed with WDFW that will provide better relational evaluation of the data. This includes analysis of mark/recapture data for repeated observations of tagged abalone over time. This also includes evaluation of changes in density over time at each restoration site and changes in mean shell lengths of abalone observed at each site as more animals mature and become emergent.