



State of Washington
DEPARTMENT OF FISH AND WILDLIFE

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March 1, 2024

The Honorable June Robinson
Chair, Senate Ways and Means
416 Sid Snyder Ave. SW
Post Office Box 40438
Olympia, WA 98504

The Honorable Timm Ormsby
Chair, House Appropriations
315 John L. O'Brien Building
Post Office Box 40600
Olympia, WA 98504

The Honorable Kevin Van De Wege
Chair, Senate Agriculture, Water
Natural Resources, and Parks
212 John A. Cherberg Building
Office Box 40424
Olympia, WA 98504

The Honorable Mike Chapman
Chair, House Agriculture and Natural Resources
132B Legislative Building
Post Office Box 40600
Olympia, WA

RE: European Green Crab Quarterly Progress Report – Winter 2023 (October 1 to December 31, 2023)

Dear Chairs Robinson, Ormsby, Van De Wege, and Chapman,

In 2021, the Washington Department of Fish and Wildlife (WDFW), tribal co-managers, and partners identified an exponential increase of invasive European green crabs (EGC), *Carcinus maenas*, in the Lummi Nation's Sea Pond within the Salish Sea, and in outer coastal areas including Makah Bay, Grays Harbor, and Willapa Bay.

On December 14, 2021, the WDFW Director submitted an emergency measures request under Revised Code of Washington (RCW) 77.135.090 for EGC response to Governor Jay Inslee. On Jan. 19, 2022, Governor Inslee issued an emergency proclamation (#22-02) to address the exponential increase in EGC populations across Washington's marine shorelines. The proclamation directed WDFW to eradicate, reduce, or contain EGC in Washington, and to increase coordination with partner agencies and Native American tribes.

The Washington State Legislature approved \$8,568,000 in emergency funding during the 2022 Supplemental Budget to facilitate increased EGC management efforts. In response to the legislative budget proviso directive, this report is the sixth in a series of ongoing quarterly progress reports (Q6). The Q6 report outlines the successes and challenges of ongoing EGC emergency response efforts in Washington state from October 1 to December 31, 2023.

Since January 1, 2022, approximately 646,576 EGC have been removed from Washington state marine waters, with 559,240 removed from the Coast Branch, and 87,336 removed from the Salish Sea Branch. During the Q6 period, the collective effort of all organizations resulted in approximately 127,679 EGC removed from Washington state marine waters, with 127,043 from the Coastal Branch and 636 from the Salish Sea Branch.

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In addition to active control trapping, Q6 trap deployment for early detection monitoring occurred in areas where EGC had not previously been detected. EGC has not been detected in the Salish Sea Branch south of northern Hood Canal.

WDFW, Washington Sea Grant, co-managers, tribes, and partners achieved significant progress in EGC management efforts. The EGC Research Task Force continues to coordinate with EGC researchers across the Pacific coast of North America to determine research priorities to support EGC management efforts in Washington state and throughout the region.

Additional progress was made on public education and community engagement to support EGC awareness, with WDFW representatives engaging approximately 1,700 individuals at public events and producing new outreach materials. While challenges remain, the continued efforts of all parties and the clear organizational structure will allow for continued success in 2024.

Per RCW 77.135.090, the WDFW Director continues to evaluate the effects of the European Green Crab emergency measures, finds that the emergency continues to persist and advises that all emergency measures should be continued.

If you have any questions about this report or the WDFW efforts to address this emergency, please contact Tom McBride, WDFW's Legislative Director, at (360) 480-1472.

Sincerely,

A handwritten signature in black ink, appearing to read "Justin Bush".

Justin Bush
WDFW European Green Crab Incident Commander

CC:

Kelly Susewind, Director, WDFW

Kelly Cunningham, WDFW Fish Program Director

Ruth Musgrave, Senior Policy Advisor to Governor Jay Inslee

European Green Crab Quarterly Progress Report – Winter 2023 (October 1 to December 31, 2023)

Washington Department of Fish and Wildlife (WDFW)



Washington
Department of
**FISH &
WILDLIFE**

March 1, 2024



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For more information, see <https://wdfw.wa.gov/accessibility/requests-accommodation>.



Executive Summary

In response to the ESSB 5693 (2022 c 297) legislative budget proviso directive, this report has been authored as the sixth in a series of ongoing quarterly progress reports (Q6). This report will serve to outline the successes and challenges of ongoing European green crab (EGC) emergency response efforts in Washington state from October 1 to December 31, 2023. In addition, this report will put the work during Q6 in the context of the previous work completed (Q1-Q5).

The previous quarterly progress reports are available at: <https://wdfw.wa.gov/publications> and on WDFW's European green crab [webpage](#).

In 2021, the Washington Department of Fish and Wildlife (WDFW), co-managers, tribes, and partners identified an exponential increase of invasive European green crab, *Carcinus maenas*, in the Lummi Nation's Sea Pond within the Salish Sea, and in outer coastal areas including Grays Harbor, Makah Bay, and Willapa Bay. On Dec. 14, 2021, WDFW Director Susewind submitted an emergency measures request under RCW 77.135.090 for EGC response to Governor Jay Inslee. On Jan. 19, 2022, Governor Jay Inslee issued an emergency proclamation (#22-02) to address the exponential increase in EGC populations across Washington's marine shorelines. The proclamation directed WDFW to eradicate, reduce, or contain EGC in Washington. The Washington State Legislature approved \$8,568,000 in emergency funding during the 2022 Supplemental Budget to facilitate increased EGC management efforts. In response to the legislative budget proviso directive, this report is the sixth in a series of ongoing quarterly progress reports (Q6). The Q6 report will outline the successes and challenges of ongoing EGC emergency response efforts in Washington state from October 1 to December 31, 2023.

An Incident Command System (ICS) was established to deal with the complexities of the EGC management effort. Support for and coordination with co-managers, tribes, and partners is essential, as the scale of the EGC emergency is such that no one entity could ever hope to implement successful statewide management strategies alone. Washington Sea Grant (WSG), the Lummi Nation, the Makah Tribe, the Shoalwater Bay Tribe, shellfish growers and various other entities have continued their ongoing efforts managing EGC populations, closely coordinating with WDFW. The ICS also resulted in the creation and distribution of various updates including reports to the governor every 10 days and Situation Reports (SitReps) based on monthly operational periods to provide information on and ensure transparency regarding management actions taken, grant funding allocations, EGC catch numbers, trapping efforts, media outreach, and other relevant information. These Situation Reports were synthesized for the public, media, and other external audiences in bi-monthly [EGC Public Updates published](#) and distributed through WDFW's EGC Management Updates email list as well as Department webpages, communications, and social media channels.

Representatives from many entities participating in EGC management have joined the ICS Multi-Agency Coordination (MAC) Group. The MAC Group provides a forum for these representatives to share information, establish a common operating picture, develop long-term priorities for the EGC emergency, and commit and allocate funding and other resources to enhance emergency measures responses.



Trapping activities in Q6 declined in response to the onset of colder weather and the end of the peak trapping season. However, many co-managers, tribes, and partners (CMTP) maintained substantial boat-based trapping efforts due to the surprisingly high catch levels from trapping in deeper water during the limited cold weather in 2022.

During the Q6 period, the collective effort of all organizations resulted in approximately 127,679 EGC removed from Washington state marine waters, with 127,043 from the Coastal Branch and 636 from the Salish Sea Branch. Since January 1, 2022, approximately 646,576 EGC have been removed from Washington state marine waters, with 559,240 removed from the Coast Branch, and 87,336 removed from the Salish Sea Branch. In addition to active control trapping, Q6 trap deployment for early detection monitoring occurred in areas where EGC had not previously been detected. EGC has not been detected in the Salish Sea Branch south of the northern Hood Canal. Data on EGC abundance, body size, sex ratios, and reproductive status were collected for future analysis, along with DNA and RNA samples to assess connectivity between EGC populations.

WDFW, WSG, co-managers, tribes, and partners achieved significant progress in EGC management efforts. The EGC Research Task Force continues to coordinate with EGC researchers across the Pacific coast of North America to determine research priorities to support EGC management efforts in Washington state and throughout the region. Additional progress was also made on public education and community engagement to support EGC awareness, with WDFW representatives engaging approximately 1,700 individuals at public events and producing new outreach materials. While challenges remain (e.g., planning for the 2024 Managers Symposium, creation of a 6-year statewide management plan), the continued efforts of all parties and the clear organizational structure set previously will allow for continued success for 2024.

Background

European green crab

The European green crab (EGC), *Carcinus maenas*, is a globally damaging invasive species that poses a threat to the ecological, economic, and cultural resources of Washington state. Native to Western Europe and Northwestern Africa, this hardy and voracious predator has since expanded its range throughout the globe (Carlton and Cohen 2003). Green crabs exploit a variety of different habitat types within intertidal and subtidal zones. Along the Pacific Coast of North America, EGC inhabit protected shorelines in unstructured sandy and muddy bottoms, estuaries, saltmarshes and seagrass beds, as well as utilizing woody debris and rocky substrates (Kern et al. 2002). EGC have wide tolerances for salinity (1.4-54 ppt) and temperature (0-35 °C) and can even survive air exposure for several days (Leignel et al. 2014).

In areas where EGC has been able to establish large populations for extended periods of time, they have the potential to negatively impact other species, particularly smaller crabs and bivalves (Jamieson et al. 1998, McDonald et al. 2001). It is estimated that damages to commercial shellfisheries from EGC predation average \$22.6 million per year on the East Coast of the United States (Lovell et al. 2007). Similar losses from EGC predation are possible for Salish Sea shellfish fisheries (Mach and Chan 2013) and Pacific Coast fisheries are also at risk. Predation on oysters by EGC could negatively impact oyster fisheries, as adult EGC can prey upon young oysters (Dare et al. 1983, Poirier et al. 2017) and have been observed cracking and consuming adult oysters in



laboratory settings (Forster, personal communication). Lab work has shown that juvenile EGC outcompeted similar-sized Dungeness crabs for food and shelter and juvenile Dungeness may serve as prey for larger EGC, resulting in potential impacts to wild Dungeness populations. Predation by EGC has led to declines in native bivalve and crab populations in invaded habitats (Grosholz et al. 2000). In addition, burrowing by EGC can have significant negative impacts on eelgrass, estuary, and marsh habitats (Malyshev and Quijón 2011, Matheson et al. 2016, Howard et al. 2019).

Given their history as a prolific invasive species, EGC is classified as a Prohibited Level 1 Invasive Species in Washington (WAC 220-640-030; Appendix A), meaning they may not be possessed, introduced on or into a water body or property, or trafficked (transported, bought, or sold), without department authorization, a permit, or as otherwise provided by rule (RCW 77.135.040; Appendix A). WDFW is currently not asking the public to kill suspected EGC, which may sound counterintuitive but is intended to protect native crabs from cases of mistaken identity (native crabs continue to be commonly misreported as EGC by the public; Flannery, personal communication). EGC is most accurately identified by the 5 large spines, also called marginal teeth, on either side of their forward carapace, a unique pattern for crabs on the Pacific Coast of North America (Figure 1). Despite their name, coloration of green crabs varies from bright green to dark orange, thus color is not a reliable feature to use when distinguishing EGC from native crab species.



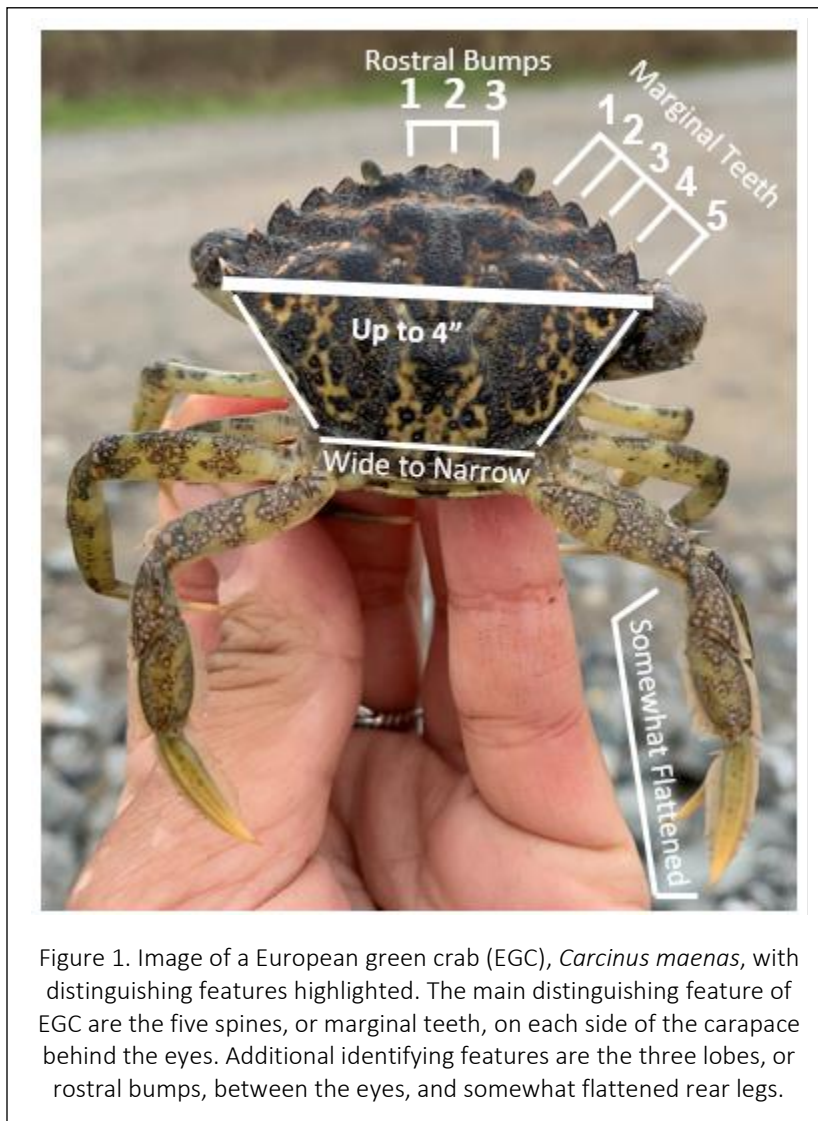


Figure 1. Image of a European green crab (EGC), *Carcinus maenas*, with distinguishing features highlighted. The main distinguishing feature of EGC are the five spines, or marginal teeth, on each side of the carapace behind the eyes. Additional identifying features are the three lobes, or rostral bumps, between the eyes, and somewhat flattened rear legs.

History of the European green crab in Washington state

The first detection of EGC in the waters of Washington was in 1998 in Willapa Bay and Grays Harbor ([Carlton and Cohen 2003](#)); Table 1; Figure 2). Initial emergency management responses took place but ended after a few years due to a lack of evidence of self-recruitment and fewer EGCs being captured. In 2015, the Washington Department of Fish and Wildlife (WDFW) learned that a population of EGCs was discovered in 2012 in Sooke Basin, British Columbia, Canada (Gillespie et al. 2015). In response over concerns of new EGC introductions within the Washington portion of the Salish Sea, WDFW designated Washington Sea Grant (WSG) to lead an early detection monthly monitoring community science network, also known as the Crab Team. This also marked the beginning of increased communication and collaboration with the Department of Fisheries and Oceans Canada (DFO) to explore transboundary EGC management in the Salish Sea. The first detections of EGC in the Washington region of the Salish Sea occurred in 2016 at Westcott Bay on San Juan Island by the WSG Crab Team and in Padilla Bay by staff at the Padilla Bay National Estuary Research Reserve (Grason et al. 2018). There were additional detections of EGC in 2017 in



Makah Bay by the Makah Tribe and in Dungeness Spit within the Dungeness National Wildlife Refuge, which is managed by the US Fish and Wildlife Service. Since 2018, there have been increasing numbers of EGC detections in the Salish Sea and Pacific coastal regions of Washington. In response to continued EGC presence in the Salish Sea, the Salish Sea Transboundary Action Plan for Invasive European Green Crab was created and signed by representatives of WDFW, WSG, the Puget Sound Partnership, and the DFO in 2019 (Drinkwin et al. 2018).

Table 1 Yearly European green crab captures in Washington from 1998-2022. Data is divided by EGC captured in the Washington State portion of the Salish Sea and EGC captured along the Pacific Coast. Please note that these data only represent crabs captured, not the effort employed. Catch effort (number of traps deployed, number of locations trapped, frequency of trap recovery) varies greatly across years and location.

Year	Salish Sea	Pacific Coast	Total
1998	0	364	364
1999	0	507	507
2000	0	235	235
2001	0	142	142
2002	0	167	167
2003	0	24	24
2004	0	4	4
2005	0	115	115
2006 - 2014	0	68	68
2015	0	8	8
2016	5	19	24
2017	101	64	165
2018	77	1,115	1,192
2019	177	1,766	1,943
2020	2,858	3,971	6,829
2021	86,340	16,825	103,165
2022	81,006	204,274	285,280

Emergency proclamation and supplemental funding

In 2021, WDFW, co-managers, tribes, and partners identified an exponential increase of invasive EGC in the Lummi Nation’s Sea Pond within the Salish Sea, and in coastal areas including Makah Bay, Grays Harbor, and Willapa Bay. It was concluded that this continuing increase in EGC distribution and abundance posed an imminent threat to Washington’s economic, environmental, and cultural resources. While \$2.3 million was appropriated by the State Legislature for EGC management in the 2021-23 biennium, it was determined to be insufficient to control these exploding populations.

On Dec. 14, 2021, Director Susewind submitted an emergency measures request under RCW 77.135.090 (Appendix A) for EGC response to Governor Jay Inslee. While emergency funding was not immediately available, on Jan. 19, 2022, Gov. Inslee issued an emergency proclamation (#22-02) to address the exponential increase in the EGC population within the Lummi Nation’s Sea Pond



and Pacific coastal areas. The proclamation directs WDFW to implement emergency measures as necessary to affect the eradication of or to prevent the permanent establishment and expansion of EGC in Washington. In addition, the Governor urged the Legislature to provide additional emergency funding as requested by the WDFW as soon as possible.

Working with the Governor's office, the Office of Financial Management, co-managers and tribes including the Lummi Nation, Makah Tribe, and others, along with Washington Sea Grant (WSG), WDFW requested \$8,568,000 from the State Legislature during the 2022 supplemental session to control increasing EGC populations. The Legislature fully-funded this request in the 2022 Supplemental Budget, which was signed by Governor Inslee on March 31, 2022.

In April 2023, the State Legislature and governor designated \$6,082,000 to be appropriated annually for green crab management in the 2023-25 Operating Budget. This amounts to a total of approximately \$13 million for the 2023-25 Biennial Budget. Previously, the Legislature had provided \$2.3 million per biennium ongoing for EGC control in 2021, but this amount was deemed insufficient to match the scale of this growing threat.

Governor Proclamation 22-02 Directives

The following text, taken from "Emergency Proclamation by the Governor 22-02 Green Crab Infestation", outlines the primary directives to WDFW and other state agencies by Governor Jay Inslee regarding EGC management:

"NOW THEREFORE, I, Jay Inslee, Governor of the state of Washington, by virtue of the authority vested in me under RCW 43.06.010(14), as a result of the above-noted situation, and in accordance with RCW 77.135.090, do hereby order the Department of Fish and Wildlife to begin implementation of emergency measures as necessary to effect the eradication of or to prevent the permanent establishment and expansion of European green crab.

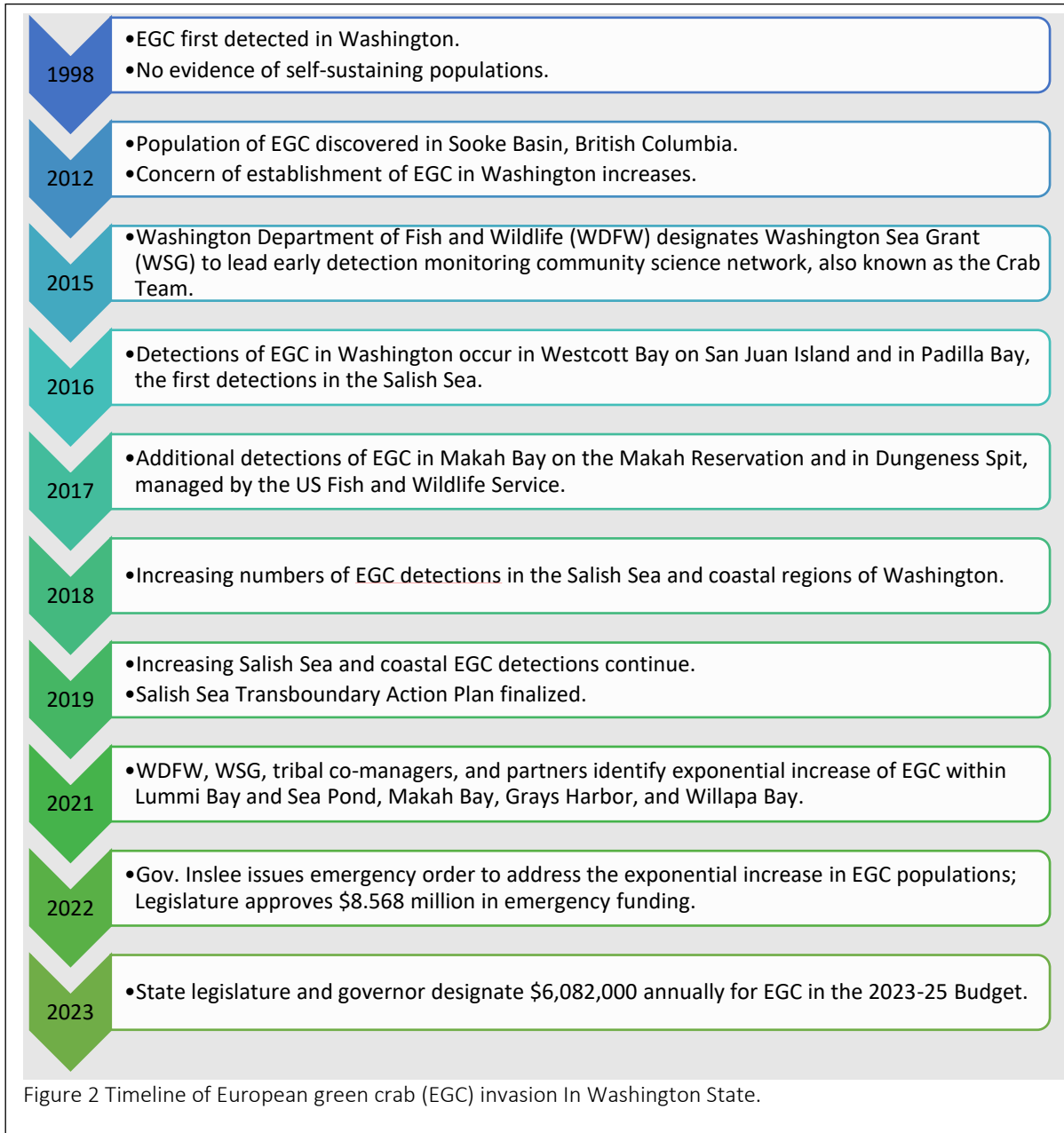
FURTHERMORE, I direct the Department of Ecology, and I ask the Department of Natural Resources and the State Parks and Recreation Commission to identify European green crab management as a high priority on their respective state-owned aquatic lands and to facilitate implementing the emergency measures described herein."

Legislative Proviso

The following text, taken from "ESSB 5693 - Making 2021-2023 fiscal biennium supplemental operating appropriations", Section 308 (Page 552, Line 16) - outlines the primary directives to WDFW by the Washington State Legislature regarding EGC management:

"Implement eradication and control measures on European green crabs through coordination and grants with partner organizations. Provide quarterly progress reports on the success and challenges of the measures to the appropriate committees of the legislature."





Successes of European green crab management measures

The following is an overview of the major successes related to European green crab (EGC) management actions for the sixth quarter of the emergency, from Oct. 1 to Dec. 31, 2023 (Q6). The success of Q1-Q5 (March 1, 2022 – Sep. 30, 2023) may also be discussed and included for context. A complete list of EGC management actions of Q6 can be found in [Appendix A](#) of this report.

Incident Command System implementation

The Washington State Emergency Management Division assigned mission #22-1085 on April 18, 2022, for the EGC emergency response. After meeting with other state and federal agencies, the Washington Department of Fish and Wildlife (WDFW) Director Kelly Susewind formally implemented an Incident Command System (ICS) on May 5, 2022, in delegating authority to WDFW's Aquatic Invasive Species (AIS) Policy Coordinator to serve as Incident Commander (Figure 3). This approach provides a clear command structure, as well as standardizing communications and management action implementation across the state. In addition, ICS provides support to federal and tribal participants across the state while they retain their autonomy in EGC management decisions and actions. During Q6, successes of the EGC ICS have included:

- Ensuring that ongoing management actions are guided by the five Incident Objectives developed in Q1:
 - A. Facilitate WDFW implementing Governor's Emergency Proclamation for statewide emergency measures with respect for tribal sovereignty and federal jurisdictions.
 - B. Health and safety of all participants.
 - C. Reduce or contain EGC populations below levels that result in environmental, economic, and cultural resource harm.
 - D. Collaborative and transparent emergency management.
 - E. Post-emergency transition to long-term EGC management by local co-managers, tribes, and partners with WDFW oversight.
- Meetings with co-managers and tribal entities to discuss ICS structure and solicit recommendations on how co-managers and tribes would like to engage on policy and technical levels.
- Regular reports to the governor every 10 days per RCW 77.135.090 on the effects of emergency measures and advising the governor if all or some emergency measures should be discontinued.
- Creation of ICS Situation Reports (SitReps) based on a monthly operational period summarizing the status of Washington state EGC emergency measures including actions taken, funding allocations, EGC catch numbers, trapping efforts, and other relevant information for dissemination among EGC emergency measure co-managers, tribes, and partners.
- Creation of bi-monthly (e.g., January/February) EGC Public Updates that included information about Washington state EGC Emergency measures, highlighting the efforts of



co-managers, tribes, and partners, and sharing stories from the field for dissemination to the public and media.

- Continued WDFW internal policy coordination meetings.

An important aspect of the EGC ICS structure is the Multi-Agency Coordination (MAC) Group. The MAC Group consists of representatives from various co-managers, tribes, and partners, including state and federal agencies, and shellfish growers (Table 2). The MAC Group provides a forum for these representatives to share information, establish a common operating picture, and recommend common long-term priorities for the EGC emergency. In addition, the group is tasked with making recommendations to WDFW for emergency funding and may commit and allocate additional or in-kind funding and other resources to enhance emergency measures response. Since its formation on June 8, 2022, the MAC Group has convened thirty-one times (twice in Q6). During Q6, EGC MAC Group successes have included:

- Completion of RCO EGC Emergency Measures Fund contracts, which includes:
 - \$91,316 U.S. National Oceanographic and Atmospheric Administration
 - \$402,220 State of Washington Department of Natural Resources
 - \$99,312 Pacific County Vegetation Management
 - \$75,154 State of Washington Department of Ecology
 - \$30,000 Grays Harbor Conservation District
 - \$90,000 Pacific Conservation District
 - \$70,517 Washington State University (WSU)/Washington Sea Grant (WSG)
 - \$100,000 Lummi Indian Business Council
 - See previous EGC Legislative Reports for more details.
- Reviewing updates from previously approved RCO EGC Emergency Measures Fund requests, which includes:
 - \$32,897 US Fish & Wildlife Service (FWS) Dungeness National Wildlife Refuge (NWR)
 - Final Report Due 2/1/2024.
 - \$110,240 US FWS Willapa National Wildlife Refuge
 - This agreement was paid in advance per federal requirements, there is no funding remaining. Work is track. A no-cost extension has been approved to 6/30/2024, to leverage additional funds.
 - Final Report Due 6/30/2024
 - See previous EGC Legislative Reports for more details.



Table 2 List of European green crab (EGC) Multi-Agency Coordination (MAC) Group member organizations. Representatives of these organizations share information, establish a common operating picture, and develop common long-term priorities for the EGC emergency.

Multi-Agency Coordination group member organizations	
Pacific Coast Shellfish Growers Association	Washington Emergency Management Division
Lummi Nation Business Council	Washington Sea Grant
Puget Sound Partnership	Washington State Department of Agriculture
Shoalwater Bay Tribe	Washington State Department of Fish and Wildlife
U.S. Bureau of Indian Affairs	Washington State Department of Natural Resources
U.S. Environmental Protection Agency	Washington State Parks and Recreation Commission
U.S. Fish and Wildlife Service	Washington State Recreation and Conservation Office
U.S. Geological Survey	Washington State University Extension
U.S. National Oceanographic and Atmospheric Administration	Willapa-Grays Harbor Oyster Growers' Association
Washington Department of Ecology	

Coordination with co-managers, tribes, and partners

Perhaps the greatest success of EGC management in Washington are the efforts, both independent and collaborative, of the many co-managers, tribes, and partners within the state (Table 3). The scope of the EGC emergency is such that no one organization can hope to curtail it alone. For years, co-managers, tribes, and partners such as WSG, shellfish growers, and local, state, and federal agencies have worked with WDFW to implement short- and long-term management actions to support statewide efforts in EGC management. The contributions of all entities involved in EGC control cannot be overvalued. While this report does not go into specifics of the contributions of each group, MAC Group member organizations were invited to submit addendums to outline their specific actions and successes in their own words. It should be noted that due to unforeseen circumstances, Addendums submitted to WDFW before publication are included in this document in [Appendix B](#).

The Washington Sea Grant Crab Team staff hosted the 3rd annual Trappers' Summit on December 7, 2023, bringing together all groups trapping green crab across Washington. The goal of the meeting was to build community, co-develop a picture of 2023 green crab status and trends, and facilitate dialogue around best practices. Over 50 trappers, including WDFW representatives, attended to present their work and engage with others to learn more about trapping results from within their regions to across the state. Participants spent the first half of the summit in poster sessions focused on data sharing from all trapping groups and engaged in discussions around 2023 patterns, successes, and challenges for the second half. These large-scale gatherings of CMPT's to discuss ongoing activities are invaluable for the continued success of statewide collaboration.



Since EGC extend beyond jurisdictional boundaries, management responses require action, collaboration, and coordination between various groups. It is important to note that EGC management is very complex with multiple jurisdictions, varying management priorities, different management types, complex operations, and different resource capacities. Additionally, each organization can have differing goals for sensitive habitats, species protections and aquaculture operation protections. SitReps were disseminated monthly based on ICS operational periods to support meeting the collaboration and transparent emergency management objective. These SitReps included information on management actions taken, grant funding allocations, EGC catch numbers, trapping efforts, media outreach and other relevant information. The first SitRep was disseminated on June 16, 2022, and twenty-nine have been completed as of the end of Q6.

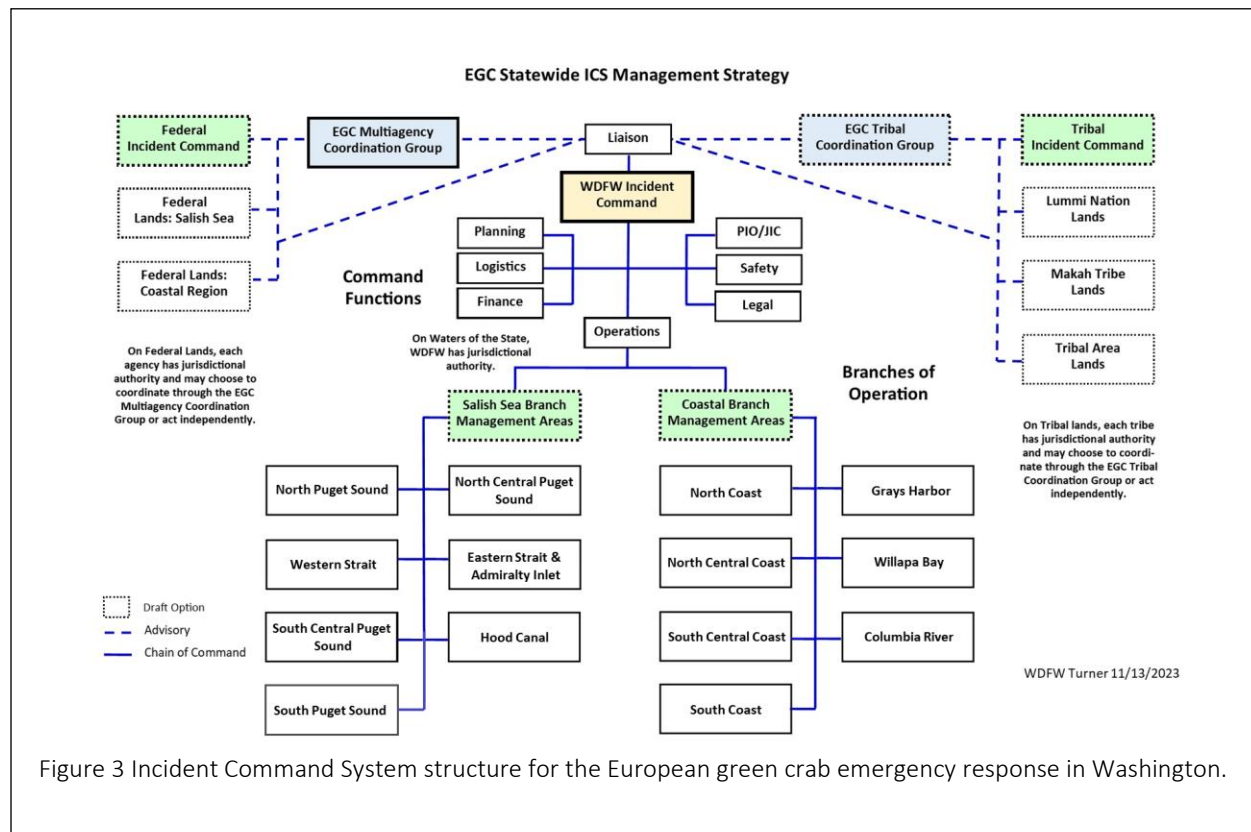


Figure 3 Incident Command System structure for the European green crab emergency response in Washington.



Table 3 List of co-managers, tribes, and partner organizations working with WDFW on control and management efforts of the European green crab in Washington. Participants implement short- and long-term management actions to support statewide efforts in EGC control, including independent and WDFW collaborative trapping, outreach and education, field support, and monitoring. These actions are an essential component of the EGC management in Washington.

European green crab management co-managers, tribes, and partner organizations	
Bay Center Farms	Quinault Indian Nation
Brady's Oysters	Samish Indian Nation
Chuckanut Shellfish	Shoalwater Bay Tribe
Drayton Harbor Oyster Co.	Stillaguamish Tribe of Indians
Elkhorn Oyster Co.	Stillwaters Environmental Center
Goose Point Oysters	Suquamish Tribe
Grays Harbor National Wildlife Refuge	Swinomish Indian Tribal Community
Jamestown S'Klallam Tribe	Taylor Shellfish Farms
Lower Elwha Klallam Tribe	Twin Harbors Waterkeeper Alliance
Lummi Nation	United States Fish and Wildlife Service
Makah Tribe	United States Navy
Northwest Straits Commission	Veterans Corps
Pacific County Vegetation Management	Washington Sea Grant
Pacific Seafoods	Washington State Department of Natural Resources
Padilla Bay National Estuarine Research Reserve	Washington State DNR Puget Sound Corps
Pacific States Marine Fisheries Commission	Washington Conservation Corps
Penn Cove Shellfish	Willapa Bay National Wildlife Refuge
Port Gamble S'Klallam Tribe	Willapa-Grays Harbor Oyster Growers' Association
Quileute Tribe	

Budget allocation

The \$626,789 in funds provided for this report period allowed for the continuation of our management efforts.

- Staff (Salaries + Benefits): \$137,771
 - Funds spent on staff. At the end of Q6, the current active EGC staff to the European Green Crab Project includes a Lead Biologist 4, a Field Ops Biologist 3, two Regional Biologist 2s, a Research Scientist 1, a portion of a Communications Consultant 5's time (~15%) for efforts as Public Information Officer, and 2 Scientific Technician 2s (2 permanent).



- Contractual Services: \$365,000
 - Funds spent on pass through contracts for various co-managers, tribes, and partners including WSG, Lummi Nation, Makah Tribe, and funding awarded through the WDFW Coastal EGC Local Management Grant and the RCO EGC Emergency Measures Grant programs.
- Equipment: \$382
 - Funds spent on high value equipment.
- Goods & Services: \$16,814
 - Funds spent on general field supplies and gear such as bait and traps.
- Travel: \$5,822
 - Funds spent on motor pool vehicles, per diem and lodging. Aside from trapping efforts, travel funds allowed staff to present at and attend conferences and perform outreach for various stakeholder groups.
- Agency Indirect: \$101,000
 - Funds spent on agency-wide, general administration costs.

European green crab monitoring and removal

The state is divided into Coastal and Salish Sea Branches to facilitate effective EGC ICS communications and management (Figure 4). These branches are then further divided into fourteen Management Areas (MA) based on WDFW recreational fishing marine areas, with MA's further divided into Coordination Areas.

Trapping efforts across the state were undertaken by WDFW, WSG, co-managers, tribes, and partners. The catch numbers presented for Q6 represent the collective effort of all organizations, and those efforts must be recognized. During Q6, trap deployment across all MA's were reduced due to decreasing temperatures and the start of winter. Traditionally, trapping was not advised during colder weather due to decreased EGC activity and heightened safety concerns. However, in recent years trappers in WA have found that EGC captures remain high in deeper water facilitated by boat-based trap deployment. Some CMTP now maintain their trapping efforts in winter months, though the general trend is a decline in trapping activity.

In total, 127,679 EGC were removed in Q6 from Washington state waters, with 127,043 removed from the Coastal Branch and 636 removed from the Salish Sea Branch (Table 4). In the Coastal Branch, the majority of EGC were removed from the following MA's: Willapa Bay (100,589), followed by Grays Harbor (25,476) and North Coast (978). In the Salish Sea Branch, most EGC were removed from the North Puget Sound MA (555), with fewer crabs collected in the Eastern Strait and Admiralty Inlet (44), Hood Canal (19), and Western Strait (18) MA's. No trapping occurred in the Columbia River, North Central Coast, North Central Puget Sound, South Central Coast, South Central Puget Sound, South Coast, and South Puget Sound Management Areas. To date, EGC have not been detected in the Salish Sea Branch south of northern Hood Canal Management Area, though early-detection monitoring continues across the southerly MA's. Data on EGC abundance, body size, sex ratios, and reproductive status were collected for future analysis, along with DNA and RNA samples to assess connectivity between EGC populations. Removed EGC were euthanized following humane best practices.



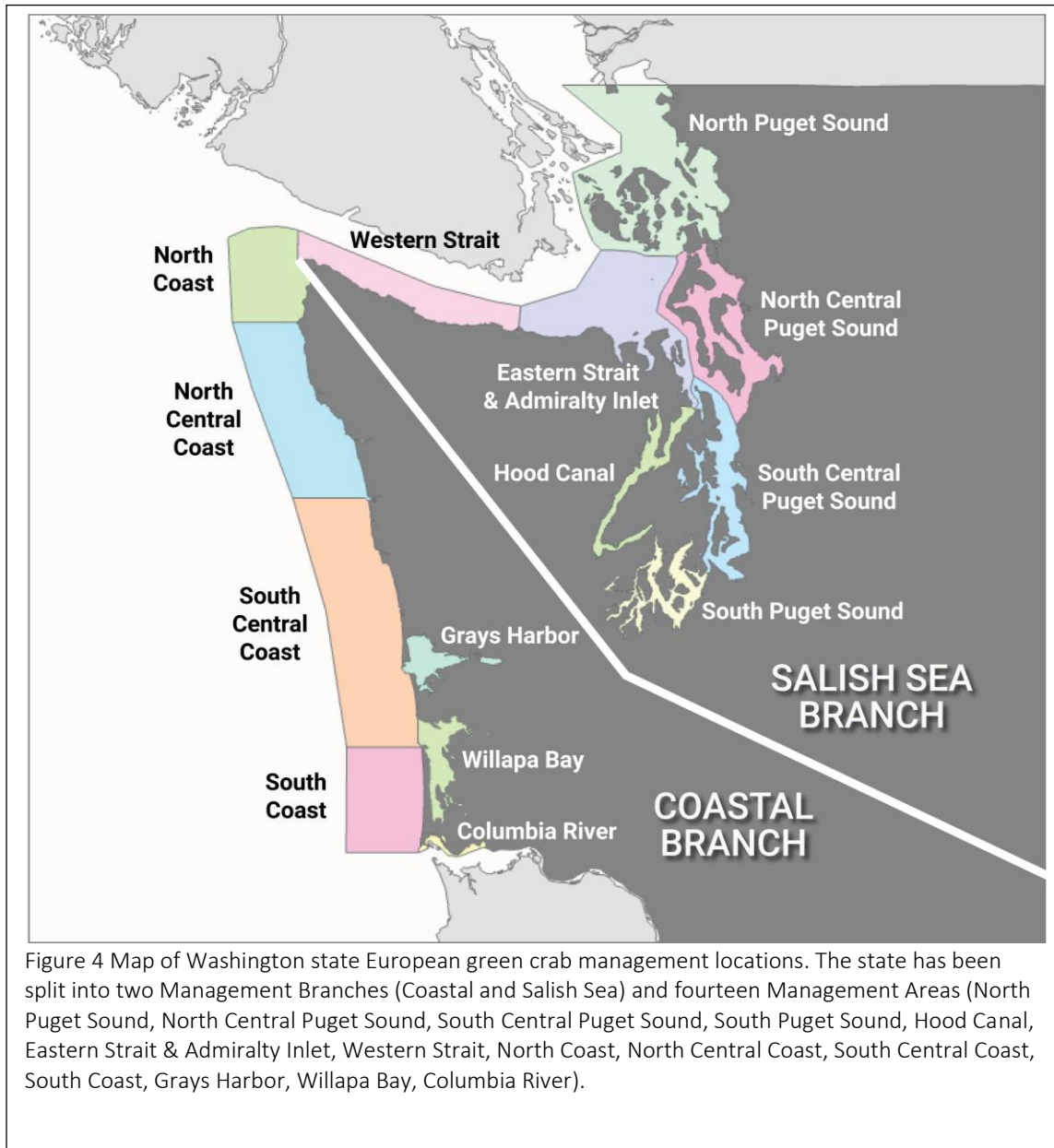


Figure 4 Map of Washington state European green crab management locations. The state has been split into two Management Branches (Coastal and Salish Sea) and fourteen Management Areas (North Puget Sound, North Central Puget Sound, South Central Puget Sound, South Puget Sound, Hood Canal, Eastern Strait & Admiralty Inlet, Western Strait, North Coast, North Central Coast, South Central Coast, South Coast, Grays Harbor, Willapa Bay, Columbia River).

WDFW is partnered with Tidal Grow Agriscience (TGA), an organic fertilizer manufacturer based in Raymond, WA. TGA generously accepts fish waste (i.e., EGC and used bait) from WDFW and participating co-managers, tribes, and partners for processing into a liquid fertilizer (Pacific Gro) free of charge. This partnership allows organic material that would otherwise be dumped in landfills to be put to productive use as outlined in HB 1799 (2022). EGC collected by the Shoalwater Bay Tribe, are utilized directly as fertilizer in their tribal community garden (Pfleeger-Ritzman, personal communication).



Table 4 European green crab (EGC) capture totals for Q1 (Jan. 1 – Sep. 30, 2022), Q2 (Oct. 1 – Dec. 31, 2022), Q3 (Jan. 1 – March 31, 2023), Q4 (April 1 – June 30, 2023), Q5 (July 1 – Sep. 30, 2023), Q6 (Oct. 1 – Dec. 31, 2023), and All (the duration of the EGC management effort) based on SitRep reported catch and trapping effort. These numbers are presented for each Management Branch (Coastal and Salish Sea) and Management Area. These totals include not only removal efforts by Washington Department of Fish and Wildlife, but co-managers, tribes, and partners such as the Washington Sea Grant Crab Team, the Lummi Nation, the Makah Tribe, the Shoalwater Bay Tribe, and participating shellfish growers. * = No trapping occurred in these Management Areas. Please note that these data only represent crabs captured, not the effort employed. Catch effort (number of traps deployed, number of locations trapped, frequency of trap recovery) varies greatly across years and location.

Branch	Management Area	Q1 Total EGC Captured	Q2 Total EGC Captured	Q3 Total EGC Captured	Q4 Total EGC Captured	Q5 Total EGC Captured	Q6 Total EGC Captured	All EGC Captured
Salish Sea	North Puget Sound	75,774	5,126	1,687	2,262	1,422	555	86,826
Salish Sea	Western Strait	0	0	0	0	0	18	18
Salish Sea	Eastern Strait and Admiralty Inlet	75	18	2	122	102	44	363
Salish Sea	Hood Canal	16	0	0	27	67	19	129
Salish Sea	North Central Puget Sound	0	*	*	0	0	*	0
Salish Sea	South Central Puget Sound	0	*	*	0	0	*	0
Salish Sea	South Puget Sound	0	*	*	0	0	*	0
Salish Sea	All	75,865	5,144	1,689	2,411	1,591	636	87,336
Coastal	North Coast	20,002	5,107	577	3,234	4,622	978	34,520
Coastal	North Central Coast	0	0	*	0	0	*	0
Coastal	South Central Coast	34	*	*	4	0	*	38
Coastal	South Coast	*	*	*	*	*	*	*
Coastal	Grays Harbor	6,402	17,862	21,479	12,708	25,901	25,476	109,828
Coastal	Willapa Bay	87,304	67,558	13,413	46,613	99,370	100,589	414,847
Coastal	Columbia River	5	*	*	1	1	*	7
Coastal	All	113,747	90,527	35,469	62,560	129,894	127,043	559,240
All	All	189,612	95,671	37,158	64,971	131,485	127,679	646,576



Determining trends in EGC abundance has been difficult due to poor documentation and reporting of trapping efforts in early 2022 in the form of [Total Trap Check Days](#). Total Trap Check Days are the cumulative number of traps checked every day the traps are deployed and serve as a measure of trapping effort (the higher the Total Trap Check Days, the more effort was put into trapping for EGC). While effort reporting is still somewhat inconsistent, we now have sufficient information to perform broad-scale comparisons across MA's for two periods: 8/8-12/31/2022 and 7/31-12/31/2023. These comparisons examine monthly values for both [CPUE](#) and the total number of EGC removed (EGC.Total) for trapping efforts by individual CMTP's. We will explore efforts by individual CMTP's to consider variability across efforts.

North Puget Sound MA has experienced a sharp decrease in EGC catch numbers since Q1 (Table 4). The majority of EGC removed have been from the Lummi Reservation Coordination Area (CA), which includes Lummi Sea Pond, Lummi Bay, regions of Bellingham Bay, and Portage Bay. For the Lummi Reservation CA, both CPUE and EGC.Total showed substantial reductions in 2023 compared to 2022 ([Appendix C](#), Figure C.1). A similar trend was observed for the remaining North Puget Sound CA's ([Appendix C](#), Figure C.2). These declines in CPUE and EGC.Total suggests a decrease in EGC abundance in North Puget Sound MA from 2022 to 2023. While environmental factors likely played some role, the dramatic decline in EGC abundance suggests the intense trapping efforts by the Lummi Nation and other CMTP are successfully reducing local EGC populations.

There was no notable increase or decrease in EGC abundance in the Eastern Strait & Admiralty Inlet MA between 2022 and 2023 ([Appendix C](#), Figure C.3). While overall catch numbers were higher in 2023 compared to 2022, the CPUE and EGC.Total for each trapping event remained relatively constant across the years. A similar phenomenon was observed in the Hood Canal MA ([Appendix C](#), Figure C.4) with more crabs removed in 2023 but similar CPUE and EGC.Total trapping events. An increase in the number of trapping events in 2023 can explain the rise in EGC removed for each MA. New detections of EGC occurred in both MA's in 2023, and an increase in the trapping range and effort is necessary.

Despite increased trapping efforts, both CPUE and EGC.Total showed substantial declines in the North Coast MA between 2022 and 2023 ([Appendix C](#), Figure C.5). The Makah Tribe, the only CMTP actively trapping in the North Coast MA, reported fewer young of the year in their catch as well, suggesting lower recruitment of EGC in the area. While These data show a clear decrease in EGC abundance from 2022 to 2023, though it cannot be determined if this was due primarily to environmental factors or consistent local trapping efforts.

Two primary factors complicate interpretation of catch data from the Grays Harbor MA ([Appendix C](#), Figure C.6). First, removal efforts dramatically increased for in Grays Harbor in late 2022. Second, Total Trap Check Days records were more consistently reported in 2023. There is a substantial overlap in EGC.Total and CPUE for 2022 and 2023, but both variables have higher peaks in 2023. While we can say more EGC were removed from Grays Harbor in 2023, it cannot be determined if this results from increased trapping efforts or increased EGC abundance.

There is a notable decrease in EGC. Total for the Willapa Bay MA are higher in 2022 compared with 2023. However, there was no corresponding CPUE increase ([Appendix C](#), Figure C.7). The rise in EGC.Total appears to be the result of increased trapping effort by local CMTP, rather than an increase in local EGC abundance. EGC.Total also did not decline with increasing efforts, suggesting that there was not a substantial decline in EGC abundance in Willapa Bay.



Although EGC were detected in the South Central Coast and Columbia River MA's in 2022, trapping efforts have been infrequent and limited. No conclusions other than the presence of EGC in these MA's are possible without more consistent and trapping efforts. WDFW plans to establish long-term monitoring sites within the Columbia River MA in 2024, while efforts are underway to establish more consistent trapping efforts in the South Central Coast MA through local entities' participation.

After two years of monitoring, EGC was detected for the first time in the Western Strait MA, specifically in Neah Bay and Salt Creek. This detection is unsurprising as EGC has been present in nearby Makah Bay (in the North Coast MA) since 2017. It is concerning that monitoring was ongoing for several years before EGC was detected in Neah Bay, especially since the size of collected EGC suggests they were several years old. Given the low number of EGC collected (18), it is unlikely Neah Bay is currently home to a massive EGC population. However, the probable delayed detection of EGC reminds all CMTPs (WDFW included) of the challenges and limitations of even well-planned and executed EGC detection efforts.

Despite continued monitoring efforts, no EGC were detected in the North Central Puget Sound, South Central Puget Sound, South Puget Sound, and North Central Coast MA's (Table 5). Trapping effort (as determined by Total Trap Check Days) has increased substantially in all MAs within the Salish Sea Branch in 2023 compared with 2022. While the trapping effort was not diligently recorded in Q1, we remain confident in saying the trapping effort increased in 2023. However, no trapping occurred in the North Central Coast MA in 2023. Efforts are underway to establish more consistent trapping efforts in the North Central Coast MA through local entities' participation.

The South Coast MA remains the only MA in WA where no EGC management activities have occurred (Table 5). South Coast consists of the western coastline of Long Beach Peninsula, which borders the Pacific Ocean. Most of the South Coast MA is sandy shoreline, except for the rocky shoreline at the southern end around North Head, and the entire area is subject to high wave action. As a result, the South Coast MA is deemed a poor habitat for EGC. Starting in 2024, WDFW will lead an annual discussion with interested CMTP to determine if management actions are necessary for the South Coast MA.

Table 5 Total Trap Check Days for 2022 and 2023 in Management Areas where EGC have been detected. Total Trap Check Days means the cumulative number of traps checked every day the traps are deployed and serves as a measure of trapping effort (the higher the Total Trap Check Days, the more effort was put into trapping for EGC). * = No trapping occurred in these Management Areas.

Branch	Management Area	Total Trap Check Days in 2022	Total Trap Check Days in 2023
Salish Sea	North Central Puget Sound	117	1,356
Salish Sea	South Central Puget Sound	81	525
Salish Sea	South Puget Sound	27	228
Coastal	North Central Coast	16	*
Coastal	South Coast	*	*



Research activity

Effective invasive species management requires a robust understanding of the invader and its impacts. As a prolific global invader, a wealth of research exists regarding EGC. However, many fundamental questions about EGC, particularly regarding their detection, abundance, impacts, and movements in Washington, have yet to be answered.

Monthly meetings of the EGC Research Task Force (RTF) continued in Q6. All individual task groups met at least once and have begun the review and updating of task language, as well as developing lists of deliverables and general timetables.

Representatives of the Lummi Nation, the Makah Tribe, Washington Sea Grant, WDFW, and the University of Washington participated in events related to EGC during the North Pacific Marine Science Organization (PICES) 2023 Annual Meeting in Seattle, WA. On October 26, these representatives presented talks as part of the session “The complex reality of managing Non-indigenous Species (NIS) in the North Pacific”. Topics during the session ranged from the importance of indigenous partnerships and perspectives for successful AIS programs, assessing EGC impacts, status of EGC management programs, genomic tracking and heat tolerance of EGC, and management needs, strategies, and targets. On October 27, these representatives participated in a scenario-based workshop alongside EGC researchers and managers from Alaska, British Columbia, California, Oregon, and Washington. The goal of this workshop was to discuss and compare various EGC assessment approaches and highlight gaps in our collective knowledge to inform the assessment of EGC populations."

Public communications and outreach efforts

Public education, involvement, and support are essential for effective invasive species management. No matter the effort of government agencies and managers, they will be limited in their ability to monitor and report on the species spread. Public awareness and reporting can complement professional monitoring and allow for earlier detection of species spread. Public awareness, media and external relations also supports effective policymaking and collaboration with local communities, stakeholders, and partners. Highlights for Q6 have included:

Focused/Local communication

- Outreach representatives from WDFW sharing information and materials on EGC awareness and identification were present events throughout Washington during Q6, including the Port Angeles Dungeness Crab and Seafood Festival, the Kitsap Salmon Tours at Chico Salmon Park in Bremerton, Pacific Marine Expo in Seattle, Pacific Marine Expo in Seattle, the Puget Sound Estuarium’s Turn the Tides event in Olympia, the Seattle Aquarium, and fishing education events at the Des Moines Pier with Sea Potential. More than 1,700 people were reached during these combined outreach efforts.
- WDFW staff presented at the 100th Meridian Initiative Columbia River Basin Team Meeting in Portland, Oregon on December 12th. Staff provided an update on EGC emergency measures and management actions to regional invasive species managers.



- WDFW published a [blog on ballast water management](#) and how successful management protects Washington from aquatic invasive species. The blog highlights how EGC were initially introduced to North America via the ballast water of ships.
- Co-managers, tribes, and partners conducted EGC outreach at numerous other public events and community forums.
- All additional communication and outreach efforts are listed in Appendix A. as well as online at: wdfw.wa.gov/species-habitats/invasive/carcinus-maenas#conservation

General public communication

- WDFW created a European green crab trapping sign to alert the public that active EGC trapping is occurring in an area and asking the public not to tamper with traps. This sign can be posted by authorized co-managers, tribes, partners, and others doing permitted trapping. This sign was based on a request from the Shoalwater Bay Indian Tribe.
- WDFW staff posted 22 [European green crab identification and reporting signs](#) at water access points in WDFW Region 4, including at Cama Beach Historical State Park and Zuanich Point in Bellingham.
- EGC rack cards are running on all Washington State Ferries and will be available to riders through June 2024. EGC [identification signs](#), [rack cards](#), wallet-sized [ID cards](#), [informational posters](#), and other materials were mailed to numerous marinas, ports, and other partners.
- Media relations and other external affairs activities continued. Current EGC management efforts have been reported in numerous local and national media outlets (Appendix A).
- Print and online advertisements supporting EGC identification and reporting continued to run in regional fishing, boating, and other outdoor publications and social media channels.

EGC 6-Year Management Plan

WDFW is currently facilitating the development of a 6-year Management Plan for EGC in Washington. This is a collaborative undertaking, and every effort is being made to address the goals and issues for each geographic area, co-manager, tribe, and partner involved in EGC management. As of December 1, 2023, WDFW has conducted 32 initial one-on-one meetings with co-managers, tribes, and partners to gather information on activities, goals, and concerns to inform the initial draft of the EGC 6-year management plan. Several entities were unable to meet but have submitted documentation outlining this information. In addition, an initial document outlining the structure and objectives of the plan was distributed to all CMTP on December 7th, 2023, for initial review.

Program challenges

WDFW, co-managers, tribes, and partners have achieved significant progress toward the five Incident Objectives in a short timeframe. However, as we continue to progress through the EGC emergency, there are several challenges we must address. These challenges include:

- Finalization of formal documentation for guidelines and protocols. Formal guidelines and protocols for a wide range of topics (e.g., formal data standards, responses to new EGC detections, trapping efforts, eDNA monitoring techniques, boat safety) have been in development for an extended period. This is primarily the result of continuous review and revision to create effective and thorough resources. However, these guidelines and



protocols must be finalized as soon as possible to ensure they can be utilized prior to the 2024 field season and their inclusion in the Management Plan.

- Development of 6-year statewide Management Plan. Initial discussions among co-managers, tribes, and partners have highlighted many priorities, but also highlighted sections of the initial draft that will require further development. Momentum must be maintained to ensure steady progress and the continued participation of all collaborators.
- Increased opportunities for in-person collaboration and coordination. The enthusiastic responses and productive discussions resulting from events like the 2023 Trappers Summit highlight the benefit of in-person gatherings for facilitating collaboration among CMTP. Finding opportunities for these events, while difficult, are a high priority.
- Finding and retaining EGC field staff. WDFW, as well as co-managers, tribes, and partners, continue to experience challenges finding personnel to fill field positions relating to EGC management activities. In particular, the lack of affordable housing in coastal areas has proven a significant challenge. Discussions are ongoing for options to remove barriers to finding sustainable long-term workforces.
- Washington European Green Crab Management Symposium. The Washington EGC Co-Managers and Partners Meeting has been expanded in scope to a 2-day symposium to take place in late-February 2024. While this will allow for workshops and other events, the increase in scope will require greater planning and coordination.

Next steps

The EGC emergency management priority actions for next quarter (Q7: Jan. 1 – Mar. 31, 2024) include:

- Finalization of planning for 2024 field season.
- Filling vacancies in permanent and seasonal EGC staff.
- Scheduling the 2024 Washington European Green Crab Management Symposium for February 2024.
- Scheduling the 2024 EGC Public Update Webinar.
- Continuation of creation and revision of the 6-year statewide EGC Management Plan in coordination with CMTP.
- Ongoing MAC Group meetings.
- Continued EGC Research Task Force a priority research list for EGC in Washington, discuss EGC research-related issues and develop usable assessment tools by the start of the 2024 field season.
- Development and distribution of monthly SitReps.
- Ongoing advocacy for increasing federal partner support and funding.
- Continued refinement of Esri EGC data collection tools for use in the field.
- Ongoing outreach to co-managers and tribes on policy and technical coordination.



Glossary

AIS – Aquatic Invasive Species

DFO – Department of Fisheries and Oceans Canada

DNR – Department of Natural Resources

Ecology – Department of Ecology

EDRR – Early Detection Rapid Response

EGC – European green crab (*Carcinus maenas*)

FY – Fiscal Year

ICS – Incident Command System

MA – Management Area

MAC Group – Multi-Agency Coordination Group

NGO – Non-governmental organizations

NOAA – National Oceanographic and Atmospheric Administration

NWR – National Wildlife Refuge

PCSGA – Pacific Coast Shellfish Growers Association

Q1 – First quarterly phase of EGC emergency response (March 1 – Sep. 30, 2022)

Q2 – Second quarterly phase of EGC emergency response (Oct. 1 – Dec. 31, 2022)

Q3 – Third quarterly phase of EGC emergency response (Jan. 1 – March 31, 2023)

Q4 – Fourth quarterly phase of EGC emergency response (April 1 – June 30, 2023)

Q5 – Fifth quarterly phase of EGC emergency response (July 1 – Sep. 30, 2023)

Q6 – Sixth quarterly phase of EGC emergency response (Oct. 1 – Dec. 31, 2023)

RCO – Recreation and Conversation Office

RTF – Research Task Force

SitReps – ICS Situation Reports

WDFW – Washington Department of Fish and Wildlife

WGHOGA – Willapa-Grays Harbor Oyster Growers Association

WSG – Washington Sea Grant

WSU – Washington State University



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Appendix A

WAC [220-640-030](#) - Prohibited level 1 species.

The following species are classified as prohibited level 1 species:

- (1) Molluscs: Family Dreissenidae: Zebra and quagga mussels: *Dreissena polymorpha* and *Dreissena rostriformis bugensis*.
- (2) Crustaceans:
 - (a) Family Grapsidae: Mitten crabs: All members of the genus *Erochier*.
 - (b) Family Portunidae: European green crab, *Carcinus maenas*.
- (3) Fish:
 - (a) Family Channidae: China fish, snakeheads: All members of the genus *Channa*.
 - (b) Family Clariidae: All members of the walking catfish family.
 - (c) Family Cyprinidae:
 - (i) Carp, Bighead, *Hypophthalmichthys nobilis*.
 - (ii) Carp, Black, *Mylopharyngodon piceus*.
 - (iii) Carp, Silver, *Hypophthalmichthys molitrix*.
 - (iv) Carp, Largescale Silver, *Hypophthalmichthys harmandi*.
 - (d) Family Esocidae: Northern pike, *Esox lucius*.

RCW [77.135.040](#) - Prohibited and regulated species - Required authorization

(1) Prohibited level 1, level 2, and level 3 species may not be possessed, introduced on or into a water body or property, or trafficked, without department authorization, a permit, or as otherwise provided by rule.

(2) Regulated type A, type B, and type C species may not be introduced on or into a water body or property without department authorization, a permit, or as otherwise provided by rule.

(3) Regulated type B species, when being actively used for commercial purposes, must be readily and clearly identified in writing by taxonomic species name or subspecies name to distinguish the subspecies from another prohibited species or a regulated type A species. Nothing in this section precludes using additional descriptive language or trade names to describe regulated type B species as long as the labeling requirements of this section are met.

RCW [77.135.090](#) - Emergency measures

(1) If the director finds that there exists an imminent danger of a prohibited level 1 or level 2 species detection that seriously endangers or threatens the environment, economy, human health, or well-being of the state of Washington, the director must ask the governor to order, under RCW [43.06.010](#)(14), emergency measures to prevent or abate the prohibited species. The director's findings must contain an evaluation of the effect of the emergency measures on environmental



factors such as fish listed under the endangered species act, economic factors such as public and private access, human health factors such as water quality, or well-being factors such as cultural resources.

(2) If an emergency is declared pursuant to RCW [43.06.010](#)(14), the director may consult with the invasive species council to advise the governor on emergency measures necessary under RCW [43.06.010](#)(14) and this section, and make subsequent recommendations to the governor. The invasive species council must involve owners of the affected water body or property, state and local governments, federal agencies, tribes, public health interests, technical service providers, and environmental organizations, as appropriate.

(3) Upon the governor's approval of emergency measures, the director may implement these measures to prevent, contain, control, or eradicate invasive species that are the subject of the emergency order, notwithstanding the provisions of chapter [15.58](#) or [17.21](#) RCW or any other statute. These measures, after evaluation of all other alternatives, may include the surface and aerial application of pesticides.

(4) The director must continually evaluate the effects of the emergency measures and report these to the governor at intervals of not less than ten days. The director must immediately advise the governor if the director finds that the emergency no longer exists or if certain emergency measures should be discontinued.

ESSB 5693 (2022 c 297)- Making 2021-2023 fiscal biennium supplemental operating appropriations

Section 308. (Page 552, Line 16)

(67) \$2,472,000 of the general fund—state appropriation in fiscal year 2022 and \$6,096,000 of the general fund—state appropriation in fiscal year 2023 are provided solely for the department to implement eradication and control measures on European green crabs through coordination and grants with partner organizations. The department must provide quarterly progress reports on the success and challenges of the measures to the appropriate committees of the legislature by December 1, 2022.23

Q1 (March 1 – September 30, 2022) EGC Report

The Q1 report is available at <https://wdfw.wa.gov/publications/02372> or via this link: [European Green Crab Quarterly Progress Report – Fall 2022](#)

Q1 Catch data clarification

Please note that European green crab (EGC) catch numbers in the Q1 report included EGC caught from Jan. 31 – Feb. 28, 2022. These months fall outside the official duration of Q1 (March 1 – Sep. 30, 2022) but were included to 1) accurately represent EGC removals for 2022 and 2) the submission process for SitRep 1 included co-managers, tribes, and partners submitting catch data from January 1- June 11, 2022, as a single number.



Q2 (October 1 – December 31, 2022) EGC Report

The Q2 report is available at <https://wdfw.wa.gov/publications/02414> or via this link: [European Green Crab Quarterly Progress Report – Winter 2022](#)

Q3 (January 1 – March 31, 2023) EGC Report

The Q3 report is available at <https://wdfw.wa.gov/publications/02431> or via this link: [European Green Crab Quarterly Progress Report – Spring 2023](#)

Q4 (April 1 – June 30, 2023) EGC Report

The Q4 report is available at <https://wdfw.wa.gov/publications/02446> or via this link: [European Green Crab Quarterly Progress Report – Summer 2023](#)

Q5 (July 1 – September 30, 2023) EGC Report

The Q5 report is available at <https://wdfw.wa.gov/publications/02460> or via this link: [European Green Crab Quarterly Progress Report – Fall 2023](#)

EGC management Definitions

Management action type definitions

Assessment means periodically checking positive detection EGC areas using trapping methods to assess presence, geographic scope, and numerical scale of a population, at a relatively comprehensive scale. Assessment trapping efforts can occur on the scale of a water body or site, depending on the purpose. The timing and implementation of assessment trapping efforts is generally opportunistic.

Control means field activities within a given infested area with the intent of reducing that area's EGC population size.

Early detection means field operations in areas that have no prior EGC detections or detections within the past 5 years and with the intent to detect EGC at their earliest point in the invasion process. This includes such activities as trapping and eDNA.

Emphasis response means planned management actions including assessment, prospecting, or control effort over a given Site or Coordination Area that brings in a significant increase of resources as would be normal for that situation. It is similar to a rapid response trapping effort except not expedited as a result of a new detection.

Monitoring means a systematic and designed sampling effort for information-gathering purposes that is implemented consistently and on a routine schedule. Monitoring protocols are well defined and are relatively stable to evaluate changes over space and time. The specific purpose and geographic scope of any individual monitoring effort might vary to suit the project but should remain internally consistent.



Prevention means activities that aim to reduce the arrival of green crabs, either as larvae or adults, resulting from the transport/transfer of green crabs from one location to another – regardless of whether green crabs are present at the receiving location.

Research means field, lab, or other scientific actions implemented to investigate an aspect of the EGC invasion and for which the activities do not fall into standard protocols of any of the above management types. Types of research may include improving efficiency/efficacy of priority management actions, increasing biological knowledge, and predicting/assessing EGC or other impacts.

Other definitions

Catch Per Unit Effort (CPUE) is an indirect metric of the abundance of EGC in relation to a defined geographic area and time scale. It is used to indicate the amount of effort undertaken to collect a given number of EGC. For EGC emergency management data consistency purposes, CPUE must be reported and qualified:

- Per 100 traps as calculated to nearest 0.10 CPUE;
- By aggregate or individual trap type; and
- By cumulative Trap set days or Trap check days over the operational period or other defined time span of interest.
 - Example 1 - 30 EGC caught in 200 shrimp traps and deployed for 1 overnight period then recovered (200 trap set days): $30 \div 200 = 0.15 \times 100 = 15.0$ CPUE.
 - Example 2 - 30 EGC caught in 200 shrimp traps and deployed for 3 overnight periods then recovered (600 trap set days): $30 \div 600 = 0.05 \times 100 = 5.0$ CPUE.

Detection means the new discovery of a live, dead, molt or other remains of an EGC specimen as verified by an EGC expert at a specific geographic location. Life stage or remains of EGC may trigger different management response at different geographic scales. This includes finds at locations where EGC have not been found for more than three years.

Education/outreach means providing information on potential pathways of human mediated risk/spread, EGC identification, and EGC reporting to relevant audiences. Examples might include presentations, creating printed collateral/signage, or informal conversations. This category is different from Training in being broader and less targeted in practical applications.

EGC Management Scale means a hierarchy of geographically defined areas from largest to smallest scale. This system is used for consistency in communications, planning, operations and other ICS functions including:

- Regional – this includes states and provinces of Canada along the Pacific coast.
- Statewide – this includes approximately 3,500 miles of coastal area encompassing marine and estuarine habitats where EGC could become established.
- Branch – Statewide operations are divided into Coastal and Salish Sea branches which corresponds to major differences in EGC management strategies due to significant propagule pressures from EGC larvae arriving in Washington State from coastal sources in California, Oregon, and British Columbia.



- Management Area – Branches are further divided into 14 Management Areas based on WDFW’s recreational fishing marine areas with 7 Management Areas within the Salish Sea Branch and 7 within the Coastal Branch.
- Coordination Area – Management Areas are further divided into Coordination Areas based on a place name that best describes a sub-Management Area or it may be based on the jurisdictional lead for that area. Delineation of Coordination Areas continues to evolve based on input from local Management Area co-managers and partners.
- Site – Coordination Areas may be further divided into Sites based on a geographic area of connected, similar habitat suitability, or access limitations and where EGC management actions can be expressed as representing the whole geographic area.
- Sub-Site – Sites can be divided into Sub-Sites in more complex situations based on similar habitat or where different operational actions are required.

EGC trap means one of four types of enclosed spaces that permit entry and prevent exit by EGC. Types used for EGC trapping operations include:

- “Fukui” trap (Fukui, Promar, etc.) means a single piece trap designed for the capture of small fish. Consists of a vinyl covered steel frame (60 × 45 × 20 cm) covered with square, single-knotted, polyethylene mesh (12 mm bar length). There are entrances at either end, with the netting panels forming a “V” shape to allow organisms to enter through slits. The traps can be flattened (collapsed) for easier storage and transport.
- “Minnow” trap means a cylindrical two-piece trap designed for capture of smaller EGC. When both halves are connected, the trap is 50 cm long with a 23 cm diameter and two inverted funnel-entrance holes, one at either end of a rigid mesh cylinder. Those used in EGC management efforts by default have holes 25 mm in diameter and mesh that is 6mm at the widest.
- “Shrimp” trap means a single piece trap for capture of shrimp. Consists of vinyl covered steel box 61 cm X 61 cm X 23 cm with a built-in bait box in the center. Mesh size is variable depending on the brand, though usually 25 mm or 50 mm. There are four rectangular entrances (one in the center of each side), lined by inverted funnels of rigid Vexar mesh.
- Other trap type means any other method utilized for the capture of live EGC. Common examples include pitfall traps (holes dug to allow EGC to fall into for collection) or experimental traps.

Established means a population of a EGC where that population is expected to have a sustained presence based on evidence (i.e., three years of capture of multiple age classes and with increasing or relatively stable abundance irrespective of trapping effort intensity).

Habitat structure means the composition and arrangement of material, be it natural or man-made, within a habitat (e.g., vegetation, docks, rocks, and woody debris). Most commonly, elements of three-dimensional (rising off the bottom) and complex (with crevices in which to hide) structure are favorable to green crab survival.

Habitat suitability means the relative ability of a habitat to support EGC. Characteristics that can be used to assess habitat suitability include physical attributes (e.g., exposure to wave energy, depth, and temperature), chemical attributes (e.g., salinity, pH, oxygen) and biotic attributes (e.g., vegetation, available prey, competitors, and predators).



Hot Spot means an area with a substantially greater relative abundance of green crab than surrounding areas. Hot spots can be defined at the site level (e.g., a creek mouth within a water body) or at the Coordination Area-level (e.g., Lummi Sea Pond), and can be spatially nested, sites of high density within Coordination Areas of high density.

Incident Action Plan (IAP) means a concise planning document containing set goals and objectives that guide incident safety, logistics, operations, and other incident actions during a set operational period.

Incident Commander means the individual responsible for all EGC emergency measures activities, including the development of strategies and tactics and the ordering and release of resources. The Incident Commander has overall authority and responsibility for conducting EGC emergency measures operations.

Infested area means a geographic area that carries or contains EGC at a branch, management area, coordination area, or site scale.

Localized detection means EGC detection occurred in a coordination area or other location (ex. bay, lagoon, estuary, or tidelands) where European green crabs have not previously been confirmed, but is within a management area where EGC have been detected. Localized detections are anticipated during the invasion. WDFW will notify relevant agency staff, co-managers, tribes, partners, tidelands owners, and other community members. Depending on need, assessment trapping or rapid response may occur to prevent population becoming established and reduce risk of spread into new management areas.

Operational Period means the interval of time scheduled for execution of a given set of EGC management actions as specified by an Incident Commander.

Rapid response means expedited management actions based on new detections or the finding of a significantly increased population for the time-sensitive intent of determining scope of EGC invasion and containing or eradicating EGC before it spreads or becomes further established. (RCW 77.135.010(20)). Based on the outcome of rapid response actions, subsequent management action types may be implemented.

Training means providing information or instruction on prevention, early detection, rapid response or other EGC emergency management protocols. This category is distinct from Education/outreach in focusing on specific, practical applications.

Trap set days means when a trap is set intertidally or sub-tidally for the action of capturing EGC for a single overnight period. Overnight trap days are standard trapping protocols based on known EGC feeding activity patterns. If a trap is set and retrieved within a single calendar day, count it as a single trap day, but be aware that it may be later counted as a portion of a trap day for comparability with a standard overnight trap day.

- Total set trap days are counted from the day after a trap is set and includes the day the trap is removed. This metric is mostly a qualitative measure of effort during an operational



period or season and may be used to estimate a gross level of potential EGC risk/density to help assess if additional support is needed.

- Example 1 - 50 traps set on Monday, Aug 8, and retrieved Friday, Aug 12: $50 \times 4 = 200$ trap days.
- Example 2 - 50 traps set on Monday, Aug 8, and retrieved Sunday, Aug 21: $50 \times 13 = 650$ trap days.
- Example 3 - 50 traps set in a prior OP and to be retrieved in a future OP (example OP is 14 days): $50 \times 14 = 700$ trap days.

Trap check days means the number of days within an operational period that a trap is checked for EGC. This metric is mostly a qualitative measure of effort and may be used to estimate a gross level of potential EGC risk/density to help assess if additional support is needed in a given Coordination Area.

- Total trap check days means the cumulative number of traps checked every day the traps are deployed. If traps are checked every day, total trap check days will be the same as total trap days.
 - Example 1 - 50 traps set on Monday, Aug 8, and retrieved Friday, Aug 12, and checked every day: $50 \times 4 = 200$ trap check days.
 - Example 2 - 50 traps set Monday, Aug 8, and retrieved Sunday, Aug 21, and checked every day: $50 \times 13 = 650$ trap check days.
 - Example 3 - 50 traps set in a prior OP and to be retrieved in a future OP and checked every day: $50 \times 14 = 700$ trap check days.
 - Example 4 - 50 traps set Monday, Aug 8, and retrieved Friday, Aug 19, and checked every other day, excluding weekends (i.e., Monday, Wednesday, and Friday): $50 \times 5 = 250$ trap check days.
 - Example 5 - 50 traps set Monday, Aug 8, and retrieved Sunday, Aug 21, and checked on Wednesdays only and the day the traps are retrieved: $50 \times 3 = 150$ trap check days.

Young of the Year (YOY) means EGC of any life stage that belong to the current-year recruitment cohort of EGC. The size and life stage of those individuals will depend on the time of capture and conditions for the year, locally and regionally. Generally, crabs that are captured in traps under 30mm are safely considered YOY regardless of time of year of capture, but YOY can reach up to ~50mm by the end (fall) of their first year.



List of Washington European green crab management actions in chronological order for Q6 (October 1 – December 31, 2023) as provided in Situation Reports

Date	EGC Management Action
10/6/2023	WDFW submitted a 10-day emergency measures status update to the Governor’s Office and Office of Financial Management advising that all emergency measures should continue.
10/16/2023	WDFW submitted a 10-day emergency measures status update to the Governor’s Office and Office of Financial Management advising that all emergency measures should continue.
10/18/2023	EGC Multi-Agency Coordination Group (MAC Group) Monthly Meeting.
10/26/2023	WDFW published and distributed a September/October 2023 EGC Public Update .
10/27/2023	WDFW submitted a 10-day emergency measures status update to the Governor’s Office and Office of Financial Management advising that all emergency measures should continue.
11/15/2023	EGC Multi-Agency Coordination Group (MAC Group) Monthly Meeting: Federal funding, 5-year management plan, and U.S. Geological Survey research updates.
11/16/2023	WDFW published and distributed the following news release: Invasive European green crab report leads to rapid response at Salt Creek Recreation Area .
11/20/2023	Incident Commander, Justin Bush, briefed the Washington Fish and Wildlife Commission Fish Committee on European green crab emergency measures.
11/28/2023	WDFW submitted a 10-day emergency measures status update to the Governor’s Office and Office of Financial Management advising that all emergency measures should continue.
12/1/2023	WDFW submitted the Fall 2023 quarterly report to the State Legislature summarizing effort from July 1 to September 31, 2023.
12/7/2023	WDFW submitted a 10-day emergency measures status update to the Governor’s Office and Office of Financial Management advising that all emergency measures should continue.
12/8/2023	WDFW submitted a 10-day emergency measures status update to the Governor’s Office and Office of Financial Management advising that all emergency measures should continue.



12/12/2023	European Green Crab Response Update to Pacific States Marine Fisheries Commission 100th Meridian Initiative Columbia River Basin Team Meeting.
12/13/2023	European Green Crab Multi-Agency Coordination Group Meeting: EGC genome mapping and annotation, research needs and opportunities, trap and buoy tags.
12/15/2023	WDFW submitted a multi-organization letter to Washington Congressional Delegation supporting proposed federal European green crab funding.
12/18/2023	WDFW submitted a 10-day emergency measures status update to the Governor's Office and Office of Financial Management advising that all emergency measures should continue.
12/20/2023	WDFW published and distributed the Nov/Dec European Green Crab Public Update . This bi-monthly report is also posted on WDFW's Medium blog and shared to social media and is distributed via email to the European Green Crab Management list, which has more than 980 subscribers. The email list sign-up is available here: https://wdfw.wa.gov/about/lists
12/27/2023	WDFW submitted a 10-day emergency measures status update to the Governor's Office and Office of Financial Management advising that all emergency measures should continue.
12/27/2023	WDFW facilitated a state natural resource agency meeting to discuss long-term management and opportunities for increased collaboration.

List of media reporting in chronological order related to Washington European green crab management for Q6 (October 1 – December 31, 2023) as provided in Situation Reports

Date	Outlet	Headline	URL
10/7/2023	The Daily World	Green crab, rising tides and the future of fishing: marine resource summit well attended	https://www.thedailyworld.com/news/green-crab-rising-tides-and-the-future-of-fishing-marine-resource-summit-well-attended/
10/18/2023	Capital Press	Western Innovator: Entomologist aids cranberry, shellfish growers	https://www.capitalpress.com/state/washington/western-innovator-entomologist-aids-cranberry-shellfish-growers/article_654ed580-6c67-11ee-a743-c787e8cf6b62.html
10/23/2023	The Guardian	'Crabs everywhere': off Canada's Pacific coast, Indigenous Haida fight a host of invasive species	https://www.theguardian.com/environment/2023/oct/23/crabs-everywhere-haida-gwaii-canada-wilderness-indigenous-haida-fight-invasive-species



11/1/2023	Willapa Harbor Herald	Don't remove stray crab traps	https://hometowndebate.com/31-10-2023-10-42-47-am-7419289.pdf
11/6/2023	KIRO NewsRadio	European green crab - A big threat to Washington's seafood industry	https://play.cdnstream1.com/s/bonneville/seattles-morning-news-w-7c908d/signing-up-for-health-co-04e13b (starts at 12 minutes)
11/14/2023	Skagit Valley Herald	Report shows mixed results for Puget Sound health	https://www.goskagit.com/news/environment/report-shows-mixed-results-for-puget-sound-health/article_470c3848-7a9e-11ee-9d1f-d35594d62518.html
11/16/2023	Undercurrent News	Invasive green crabs likely already on the move in Alaska	https://www.undercurrentnews.com/2023/11/16/invasive-green-crabs-likely-already-on-the-move-in-alaska/
11/17/2023	Radio Pacific Inc., MyClallamCounty.com	Invasive European Green Crabs Found at Salt Creek	https://www.myclallamcounty.com/2023/11/17/invasive-european-green-crabs-found-at-salt-creek/
11/17/2023	Pacific Northwest Ag Network	Invasive European Green Crab Found at Salt Creek Recreation Area	https://pnwag.net/egc-found-salt-creek-wa/
12/18/2023	Chinook Observer	Top trappers: Willapa Bay crew leads front-line fight against green crab*	https://www.chinookobserver.com/news/local/top-trappers-willapa-bay-crew-leads-front-line-fight-against-green-crab/article_6624a6b2-9dde-11ee-b6f1-97604b4e9d55.html *WDFW was not contacted for this article prior to publication. EGC co-managers, tribes, and partners are respectfully requested to coordinate with WDFW and ICS leads regarding media inquiries related to permitted EGC management actions and funding.
12/22/2023	B-town Blog	Learn about European Green Crabs and the Puget Sound on Wednesday, Jan. 3	https://b-townblog.com/learn-about-european-green-crabs-and-the-puget-sound-on-wednesday-jan-3/
12/26/2023	Northwest Sportsman	2023 Northwest Fish And Wildlife Year In Review	https://nwsportsmanmag.com/2023-northwest-fish-and-wildlife-year-in-review/



Appendix B – Co-manager and partner addendums

Washington Department of Natural Resources



Addendum for the Operational Period of October 1st – December 31st, 2023, for European Green Crab Emergency Measures.

- 1) DNR is seeking ongoing funding from the State Legislature in the upcoming supplemental legislative session for DNR's role in the European green crab emergency measures response. The Washington Department of Fish and Wildlife and the Washington Invasive Species Council will submit letters of support.
- 2) DNR assisted WDFW in trapping around Seabeck from October 10th through the 12th. DNR trapped at Nicks Lagoon, Misery Point Lagoon, and Big Beef Creek.
- 3) DNR contacted DNR Citizen's Stewardship Committees (CSC) to inquire about interest in participating in the Washington Sea Grant/Washington State University Extension Molt Search project. The Fidalgo Bay CSC and Cherry Point CSC have expressed interest in Washington State University/Washington Sea Grant's Molt Search program. In response, DNR will set up training days in the spring for both CSCs.
- 4) The DNR team attended the Washington State Vegetation Management Association Conference and the Trappers Summit hosted by WA Sea Grant and WDFW.
- 5) Trapping efforts in Grays Harbor included the Grays-Harbor National Wildlife Refuge, North Bay Natural Area Preserve, John's River, Elk River Natural Area Preserve and Grass Island. Additional trapping efforts within Willapa Bay included the Bone River Natural Area Preserve and the Palix River. During this operational period 6,861 EGC were captured from these areas. In addition, the DNR team devoted time to data quality assurance and quality control for year-end reporting.



Appendix C – Additional Figures

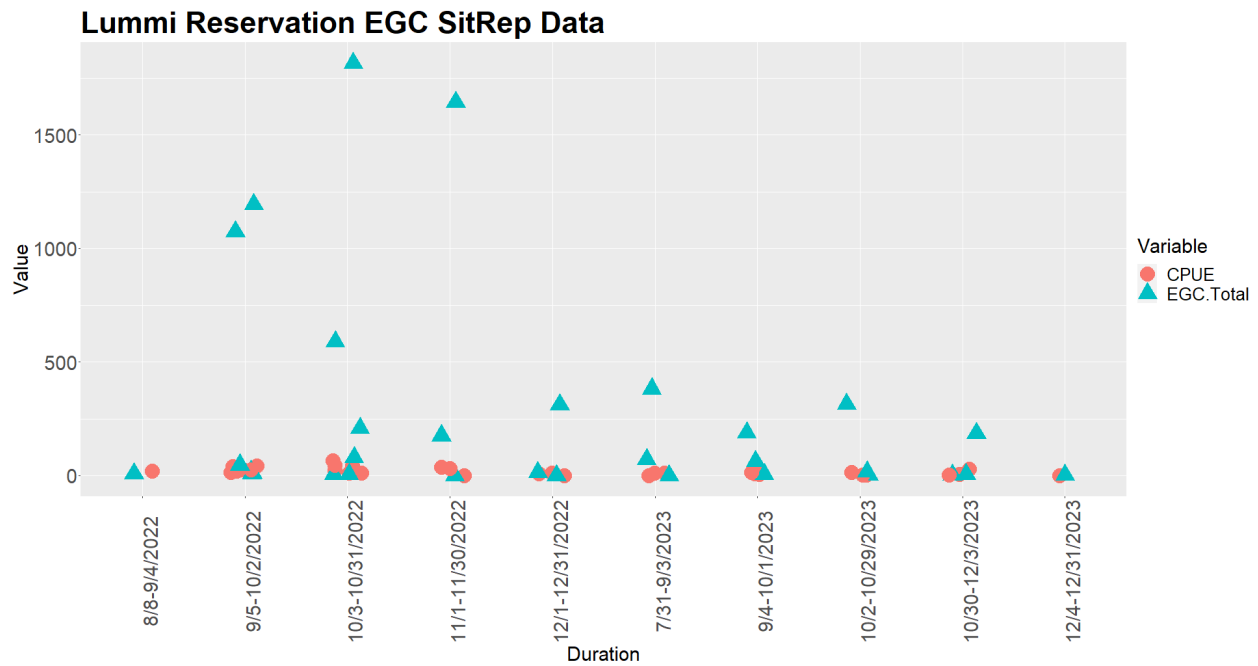


Figure C.1 Monthly values for CPUE (# of EGC per 100 Traps) and EGC.Total (number of EGC removed) data reported in Situation Reports (SitReps) for the Lummi Reservation Coordination Area for 8/8-12/31/2/2022 and 7/31-12/31/202. The x-axis, Duration, denotes the period (~ 1 month) during which the data was collected. The y-axis, Value, represents the value for each Variable (CPUE or EGC.Total).



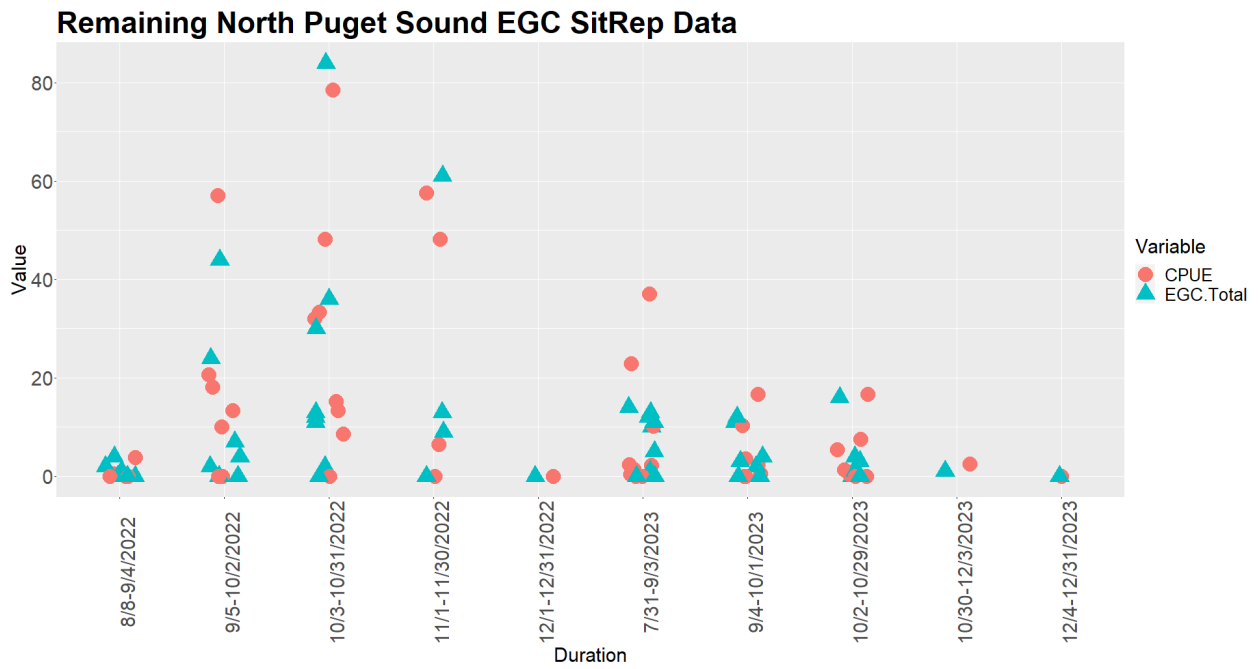


Figure C.2 Monthly values for CPUE (# of EGC per 100 Traps) and EGC.Total (number of EGC removed) data reported in Situation Reports (SitReps) for the North Puget Sound Management Area (excluding Lummi Reservation Coordination Area) for 8/8-12/31/2/2022 and 7/31-12/31/202. The x-axis, Duration, denotes the period (~ 1 month) during which the data was collected. The y-axis, Value, represents the value for each Variable (CPUE or EGC.Total).



Eastern Strait & Admiralty Inlet EGC SitRep Data

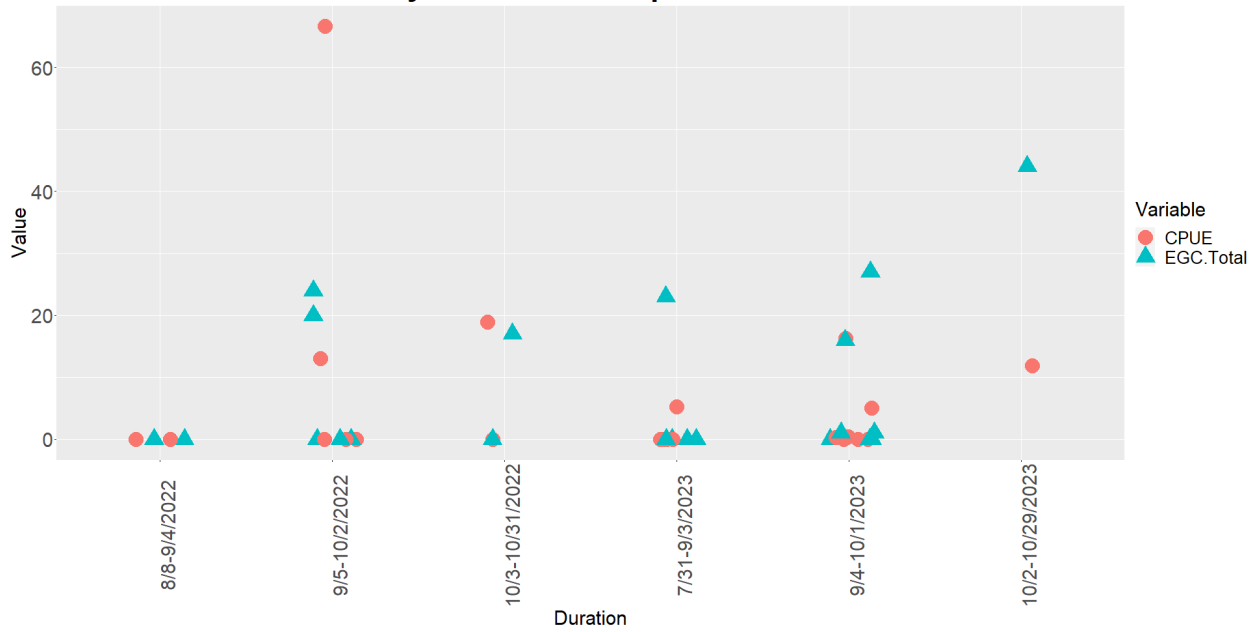


Figure C.3 Monthly values for CPUE (# of EGC per 100 Traps) and EGC.Total (number of EGC removed) data reported in Situation Reports (SitReps) for the Eastern Strait & Admiralty Inlet Management Area for 8/8-12/31/2/2022 and 7/31-12/31/2023. The x-axis, Duration, denotes the period (~ 1 month) during which the data was collected. The y-axis, Value, represents the value for each Variable (CPUE or EGC.Total).



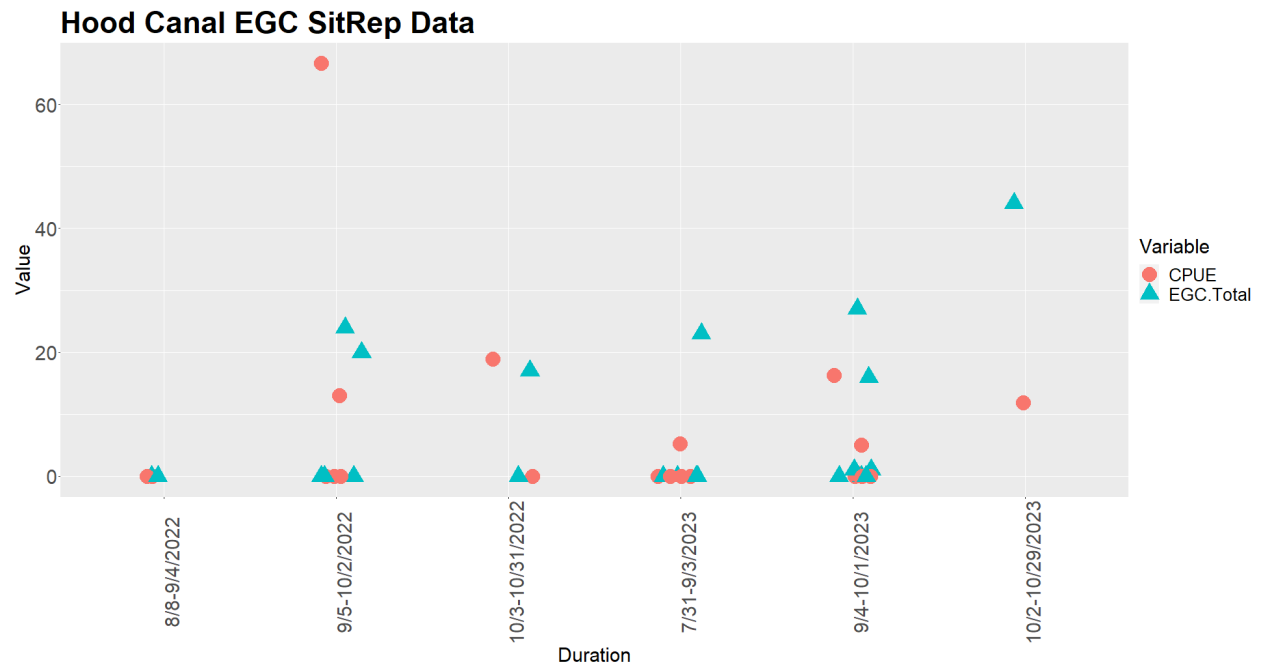


Figure C.4 Monthly values for CPUE (# of EGC per 100 Traps) and EGC.Total (number of EGC removed) data reported in Situation Reports (SitReps) for the Hood Canal Management Area for 8/8-12/31/2/2022 and 7/31-12/31/202. The x-axis, Duration, denotes the period (~ 1 month) during which the data was collected. The y-axis, Value, represents the value for each Variable (CPUE or EGC.Total).



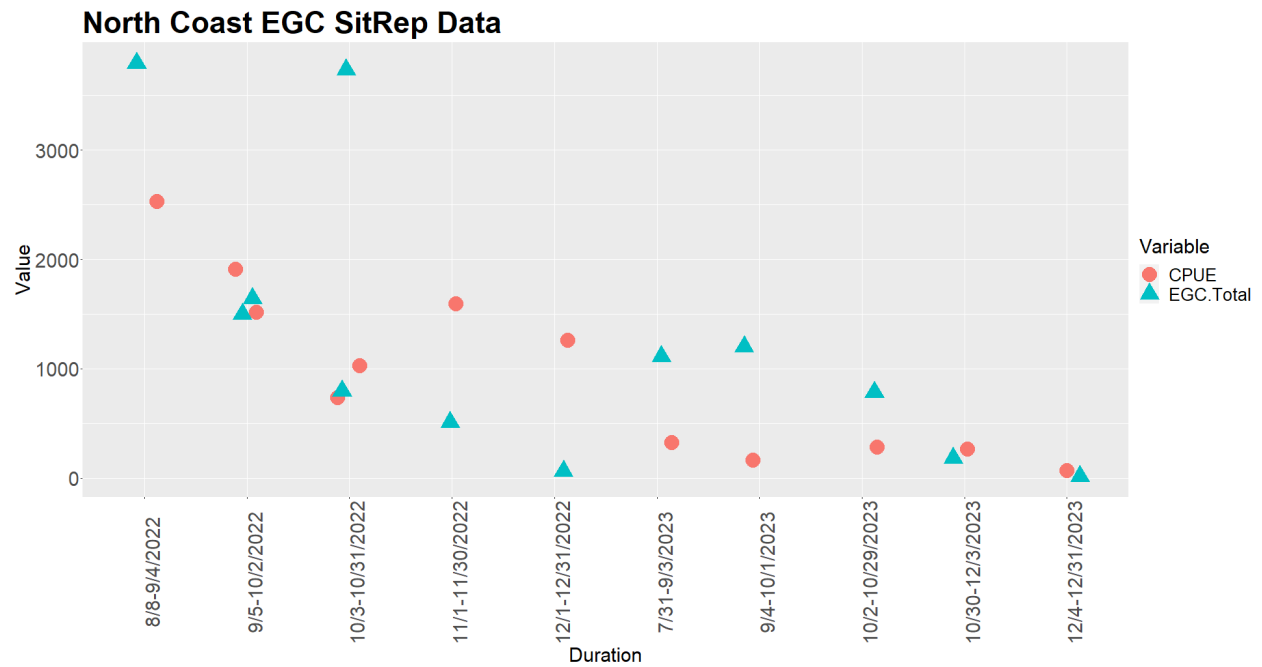


Figure C.5 Monthly values for CPUE (# of EGC per 100 Traps) and EGC.Total (number of EGC removed) data reported in Situation Reports (SitReps) for the North Coast Management Area for 8/8-12/31/2/2022 and 7/31-12/31/202. The x-axis, Duration, denotes the period (~ 1 month) during which the data was collected. The y-axis, Value, represents the value for each Variable (CPUE or EGC.Total).



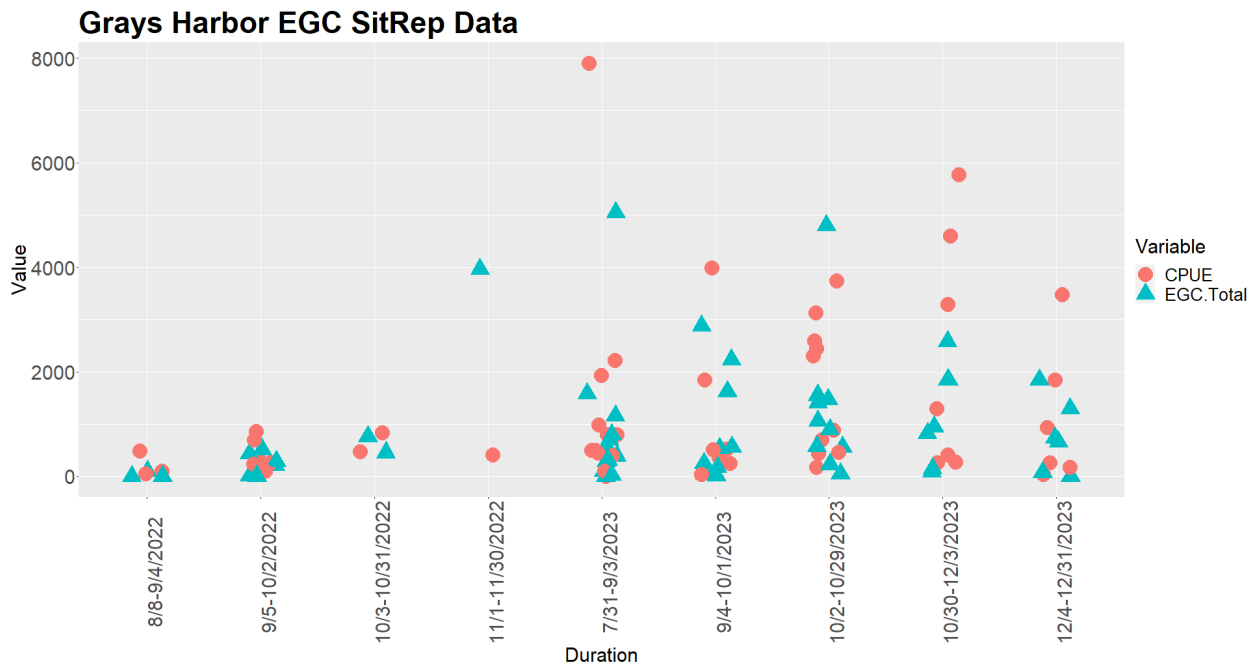


Figure C.6 Monthly values for CPUE (# of EGC per 100 Traps) and EGC.Total (number of EGC removed) data reported in Situation Reports (SitReps) for the Grays Harbor Management Area for 8/8-12/31/2/2022 and 7/31-12/31/202. The x-axis, Duration, denotes the period (~ 1 month) during which the data was collected. The y-axis, Value, represents the value for each Variable (CPUE or EGC.Total).



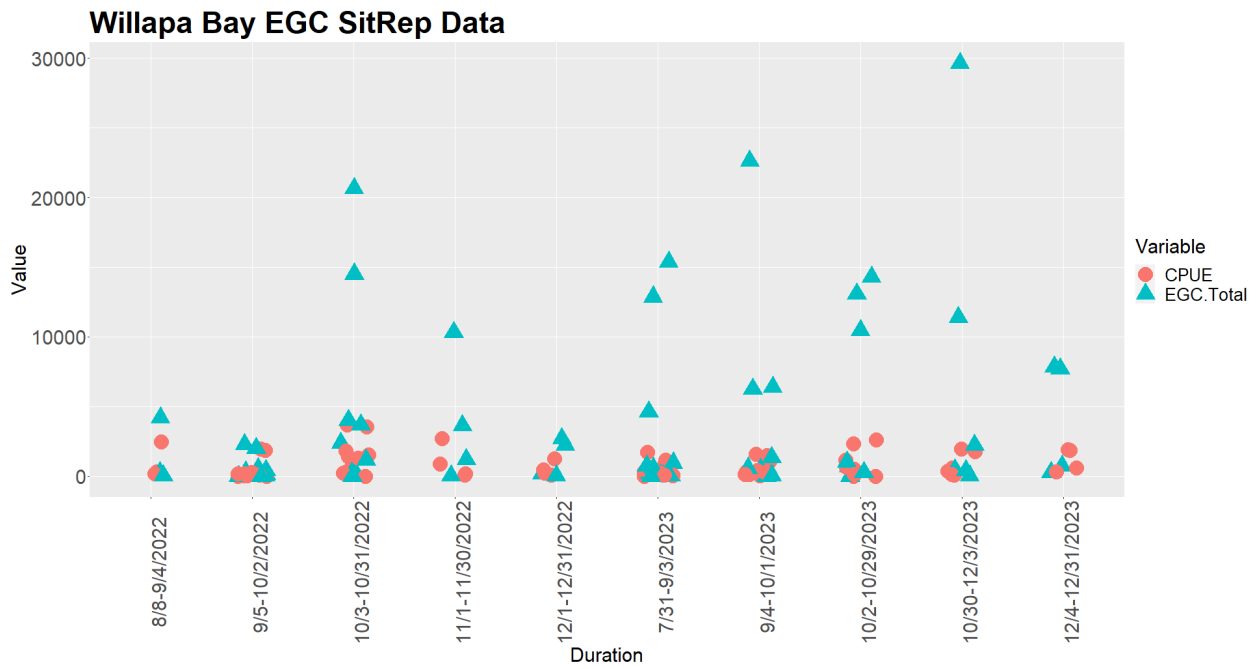


Figure C.7 Monthly values for CPUE (# of EGC per 100 Traps) and EGC.Total (number of EGC removed) data reported in Situation Reports (SitReps) for the Willapa Bay Management Area for 8/8-12/31/2/2022 and 7/31-12/31/202. The x-axis, Duration, denotes the period (~ 1 month) during which the data was collected. The y-axis, Value, represents the value for each Variable (CPUE or EGC.Total).

