



State of Washington
DEPARTMENT OF FISH AND WILDLIFE

Mailing Address: Post Office Box 43200 Olympia, WA 98504-3200 • (360) 902-2200 • TDD (360) 902-2207
Main Office Location: Natural Resources Building, 1111 Washington Street SE, Olympia, WA

September 1, 2023

The Honorable Christine Rolfes
Chair, Senate Ways and Means
303 John A. Cherberg Building
Post Office Box 40466
Olympia, WA 98504-0466

The Honorable Timm Ormsby
Chair, House Appropriations
315 John L. O'Brien Building
Post Office Box 40600
Olympia, WA 98504-0600

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

The Honorable Mike Chapman
Chair, House Rural Development,
Natural Resources, and Parks
132B Legislative Building
Post Office Box 40600
Olympia, WA 98504

RE: European Green Crab Quarterly Progress Report – Summer 2023 (April 1 to June 30, 2023)

Dear Chairs Rolfes, 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 Dec. 14, 2021, the WDFW Director submitted an emergency measures request under 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 fourth in a series of ongoing quarterly progress reports (Q4). The Q4 report outlines the successes and challenges of ongoing EGC emergency response efforts in Washington state from April 1 to June 30, 2023.

Trapping activities in Q4 increased resulting from warmer weather conditions and expected increases in EGC activity. All entities involved in EGC management were in the field. Meetings among co-managers, tribes, and partners in Willapa Bay and Grays Harbor took place to discuss lessons learned and priorities moving forward for the future of EGC management.

During the Q4 period, the collective effort of all organizations involved in EGC management removed 64,967 additional EGC from Washington state marine waters, with 62,558 from the Coastal Branch and 2,409 from the Salish Sea Branch. Since January 1, 2022, approximately 387,399 EGC have been removed from Washington state marine waters, with 302,301 removed from the Coast Branch, and 85,104 removed from the Salish Sea Branch. In addition to active removal trapping, Q4 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, in collaboration with 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 1,200 individuals at public events and producing new outreach materials, and the activation of the EGC Hub website. While challenges remain (e.g., finalizing the Fiscal Year 2024 Strategic Action Plan, refinement of electronic data collection software, creation of a 5-year statewide management plan), the continued efforts of all parties and the clear organizational structure set previously will allow for continued success during the remainder of the 2023 emergency response field season.

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 Department's efforts in this area, please feel free to contact Tom McBride, WDFW's Legislative Director, at (360) 480-1472.

Sincerely,



Allen Pleus
WDFW European Green Crab Incident Commander

cc:

Kelly Susewind, Director, Washington Department of Fish and Wildlife
Kelly Cunningham, WDFW Fish Program Director
Ruth Musgrave, Senior Policy Advisor to Governor Jay Inslee

European Green Crab Quarterly Progress Report – Summer 2023 (April 1 to June 30, 2023)

Washington Department of Fish and Wildlife (WDFW)



Washington
Department of
**FISH &
WILDLIFE**

September 1, 2023

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Executive Summary

In response to the ESSB 5693 (2022 c 297) legislative budget proviso directive, this report has been authored as the fourth in a series of ongoing quarterly progress reports (Q4). This report will serve to outline the successes and challenges of ongoing European green crab (EGC) emergency response efforts in Washington state from April 1 to June 30, 2023. In addition, this report will put the work during Q4 in the context of the previous work completed (Q1-Q3).

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 (EGC), *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 fourth in a series of ongoing quarterly progress reports (Q4). The Q4 report will outline the successes and challenges of ongoing EGC emergency response efforts in Washington state from April 1 to June 30, 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 operational periods (monthly January and February, then bi-weekly through June) 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 most 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. In Q4, the EGC MAC Group continued the implementation of the Fiscal Year 2023 EGC Emergency Measures Strategic Action Plan.



Trapping activities in Q4 increased resulting from warmer weather conditions and expected increases in EGC activity. All entities involved in EGC management were in the field. Meetings among co-managers, tribes, and partners in Willapa Bay and Grays Harbor took place to discuss lessons learned and priorities moving forward for the future of EGC management.

During the Q4 period, the collective effort of all organizations involved in EGC management removed 64,967 additional EGC from Washington state marine waters, with 62,558 from the Coastal Branch and 2,409 from the Salish Sea Branch. Since January 1, 2022, approximately 387,399 EGC have been removed from Washington state marine waters, with 302,301 removed from the Coast Branch, and 85,104 removed from the Salish Sea Branch. In addition to active removal trapping, Q4 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 1,200 individuals at public events and producing new outreach materials, and the activation of the EGC Hub website. While challenges remain (e.g., finalizing the Fiscal Year 2024 Strategic Action Plan, refinement of electronic data collection software, creation of a 5-year statewide management plan), the continued efforts of all parties and the clear organizational structure set previously will allow for continued success during the remainder of the 2023 emergency response field season.

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). Green crab has 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). We are 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 or 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.



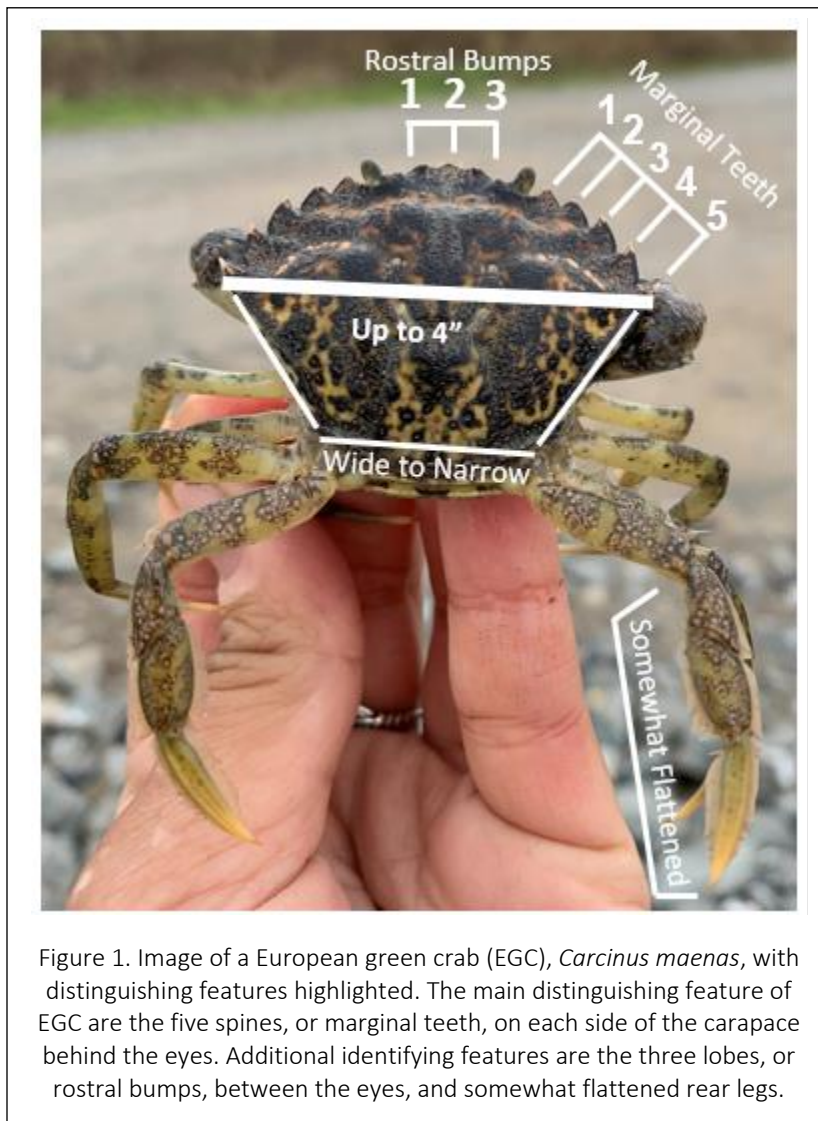


Figure 1. Image of a European green crab (EGC), *Carcinus maenas*, with distinguishing features highlighted. The main distinguishing feature of EGC are the five spines, or marginal teeth, on each side of the carapace behind the eyes. Additional identifying features are the three lobes, or rostral bumps, 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 this data only represents crabs captured, not the effort employed. Catch effort (number of traps deployed, number of locations trapped, frequency of trap recovery) varies greatly across years.

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 January 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.

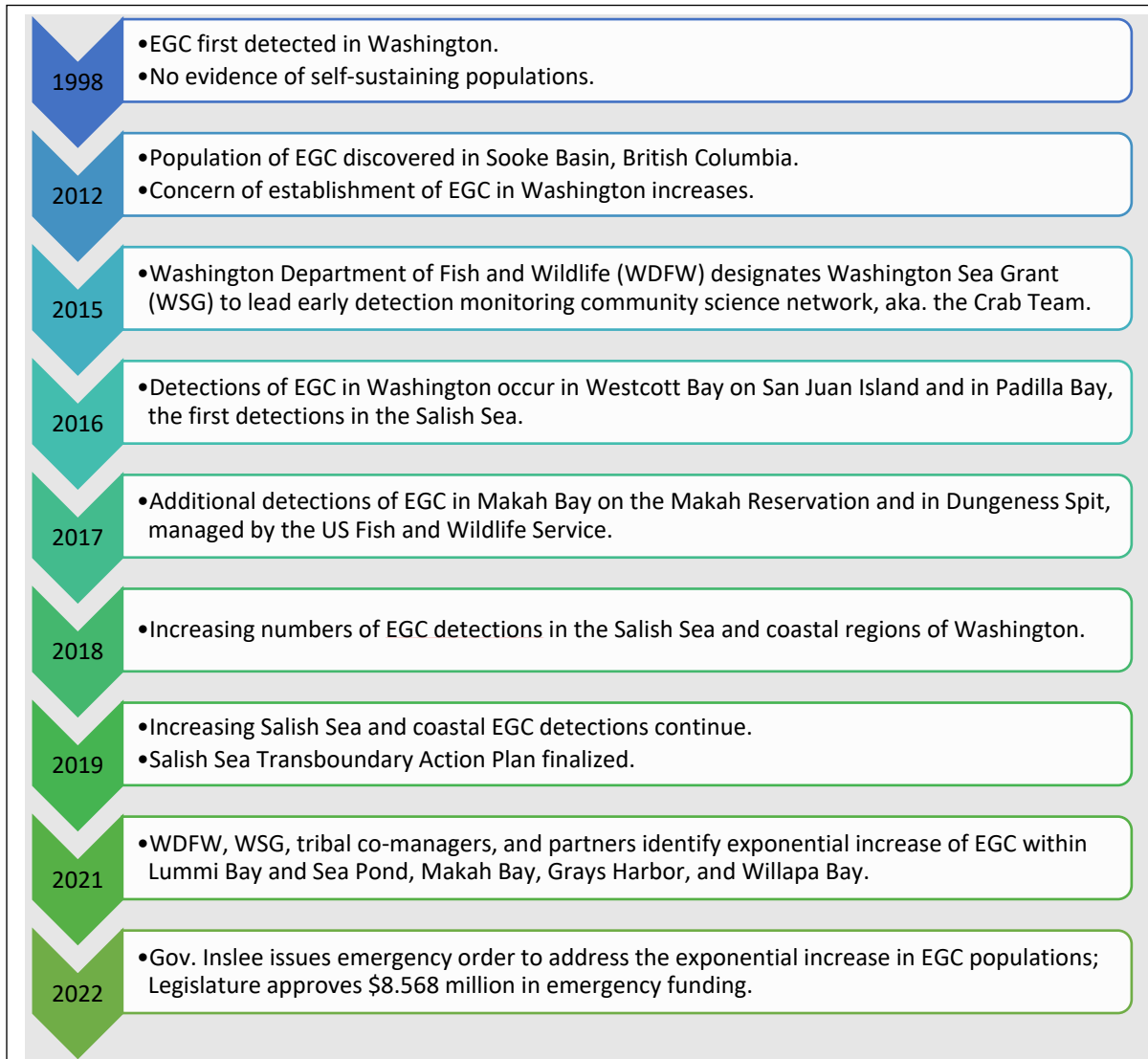


Figure 2 Timeline of European green crab (EGC) invasion In Washington State.



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 fourth quarter of the emergency, from April 1 to June 30, 2023 (Q4). The success of Q1-Q3 (March 1, 2022 – March 31, 2023) may also be discussed and included for context. A complete list of EGC management actions of Q4 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 Allen Pleus, 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 Q4, 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 two-week 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.
 - During months of reduced trapping activity resulting from winter conditions (November - February), SitReps are created on a monthly operational period.
- Creation of bi-monthly 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 twenty-three times (five times in Q4). During Q4, EGC MAC Group successes have included:

- Reviewing updates from previously approved RCO EGC Emergency Measures Fund requests, which includes:
 - \$91,316 U.S. National Oceanographic and Atmospheric Administration
 - \$402,220 State of Washington Department of Natural Resources
 - \$100,000 Lummi Indian Business Council
 - \$99,312 Pacific County Vegetation Management
 - \$75,154 State of Washington Department of Ecology



- \$32,897 US Fish & Wildlife Service (FWS) Dungeness National Wildlife Refuge (NWR)
- \$110,240 US FWS Willapa National Wildlife Refuge
- \$70,517 Washington State University (WSU)/Washington Sea Grant (WSG)
- \$30,000 Grays Harbor Conservation District
- \$90,000 Pacific Conservation District
- See the Q1, Q2, and Q3 EGC Legislative Reports for more details.
- Completed draft of FY 2024 EGC Emergency Measures Strategic Action Plan. This draft is under review by the MAC Group.
- Laura Kraft, Cranberry and Shellfish Specialist at the Long Beach Research and Extension Unit with Washington State University, joined the MAC Group as a new member.

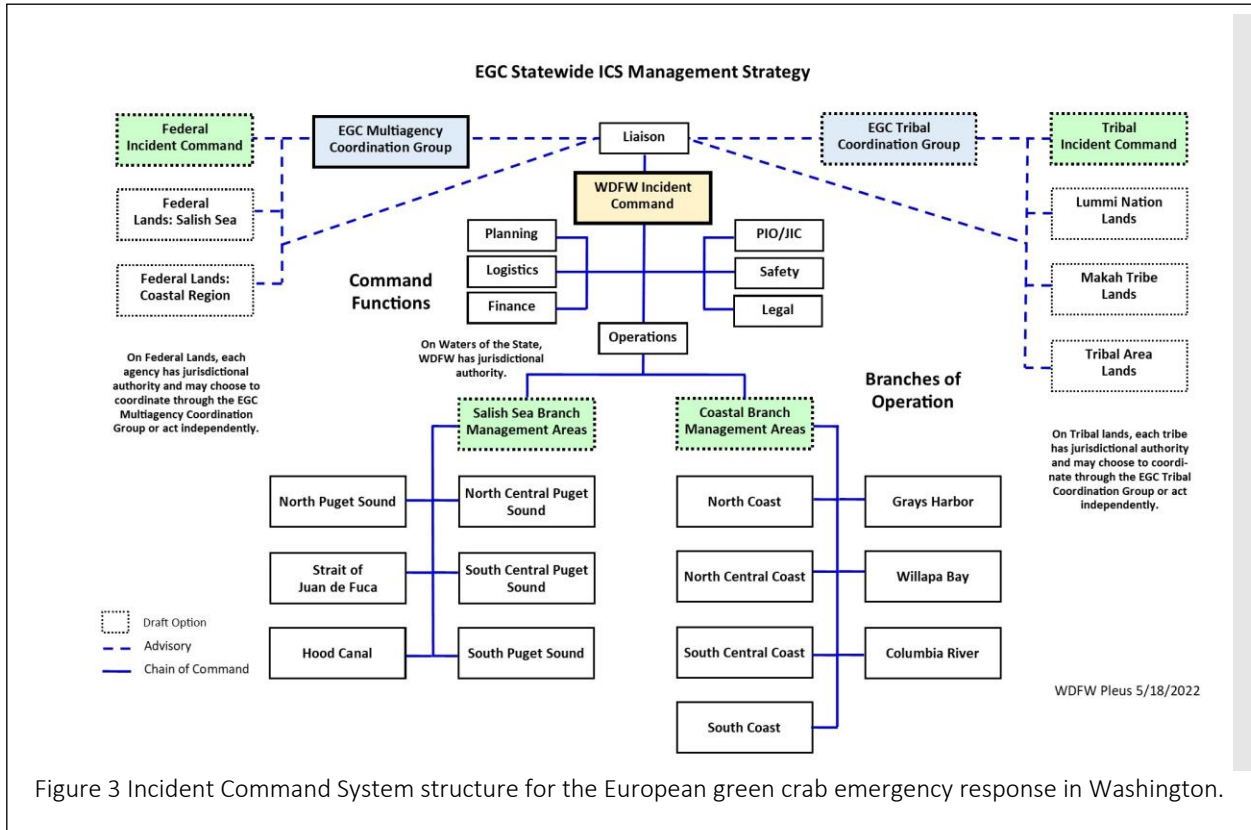


Table 2 List of European green crab (EGC) Multi-Agency Coordination (MAC) group member organizations. Representatives of these organizations share information, establish a common operating picture, and develop common long-term priorities for the EGC emergency.

Multi-Agency Coordination group member organizations	
Pacific Coast Shellfish Growers Association	Washington Department of Fish and Wildlife
Lummi Nation Business Council	Washington Department of Natural Resources
Puget Sound Partnership	Washington Emergency Management Division
Shoalwater Bay Tribe	Washington Recreation and Conservation Office
U.S. Bureau of Indian Affairs	Washington Sea Grant
U.S. Environmental Protection Agency	Washington State Department of Agriculture
U.S. Fish and Wildlife Service	Washington State Parks and Recreation Commission
U.S. Geological Survey	Washington State University
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. Addendums submitted to WDFW before publication are included in this document in [Appendix B](#).

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 every two weeks based on ICS operational periods to support meeting the collaboration and transparent emergency management objective. During months of reduced trapping activity resulting from winter conditions (November - February), SitReps dissemination was shifted to a monthly operational period. 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-three have been completed as of the end of Q4.

During Q4, several large meetings between coastal co-managers and partners occurred to discuss past and future EGC management efforts.

On April 18, 2023, WDFW hosted a Willapa Bay Management Workshop. EGC MAC Group members, the Shoalwater Bay Tribe, Washington Sea Grant (WSG), and local shellfish growers met in Long



Beach to discuss European Green Crab management in Willapa Bay. The workshop was an opportunity to hear from those that are trapping, monitoring, and farming in Willapa Bay. Some of the topics discussed were setting reasonable data collection expectations for trappers while they are on the water, difficulty in retaining staff based on the seasonality of trapping, protecting resources, and larval retention in South Willapa Bay. Attendees also performed a mapping exercise to share where they are trapping, what resources exist in those areas, and what the specific needs were within each coordination area. Of concern was determining thresholds and factors that inform where to trap, and when to reassess a trapping location. Attendees would like to see research on which type of bait and traps are most effective. WDFW expressed the desire for an “all-hands-on-deck” approach if a large assessment is needed.

On May 5, 2023, WDFW hosted a Grays Harbor Management Workshop. EGC MAC Group members, Grays Harbor Conservation District (GHCD), state agencies, the Quinault Tribe, WSG, and local shellfish growers gathered in Montesano to discuss 2023 management of EGC in Grays Harbor. The workshop included a round-table discussion, mapping exercise, and update from partners on available resources and efforts. Attendees discussed thresholds for trapping, difficulties retaining staff, potential new partners, and narrowing down which areas of Grays Harbor do not have EGC, using LiDAR, aerial imagery, bathymetric charts, and other data, to better focus on areas where they are. The GHCD was discussed as being the first point of contact for Grays Harbor, and a flow-chart is being created to streamline communication. Overall, attendees would like to add more traps, increase research and science with more control sites considered around the bay, and perform assessments at Elk River and/or Ocean Shores.

On May 22, 2023, WDFW met with the Washington Department of Natural Resources (DNR), the Washington Department of Ecology, Washington State Parks, and Grays Harbor Conservation District to discuss 2023 planning and funding needs.

WDFW continued collaboration with Esri, a geographic information system (GIS) company, on the creation of a “European green crab hub”, a website that serves as a go-to resource for all things EGC in Washington. While revisions and updates are ongoing, the Hub went live on June 15, 2023 (<https://wdfw-egc-hub-wdfw.hub.arcgis.com/>).



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 \$3,273,503 in funds provided for this report period allowed for the continuation of our management efforts.

- Staff (Salaries + Benefits): \$781,026
 - Funds spent on staff. WDFW hired 13 seasonal technicians for field activities and a permanent regional Biologist. This brings the current active EGC staff to the European Green Crab Project to include a Lead Biologist 4, a Field Ops Biologist 3, three Regional Biologist 2s, a Research Scientist 1, a Communications and Outreach Specialist 3, a portion of a Communications Consultant 5's time (~15%) for efforts as Public Information Officer, and 17 Scientific Technician 2s (4 permanent, 13 seasonal).



- Equipment: \$213,217
 - Funds spent on high value equipment. This included hot pressure washers and water recovery mats for decontamination of field gear and a cargo trailer for transporting and storing field gear for quick deployment.
- Goods & Services: \$118,175
 - Funds spent on general field supplies and gear such as bait, traps, pot pullers and hydro labs for water quality measurements.
- Travel: \$80,788
 - 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.
- Contractual Services: \$1,915,571
 - 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.
- Pass Through: \$46,368
 - Fund spent on pass through funding for client services with the Pacific Shellfish Institute.
- Agency Indirect: \$118,358
 - 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 thirteen Management Areas based on WDFW recreational fishing marine areas. Trapping efforts across the state were undertaken by WDFW, WSG, co-managers, tribes, and partners. The catch numbers presented for Q4 represent the collective effort of all organizations, and those efforts must be recognized.

During Q4, trap deployment across Washington’s Management Areas dramatically increased due to improved field conditions and increased EGC activity resulting from warmer weather. Trapping efforts occurred in all Management Areas except for South Coast. The South Coast Management Area consists of the western coastline of Long Beach Peninsula, which borders the Pacific Ocean. The majority of South Coast 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, South Coast is deemed poor habitat for EGC, and there are currently no management actions occurring.

In total, 64,967 EGC were removed in Q4 from Washington state waters, with 62,558 removed from the Coastal Branch and 2,409 removed from the Salish Sea Branch (Table 4). In the Coastal Branch, the majority of EGC were removed from the following Management Areas: Willapa Bay (46,613), followed by Grays Harbor (12,706) and North Coast (3,234), with a few collected in South Central Coast (4) and a single crab from Columbia River (1). In the Salish Sea Branch, most EGC were removed from the North Puget Sound Management Area (2,262), with fewer crabs collected in the Strait of Juan de Fuca (120) and Hood Canal (27) Management Areas. While trapping occurred in the North Central Coast, North Central Puget Sound, South Central Puget Sound, and South Puget



Sound Management Areas, no EGC were captured. 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 Management Areas. 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.

As of Q4, WDFW 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 will allow 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).



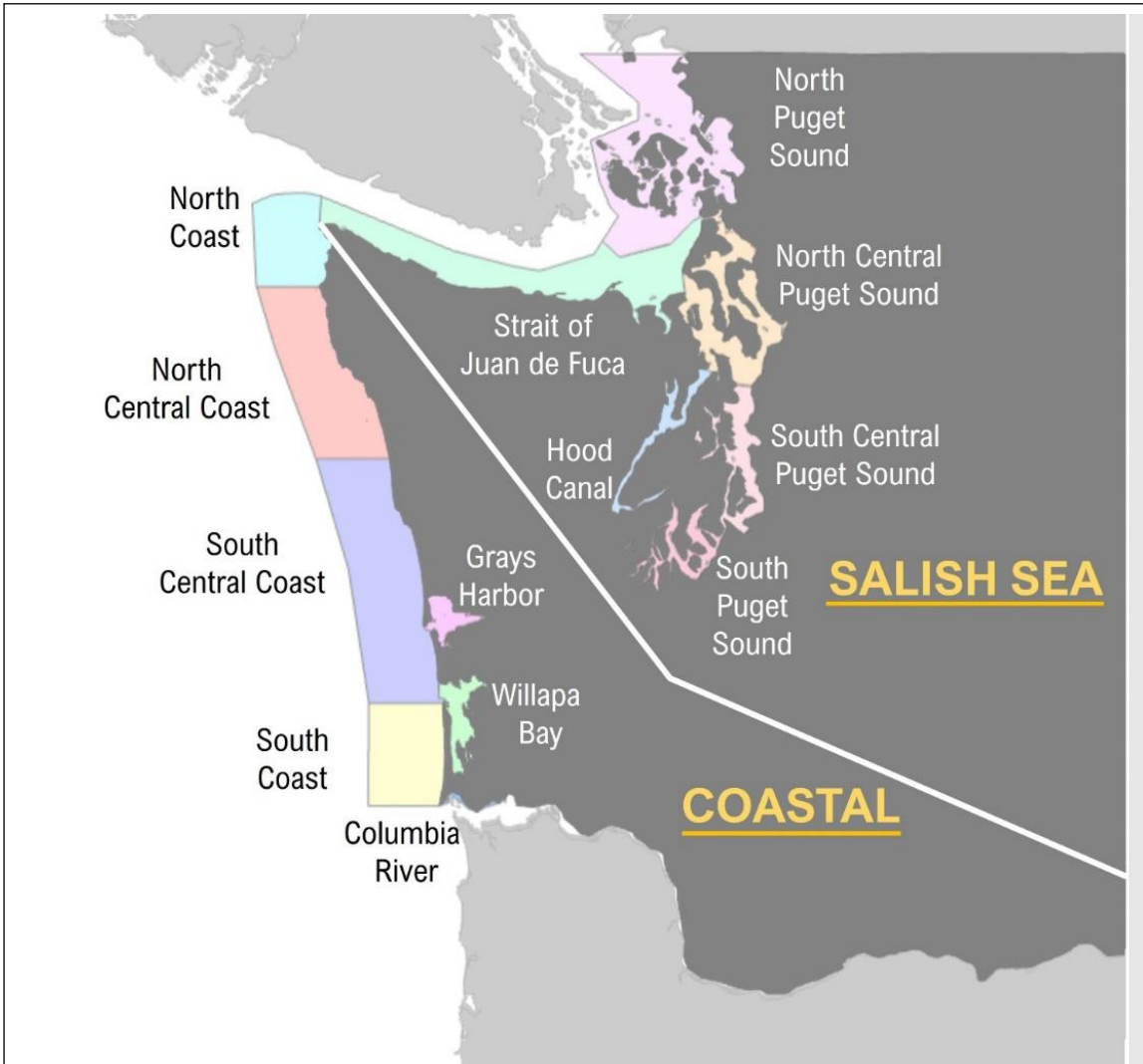


Figure 4 Map of Washington state European green crab management locations. The state has been split into two Management Branches (Coastal and Salish Sea) and thirteen Management Areas (North Puget Sound, Strait of Juan de Fuca, Hood Canal, North Central Puget Sound, South Central Puget Sound, South Puget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



Table 4 European green crab capture totals for Q4 (April 1 – June 30, 2023), Q3 (January 1 – March 31, 2023), 2022 (January 1 – December 31, 2022), 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.

Management Branch	Management Area	Q4 Total EGC Captured	Q3 Total EGC Captured	2022 Total EGC Captured	All EGC Captured
Salish Sea	North Puget Sound	2,262	1,687	80,900	84,849
Salish Sea	Strait of Juan de Fuca	120	2	90	212
Salish Sea	Hood Canal	27	0	16	43
Salish Sea	North Central Puget Sound	0	*	0	0
Salish Sea	South Central Puget Sound	0	*	0	0
Salish Sea	South Puget Sound	0	*	0	0
Salish Sea	All	2,409	1,689	81,006	85,104
Coastal	North Coast	3,234	577	25,109	28,920
Coastal	North Central Coast	0	*	0	0
Coastal	South Central Coast	4	*	34	38
Coastal	South Coast	*	*	0	*
Coastal	Grays Harbor	12,706	21,479	24,264	58,449
Coastal	Willapa Bay	46,613	13,413	154,862	214,888
Coastal	Columbia River	1	*	5	6
Coastal	All	62,558	35,469	204,274	302,301
All	All	64,967	37,152	285,280	387,399

Direct comparisons of Q4 capture totals for the same time in 2022 are difficult. The submission process for SitRep 1 included catch data from January 1- June 11, 2022, as a single number. However, we can make some informative observations. Overall, EGC captures have increased compared to Q3. This is expected, as trapping efforts increased with the end of winter weather. Additionally, EGC are more active in higher tidal ranges, where traps are deployed during land-based efforts, with warming temperatures.

A notable observation is that EGC captures declined in Grays Harbor in Q4 compared to Q3. There are a couple of potential explanations for this unique change. Partners in Grays Harbor often use boat-based trapping, which deploys traps into deeper water than land-based efforts. As EGC migrate into higher tidal ranges with warming water, this method of trapping may be less effective. In addition, there may have been a shift in priorities with warming weather, as shellfish growers focus more on product management.

There has been a clear decline in EGC captures in North Puget Sound Management Area since the beginning of the EGC emergency, with less than 5% of all EGC removed occurring in the last six



months (January – June 2023). This is an encouraging sign that intensive trapping efforts, specifically in the Lummi Sea Pond, may be reducing local EGC abundance. However, continued trapping efforts and analysis led by the Lummi Nation are required to determine if this reduction is a long-term change or a temporary shift in EGC abundance.

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.

From May 15-19, 2023, representatives from WDFW, Washington Sea Grant, and the Department of Fisheries and Oceans Canada attended the 11th Annual International Conference on Marine Bioinvasions in Baltimore, Maryland. Researchers from around the world gathered to present their research on marine invasive species, including the European green crab (EGC). The hairy shore crab, *Hemigrapsus oregonensis*, is increasingly recognized as a major prey item for EGC in the Pacific Northwest and could serve as a useful indicator of EGC impacts ([Howard & Therriault](#), [Rubinoff et al.](#)). Multi-model ensembles are being used to more effectively identify early detection sites ([Therriault et al.](#)) while Washington researchers reflected on the successes and lessons related to early detection efforts in the state ([Grason et al.](#)). Work continues on high-throughput genetic analysis of West coast EGC populations ([Tepolt](#)), which has allowed the development of a highly scalable, low-cost marker panel to determine the region of origin for Washington EGC ([Newbrey et al.](#)). Additional presentations included an overview of the new national EGC management plan ([Grosholz & Thom](#)), a poster summarizing the status of EGC in Alaska ([Shaw et al.](#)), potential biotic resistance to EGC from otters in California ([Grosholz et al.](#)), and assessment of predation impacts of EGC across estuarine gradients in Oregon ([de Rivera & Larson](#)). Researchers from Woods Hole Oceanographic Institution and WDFW have proposed efforts for the initial sequencing and annotation of the EGC genome and, if successful, hope to present the results at the next meeting in 2025.

Meetings of the EGC Research Task Force (RTF) continued in Q4. Additional members from Alaska have joined the RTF, which expands the membership to include representatives from all continental Pacific coastal states. Progress continues determining priority research for Washington, setting data standards, and research related tasks outlined in the Fiscal Year 2024 Action Plan draft are under review.

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 also supports effective policymaking and collaboration with local communities, stakeholders, and partners. Highlights for Q4 have included:

Focused/Local communication



- Outreach representatives from WDFW were present at numerous events throughout Washington during Q4, including the Port Townsend Farmers Market, Twin Harbors Earth Day Coastal Cleanup, Grays Harbor Shorebird and Nature Festival, Birch Bay Sand Sculpture Competition, and Jetty Island Beach Cleanup. More than 1,200 people were reached during these combined outreach efforts.
- 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 deployed new outreach materials during Q4, including an informational rack card (in [English](#) and [Spanish](#)) and a [wallet-sized EGC identification card](#). Signs, outreach materials, and other resources were shared with county conservation districts, parks, co-managers, tribes, marinas, boat launches and water access areas, shellfish growers, and other partner groups. More than 6,000 rack cards and almost 7,000 wallet ID cards were distributed. [Materials are hosted online here](#).
- WDFW launched a new online [European Green Crab Hub](#) (EGC Hub) to support the coordination of ongoing emergency measures and provide public information about the management of this invasive species. The EGC Hub features a dashboard showing European green crab catch within the Coastal and Salish Sea Management Branches, including Management Areas based on established Washington Marine Areas. The online resource also includes information about the co-managers, tribes, and partners collaborating with WDFW. The EGC Hub also features [an interactive StoryMap](#) with a comprehensive overview of European green crabs in Washington and their history.
- Current EGC management efforts have been reported in numerous local and national media outlets (Appendix A).

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:

- Leadership transition at WDFW. During Q4, it was announced that Allen Pleus, current Incident Commander for the EGC Emergency, will be retiring as Aquatic Invasive Species Policy Coordinator at WDFW at the end of September 2023. Justin Bush, former Executive Coordinator to the Washington Invasive Species Council, was recruited to fill this position and is currently working in partnership with Incident Commander Pleus to minimize disruption to the WDFW AIS unit and EGC emergency management activities.
- Creation of 5-year statewide management plan. Dr. Brian Turner, the research scientist with the WDFW AIS unit, has begun the initial steps of creating a 5-year management plan for EGC in Washington. This will be a highly collaborative undertaking and every effort will be made to address the goals and issues for each geographic area, co-manager, tribe, and partner involved in EGC management.
- Development of formal minimum data standards. There have been inconsistencies in the level of detail in data collected among the many co-managers, tribes, and partners involved



in EGC management efforts. This can complicate and restrict the potential uses of the data. To address this issue, representatives from WDFW and Washington Sea Grant are in the process of developing minimum data standards which will be required for all participants in EGC management efforts. Several levels of data standards will be included to accommodate various trapping goals as well as capacity limitations in terms of data collection capability.

- Finding and retaining EGC field staff. WDFW, as well as co-managers, tribes, and partners, 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.
- Data collection system. Working with Esri, a geographic information system (GIS) company, WDFW developed software to allow direct uploading of catch data in real-time to significantly enhance our data collection capability while also eliminating errors resulting from data transfers from physical to digital formats. While the software is currently in use by WDFW and a subset of co-managers, tribes, and partners, additional refinement and adjustment is underway to produce the highest quality product and reduce potential sources of error and confusion in its application.
- Data hub implementation. Updating the “European green crab hub”, a website that serves as a go-to resource for all things EGC in WA (<https://wdfw-egc-hub-wdfw.hub.arcgis.com/>). The site is active and WDFW is working with Esri to ensure site functionality during this initial stage of operation.
- Finalizing the Fiscal Year 2024 EGC Strategic Action Plan (2024 SAP). Completing the 2024 SAP to meet Incident Objectives and identifying the statewide and Management Area leadership is required to implement plan tasks and determine the necessary resources to support them. The 2024 SAP is currently under review by MAC Group members with feedback and revisions due by August 4, 2023. The final 2024 SAP will be completed as soon as possible after feedback is reviewed.
- Improving efficacy and structure of the Research Task Force (RTF). While discussions among the RTF have been productive, there have been delays in the process of creating a rigorous ranked list of EGC research priorities for WA. There is an immediate need for a list of research priorities before the field season begins in earnest. To that end, the preparation of an unranked list of priority research is underway to serve as a temporary guide. This unranked list is based on the research required to complete tasks in the FY 2023 SAP and will likely significantly overlap with the final ranked list.
- Operational period duration. Operational periods have been two weeks during high trapping activity (March – October). The quick turnaround for data reporting from co-managers, tribes, and partners and the creation of SitReps by WDFW has proven challenging. To address the issue, the MAC Group will discuss if the operational period should be monthly year-round. Please note that the MAC Group approved this change to begin in Q5 (July 1 – September 30, 2023).
- Rescheduling of MAC Group meetings. Previous MAC Group meetings discussed adjusting the schedule and scope of future meetings. It was decided that future MAC Group meetings will consist of a two-hour regular meeting on the second Wednesday of each month from 10 a.m. to 12 p.m., and a one-hour check-in meeting on the fourth Wednesday of each month from 10 a.m. to 11 a.m. While this adjustment should improve the efficacy and focus of MAC Group meetings, any major change will result in some initial disruption.



Next steps

The EGC emergency management priority actions for next quarter (Q5: July 1 – September 30, 2023) include:

- Finalization and implementation of the Fiscal Year 2024 EGC Strategic Action Plan.
- Complete initial draft of 5-year statewide EGC management plan by December 1, 2023.
- Ongoing MAC Group meetings.
- Continued monthly EGC Research Task Force meetings to develop a priority research list for EGC in Washington and discuss EGC research-related issues.
- Development and distribution of monthly Situation Reports (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

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

Q2 – Second quarterly phase of EGC emergency response (October 1 – December 31, 2022)

Q3 – Third quarterly phase of EGC emergency response (January 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 – September 30, 2023)

RCO – Recreation and Conversation Office

RTF – Research Task Force

SitReps – ICS Situation Reports

WDFW – Washington Department of Fish and Wildlife

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 January 31 – February 28, 2022. These months fall outside the official duration of Q1 (March 1 – September 30, 2022) but were included to 1) accurately represent EGC removals for 2022 and 2) the submission process for SitRep 1 included partners and co-managers 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, 2022) EGC Report

The Q2 report is available at <https://wdfw.wa.gov/publications/02431> or via this link: [European Green Crab Quarterly Progress Report – Spring 2023](#)

List of Washington European green crab management actions in chronological order for Q4 (April 1 – June 3, 2023) as provided in Situation Reports

Date	EGC Management Action
3/21-4/2/2023	Ongoing WDFW data hub/app development with Esri.
3/21-4/2/2023	Design, ordering, and acquisition of EGC retractable, standing banner for use in outreach.



4/1/2023	Half-page print advertisements supporting European green crab awareness, identification and public reporting were published in Northwest Sportsman and Northwest Reel Life magazine, targeting anglers, crabbers, and boaters.
4/5/2023	Senator Murray and Representative Kilmer Field Tour: Jamestown S’Klallam Tribe hosted the event and set out demonstration traps in Sequim Bay. Washington Sea Grant (WSG) helped outline the threat of green crabs, history, and ongoing actions, as well as the potential role federal support could play. WDFW provided information on the statewide EGC emergency response.
4/5/2023	Senator Murray statement: “Whether it’s the Fish and Wildlife Service, the Bureau of Indian Affairs, or NOAA (National Oceanographic and Atmospheric Administration)—these agencies have an important role to play—and as Senate Appropriations Chair, I’m going to work to make sure they do their part. I will be writing our nation’s spending bills for the next fiscal year and here’s the bottom line: this is a priority for Puget Sound and all of Washington state—so I’m going to make sure it’s a federal priority, too.”
4/6-4/8/2023	EGC Outreach Specialist Jessica Ostfeld (WDFW) presented on EGC in Washington state at the Coastal Invasive Species and Exotic Pets Workshop on April 6 in Astoria, Oregon. Washington State University (WSU) Extension and WDFW Communications and Public Engagement staff tabled at the Long Beach Razor Clam on April 8. At these events, more than 1,400 people were reached.
4/10/2023	Federal EGC caucus meeting: Representatives from the Washington Department of Fish and Wildlife, Recreation and Conservation Office, U.S. Geological Survey, U.S. Fish and Wildlife Service, Environmental Protection Agency, National Marine Fisheries Service (NMFS), and Bureau of Indian Affairs attended the European Green Crab Federal Caucus meeting on April 10, 2023. Agenda items included challenges in receiving funding to prevent and manage European Green Crab through the Department of Interior’s Early Detection and Rapid Response initiative for invasive species and NMFS’ proposal to develop a programmatic ESA consultation for European Green Crab activities.
4/11-4/13/2023	ICS 300 Training: The Washington Invasive Species Council in partnership with the Washington Emergency Management Division, Washington Department of Corrections, Washington Department of Fish and Wildlife, and Washington State Department of Agriculture held an Incident Command 300: “Intermediate ICS for Expanding Incidents” training to build response capability for invasive species responders and others. Beyond the fifteen invasive species responders from three different state departments, other course attendees represented federal, state, and local governments from nine organizations including a host nation employee of the U.S. Army Garrison Benelux in Belgium. The results of this course will be demonstrated in effective emergency response to public health, natural resource, and other incident types in Washington and beyond.
4/14/2023	EGC data sharing agreements meeting: WDFW internal meeting with agency data managers to discuss data sharing agreement options for EGC management.
4/14/2023	Molt Search training: WSU Extension and WSG held a “Train the Trainer” event. WSU Coordinators and community partners attended the event and were taught how to identify EGC, how to conduct a Molt Search, and how to report their findings using the MyCoast app. WSU Coordinators were provided with educational materials to use for their own trainings.
4/18/2023	Willapa Bay 2023 Planning Workshop: EGC Multi-Agency Coordination (MAC) Group members, local partners, and shellfish growers met in Long Beach to discuss European Green Crab management in Willapa Bay. The workshop was an opportunity to hear from those that are trapping, monitoring, and farming in Willapa Bay. Some of the topics discussed were setting reasonable data collection expectations for trappers while they are on the water, difficulty in retaining staff based on the seasonality of trapping, protecting resources, and larval retention in



	<p>South Willapa Bay. Attendees also performed a mapping exercise to share where they are trapping, what resources exist in those areas, and what the specific needs were within each coordination area. Of concern was determining thresholds and factors that inform where to trap, and when to reassess a trapping location. Attendees would like to see research on which type of bait and traps are most effective. WDFW expressed the desire for an “all-hands-on-deck” approach if a large assessment is needed.</p>
4/22/2023	<p>WDFW staff visited Westport on April 21-22, 2023, for the Earth Day Coastal Cleanup with State Parks, WA CoastSavers and Surfrider Foundation at Twin Harbors State Park in the South Central Coast Management Area. In addition to doing EGC outreach for attendees and beachgoers at the event, EGC reporting signs were distributed to several local businesses and posted at Twin Harbors State Park.</p>
4/26/2023	<p>EGC Multi-Agency Coordination (MAC) Group meeting: Meagan West provided a federal appropriations update and detailed work with Justin Bush on expanding reach to neighboring states for invasive species management at a regional level. Public Information Officer Chase Gunnell provided a communications update and highlighted 2023 outreach efforts and materials available to MAC Group members and partners upon request. Incident Commander Allen Pleus provided a debriefing on the success of the recent Willapa Bay European Green Crab Management Area Strategic Planning Workshop in Long Beach, WA, and provided details on the upcoming companion workshop for the Grays Harbor Management Area. The MAC Group responded to a membership request and confirmed Laura Kraft (Washington State University) as a MAC Group member pending a formal invitation from the WDFW Director. A working draft of the European Green Crab Fiscal Year 2023-2025 Budget was shared and discussed, and initial feedback was collected.</p>
4/26/2023	<p>WDFW published the March/April European Green Crab Public Update, available online (https://wdfw.wa.gov/sites/default/files/2023-04/egc-public-update-marapr-23-final-1_0.pdf) and summarized on the Department’s Medium blog (https://wdfw.medium.com/march-april-european-green-crab-updates-5c693743303d). Highlights included 2023 field season updates as well as emphasis on the Coastal Management Branch, and WSU and Washington Sea Grant’s Molt Search program.</p>
4/28/2023	<p>WDFW partnered with Puget Soundkeeper and Seal Sitters on a City Nature Challenge outreach event on beaches near Alki Point in West Seattle in the South Central Puget Sound Management Area. Attendees were trained on how to identify European green crabs and to use iNaturalist to identify other organisms. No green crabs were found at the event.</p>
5/2/2023	<p>WDFW met with Grays Harbor Conservation District to discuss 2023 planning and funding needs.</p>
5/4/2023	<p>Grays Harbor management workshop: EGC Multi-Agency Coordination (MAC) Group members, Grays Harbor Conservation District (GHCD), state agencies, the Quinault Tribe, Washington Sea Grant (WSG) and local shellfish growers gathered in Montesano to discuss 2023 management of EGC in Grays Harbor. The workshop included a round-table discussion, mapping exercise, and update from partners on available resources and efforts. Attendees discussed thresholds for trapping, difficulties retaining staff, potential new partners, and narrowing down which areas of Grays Harbor do not have EGC, using LiDAR, aerial imagery, bathymetric charts, and other data, to better focus on areas where they are. The GHCD was discussed as being the first point of contact for Grays Harbor, and a flow-chart is being created to streamline communication. Overall, attendees would like to add more traps,</p>



	increase research and science with more control sites considered around the bay, and perform assessments at Elk River and/or Ocean Shores.
5/4/2023	Staff from Padilla Bay National Estuarine Research Reserve provided training on EGC identification to State Parks staff at Ala Spit County Park.
5/10/2023	EGC MAC Group meeting: A Research Task Force (RTF) update was provided by Dr. Brian Turner. The RTF was tasked with creating a structured ranked list of research priorities for the state to best utilize limited resources for the most impact. Abby Keller gave an overview of her research to determine the effect of trapping efforts on EGC populations and what trapping effort is needed to minimize ecological change by EGC. The group debriefed and discussed the recent in-person Grays Harbor EGC Management Area Strategic Planning Workshop and provided feedback. Changes to the Interagency Agreement funding system was the next item on the agenda, and it was proposed that the previous Coastal Local EGC Management Grant Program be rolled into the Recreation and Conservation Office (RCO) interagency funding program in order to streamline the process and provide sponsors with a singular point of contact. The same amount of funding would still be reserved for coastal EGC management under the proposed funding program. This discussion rolled into Fiscal Year 24 state emergency funding allocations, and it was determined that a state caucus meeting would be scheduled to further flesh out state funding needs and concerns.
5/16/2023	WDFW met with Washington Departments of Natural Resources, Ecology, and Parks to discuss 2023 planning and funding needs.
5/15-5/19/2023	International Conference on Marine Bioinvasions: Representatives from WDFW, Washington Sea Grant, and the Department of Fisheries and Oceans Canada attended the 11th Annual International Conference on Marine Bioinvasions in Baltimore, Maryland. Researchers from around the world gathered to present their research on marine invasive species, including the European green crab (EGC). The hairy shore crab, <i>Hemigrapsus oregonensis</i> , is increasingly recognized as a major prey item for EGC in the Pacific Northwest and could serve as a useful indicator of EGC impacts (Howard & Therriault, Rubinoff et al.). Multi-model ensembles are being used to more effectively identify early detection sites (Therriault et al.) while Washington researchers reflected on the successes and lessons related to early detection efforts in the state (Grason et al.). Work continues on high-throughput genetic analysis of West coast EGC populations (Tepolt), which has allowed the development of a highly scalable, low-cost marker panel to determine the region of origin for Washington EGC (Newbrey et al.). Additional presentations included an overview of the new national EGC management plan (Grosholz & Thom), a poster summarizing the status of EGC in Alaska (Shaw et al.), potential biotic resistance to EGC from otters in California (Grosholz et al.), and assessment of predation impacts of EGC across estuarine gradients in Oregon (de Rivera & Larson).
5/22/2023	State EGC caucus meeting: Discussion of MAC Group decision to directly fund state agencies out of the \$1.6 million grant fund. Decision to allocate \$600,000 to state agencies and Washington State University.
5/23/2023	WDFW bi-monthly communications & outreach meeting: WDFW Communications and AIS staff met and discussed upcoming European green crab communications and outreach needs. This included communications around Justin Bush taking on the role of AIS Unit Manager and EGC Incident Commander upon the departure of Allen Pleus, division of EGC communications and outreach responsibilities, distribution of outreach materials, and upcoming outreach events and public liaison needs.



5/24/2023	EGC Multi-Agency Coordination (MAC) Group meeting: Incident Commander Allen Pleus announced his retirement, scheduled for this fall, and the transition of Justin Bush to the WDFW Aquatic Invasive Species Policy Manager. Lennah Mohar and Brandon Cooper gave the group a detailed overview of the planned launch for the European Green Crab Hub. The portion of the Hub that is public-facing will provide a one-stop shop for the public to get information on EGC and how to identify it, report sightings, and see general public-facing data. An additional layer of the Hub will be internal only, and allow co-managers, partners, and tribes to access information, submit data, track events, and request trapping equipment or other materials. Curtis Roegner of the National Oceanic and Atmospheric Administration (NOAA) gave an update on NOAA's telemetry research on EGC retention and movement. EGC were found to behave very differently from Dungeness crab, which were also tracked in this study. EGC showed utilization of both intertidal and subtidal areas, and a time-lapse video was shown of their movements throughout the five-month study. A discussion on emergency measures funding was continued from the previous meeting and informed by a state caucus. \$600k was designated for state agency use, and \$1 million for Pacific and Grays Harbor Conservation Districts.
5/25/2023	Aquatic Nuisance Species Task Force (ANSTF) National EGC Management Plan meeting: Discussion and integration of comments from broader EGC expert review before sending to the ANSTF for review.
	Washington State University Long Beach Research and Extension Unit hosted a workshop with local shellfish growers and stakeholders to determine research priorities for the European Green Crab invasion on the coast. Eleven participants joined the workshop, including six shellfish growers representing 7,200 acres of tidelands in Willapa Bay and Grays Harbor, members of WDFW, Willapa Grays Harbor Oyster Growers Association (WGHOGA), and the Pacific Shellfish Institute. The workshop first included a presentation on use of sterile male technique in the screwworm fly as an historic perspective to help educate growers on old and new technology for autocidal control. Then, growers were given a three-page list of research priorities and asked which, if any, they would prioritize in the short-term through a facilitated small-group, large-group share-out format. Shellfish growers easily placed their first four priorities as follows: 1. Trapping technology/trapping efficiency, 2. Population size, 3. Pheromones, and 4. Ecological/Economic Impact.
6/1/2023	Pacific Northwest Economic Region group: WDFW discussed with their aquatic invasive species committee plans to present on EGC at their annual meeting in Boise, Idaho, on July 19th.
6/1/2023	Q3 Report: The third EGC Quarterly Report (Q3) to the State Legislature was submitted on June 1. In response to the legislative budget proviso directive in ESSB 5693 (2022), this report has been authored as the third in a series of ongoing quarterly progress reports. This report will serve to outline the successes and challenges of ongoing European green crab emergency response efforts in Washington state from Jan. 1 to March 31, 2023. In addition, this report will put the work during Q3 in the context of the work completed in 2022 (reports for Quarter 1 and Quarter 2).
6/6/2023	Columbia River Basin Team: WDFW presented update on EGC emergency management to regional, state, tribal, federal, and Canadian provincial aquatic invasive species managers.
6/7/2023	European Green Crab Multi-Agency Coordination (MAC) Group meeting: MAC Group meetings times and frequency were discussed, and Jessica La Belle (RCO) gave an overview of a survey that will be used to inform future MAC Group meeting schedules, times, and topics. Responses to the survey are due by June 16. Dr. Brian Turner of WDFW discussed the needs and goals for a long-term management plan for EGC in Washington. The long-term plan will



	span goals and actions for 2025-2030 and will be informed by previous action plans, the Salish Sea Transboundary Plan, and the new national plan once it is finalized. Dr. Turner will be the primary writing lead for this plan and will solicit participation and feedback from MAC Group members for its development. Bob Simmons of Washington State University and Jeff Adams of Washington Sea Grant presented on the Molt Search project, which was collaboratively developed by their organizations and a previous recipient of funding by recommendation of the MAC Group. The project trains and organizes community volunteers to identify and report EGC through the MyCoast app, as well as collect data for native crabs. The project has had high attendance and community engagement.
6/15/2023	Washington Invasive Species Council: Incident Commander Allen Pleus provided an EGC and fiscal year 2024 funding update.
6/15/2023	The European Green Crab Hub formally launched (https://wdfw-egc-hub-wdfw.hub.arcgis.com/).
6/20/2023	Fourth meeting of the European green crab Research Task Force.
6/21/2023	EGC Multi-Agency Coordination (MAC) Group Meeting: <ul style="list-style-type: none"> o Justin Bush was welcomed as the new Aquatic Invasive Species Policy Coordinator at the Washington Department of Fish & Wildlife and will share this role with Allen Pleus until the end of September. MAC Group members were asked to please copy both Justin Bush and Allen Pleus on communications. o A federal budget update was provided by Meagan West and covered the events of Puget Sound Day on the Hill in Washington, DC, and work with legislators to secure funding for EGC work. o Renny Talbot, of Department of Fisheries & Oceans Canada, gave an overview of the Aquatic Invasive Species Prevention Fund, which is \$36.6 million over 2022-2027 dedicated to aquatic invasive species management. These and other funds will increase EGC monitoring, trapping, and research done by our neighbors to the north. o A discussion was held regarding the need for state agency funding and encouraging coordinated response to best secure funding from state legislature. Agencies should be prepared to pursue funding with a proposal during the next legislative session. o Previous MAC Group meetings discussed adjusting the schedule and scope of future meetings. A survey was provided to MAC Group members and results were summarized. Future MAC Group meetings will consist of a two-hour regular meeting on the second Wednesday of each month from 10 a.m. to 12 p.m., and a one-hour check-in meeting on the fourth Wednesday of each month from 10 a.m. to 11 a.m.
6/28/2023	WDFW Internal Policy Team: Incident Commander Allen Pleus provided an EGC update.



List of media reporting in chronological order related to Washington European green crab management for Q4 (April 1 – June 30, 2023) as provided in Situation Reports

Date	Outlet	Headline	URL
4/4/2023	NW News Network	Shellfish growers in Northwest's oyster capital want 'blitz' against invasive green crabs	https://www.nwnewsnetwork.org/environment-and-planning/2023-04-04/shellfish-growers-in-northwests-oyster-capital-want-blitz-against-invasive-green-crabs
4/5/2023	Office of Sen. Murray	Senator Murray, Rep. Kilmer trap European green crab, Murray discusses efforts to marshal federal resources	https://www.murray.senate.gov/senator-murray-rep-kilmer-trap-european-green-crab-murray-discusses-efforts-to-marshall-federal-resources/
4/5/2023	NW Sportsman	WA invasive crab problem gets attention from Murray, Kilmer	https://nwsportsmanmag.com/wa-invasive-crab-problem-gets-attention-from-murray-kilmer/
4/5/2023	KING 5	Washington state leaders push for federal funding to trap invasive European green crabs	https://www.king5.com/article/tech/science/environment/washington-federal-funding-trap-invasive-crab-species/281-4d9a0edb-914c-4e6c-ae9-3479504641b8
4/6/2023	KIRO 7	Federal funding sought to eradicate destructive green crab in Washington	https://www.kiro7.com/news/local/federal-funding-sought-eradicate-destructive-green-crab-washington/POVSHKIPOVAL5MHDZ2LPSSXEVA/
4/9/2023	NPR	Northwest shellfish growers call for aggressive action against invasive crabs	https://www.npr.org/2023/04/09/1168858087/northwest-shellfish-growers-call-for-aggressive-action-against-invasive-crabs
4/21/2023	WSU Insider	WSU Extension helps train volunteers to find invasive crab	https://news.wsu.edu/news/2023/04/21/wsuextension-helps-train-volunteers-to-find-invasive-european-green-crab/
4/21/2023	The Seattle Times	WA could get millions in federal salmon recovery dollars	https://www.seattletimes.com/seattlenews/environment/60-million-coming-to-wa-for-salmon-recovery/
4/23/2023	KIRO 7	Department of Commerce recommends \$74.4 million for WA state	https://www.kiro7.com/news/local/department-commerce-recommends-744-million-wa-state-climate-change-projects/WL7SUNIX3FHBVJNYJBMLOWTAKE/



		environmental projects	
4/27/2023	KIRO 7	WA Fish and Wildlife: European green crab continues to cause issues	https://www.kiro7.com/news/local/wa-fish-wildlife-european-green-crab-continues-cause-issues/DUFVOPBQ5NEBPPFHKDRSTGEHSY/
4/28/2023	KXRO	Over 38,000 European green crab caught this year; future efforts prioritize local waters	https://www.kxro.com/over-38000-european-green-crab-caught-this-year-future-efforts-prioritize-local-waters/
4/30/2023	Westside Seattle	WSU Extension and WA Sea Grant collaborate on volunteer program to protect Puget Sound from invasive European green crab species	https://www.westsideseattle.com/2023/04/30/wsu-extension-and-wa-sea-grant-collaborate-volunteer-program-protect-puget-sound
5/1/2023	Washington Sea Grant Blog	Introducing Molt Search	https://wsg.washington.edu/introducing-molt-search/
5/2/2023	FOX 13	Washington org announces volunteer program to detect invasive European green crabs	https://www.fox13seattle.com/news/washington-org-announces-volunteer-program-to-detect-invasive-european-green-crabs
5/3/2023	KUOW	Volunteers needed to defend Washington against the green crab invasion	https://www.kuow.org/stories/volunteers-needed-to-defend-washington-against-the-green-crab-invasion
5/5/2023	Skagit Valley Herald	Trapping of invasive green crabs restarts	https://www.goskagit.com/news/environment/trapping-of-invasive-green-crabs-restarts/article_cdb4a9de-eb74-11ed-906f-1fc9206026f5.html
5/8/2023	KUOW	Washington needs YOU to fight the green crab invasion: Today So Far	https://www.kuow.org/stories/washington-needs-you-to-fight-the-green-crab-invasion-today-so-far
5/9/2023	Current Science Daily	eDNA Useful Tool For Early Detection Of Invasive Green Crab	https://currentsciencedaily.com/stories/642053493-edna-useful-tool-for-early-detection-of-invasive-green-crab



5/15/2023	gokagit.com	Team searches for invasive crabs in area bays	https://www.gokagit.com/anacortes/news/team-searches-for-invasive-crabs-in-area-bays/article_526199f8-f2af-11ed-a471-5fbb720a196f.html
5/17/2023	The Northern Light	Citizen science program to survey European green crabs	https://www.thenorthernlight.com/stories/citizen-science-program-to-survey-european-green-crabs,25577
5/17/2023	KXCR	The European Green Crab Invasion	https://soundcloud.com/user-772733150/the-european-green-crab-invasion?in=user-772733150/sets/beyond-your-front-door
5/19/2023	KGMI	Green crab molt search training at BP Heron Center	https://kgmi.com/news/007700-green-crab-molt-search-training-at-bp-heron-center/
5/26/2023	KRBD	Metlakatla hosts citizens and scientists for a lesson on identifying invasive green crabs	https://www.krbd.org/2023/05/26/metlakatla-hosts-citizens-and-scientists-for-a-lesson-on-identifying-green-crabs/
5/26/2023	Times Colonist	Pacific Salmon Foundation gets \$750,000 to fight invasive green crab	https://www.timescolonist.com/local-news/pacific-salmon-foundation-gets-750000-to-fight-invasive-green-crab-7059543
5/29/2023	Undercurrent News	Canada creates CAD \$8.75 million fund to battle aquatic invasive species	https://www.undercurrentnews.com/2023/05/29/canada-creates-cad-8-75-million-fund-to-battle-aquatic-invasive-species/
6/4/2023	MeatEater	The silent threat to Pacific salmon: European green crabs	https://www.themeateater.com/conservation/wildlife-management/the-silent-threat-to-pacific-salmon-european-green-crabs
6/8/2023	AOL/The Bellingham Herald	These federal funds will aid flood resilience, water quality and enhance tribal fisheries	https://www.aol.com/news/federal-funds-aid-flood-resilience-120000163.html
6/11/2023	Skagit Valley Herald	Volunteers taught how to identify invasive green crabs	https://www.gokagit.com/news/environment/volunteers-taught-how-to-identify-invasive-green-crabs/article_34d68390-0622-11ee-aa8c-872997c6ac74.html
6/14/2023	Washington State Standard	Pincher patrol: Over 400K invasive crabs trapped, killed as fight goes on	https://washingtonstatestandard.com/2023/06/14/pincher-patrol-400k-invasive-crabs-trapped-killed-as-fight-goes-on/



6/15/2023	FOX 13	WDFW creates new hub to fight invasive European green crabs	https://www.fox13seattle.com/video/1235613
6/16/2023	FOX 13	New tools to fight invasive green crab	https://www.youtube.com/watch?v=OylE0wxu2FM
6/19/2023	Nature World News	400,000 Invasive European Green Crabs Euthanized, in Bid for Eradication — Washington	https://www.natureworldnews.com/articles/57003/20230619/400-000-invasive-european-green-crabs-euthanized-bid-eradication-washington.htm



Appendix B – Co-manager and partner addendums

Washington Department of Natural Resources



Washington Department of Natural Resources (DNR) – Addendum for the Operational Period of April 1st – June 30th, 2023, under IAA #22-1970 for European Green Crab Emergency Measures.

- 1) All DNR staff associated with DNR’s EGC Program, including two new technicians hired on June 16th, 2023, have been equipped and trained to WDFW EGC management protocols and integrated into the Aquatic Resources Division’s Invasive Species and Aquatic Reserves Programs. The two new technician positions have enabled DNR to ramp up trapping efforts on the coast.
- 2) DNR EGC Coordinators continue to implement DNR’s EGC work plan developed last quarter. DNR management actions under this work plan include development of new monitoring sites in or near Aquatic Reserves, assessment trapping at sensitive habitats such as DNR managed Natural Areas and control trapping throughout the Coastal Region. DNR staff efforts have resulted in 565 EGC captured this operational period within DNR Natural Areas in Grays Harbor and Willapa Bay.
- 3) DNR purchased a 24’ landing craft to be used primarily in the Puget Sound to monitor EGC on our Natural Area Preserves and Aquatic Reserves last operational period and purchased an airboat for EGC assessment and control measures on the coast this operational period.
- 4) In addition to the above accomplishments DNR has presented and received feedback on our EGC work plan from the Pacific County Marine Resource Committee, the Grays Harbor County Marine Resource Committee, and to the Ecosystem Based Management Collaborative of Grays Harbor and Willapa Bay. DNR has also presented our Work Plan to the Lunch and Learn audience to inform all DNR staff about the EGC program. Additionally, DNR visited a Taholah High School classroom to present and educate students on EGC. This was followed by a field trip to Griffiths-Priday State Park to teach students how to check traps and capture EGC.

In June, four students from the University of Washington volunteered to help DNR trap for EGC at the Grays Harbor National Wildlife Refuge (GHNWR). The pictures below depict the trapping event from beginning to end.





Figure B1 Pictured left to right Clint, John, Mateo, and Arthur packed up with traps to set at the GHNWR.





Figure B2 Pictured left to right Clint, Arthur, Mateo, and John baiting traps at the GHNWR.



Figure B3 Pictured left to right Arthur, Clint, John, and Mateo setting traps at the GHNWR.





Figure B4. Pictured left to right Mateo, John, Clint, and Arthur setting traps at the GHNWR.



Figure B5. Tim checking a minnow trap



Figure B6. Clint checking a shrimp pot.





Figure B7. Pictured left to right Arthur, Tim, and Clint packing traps out at the GHNWR.

Washington Sea Grant



FY2023 Q4 Addendum

April 1 - Jun 30, 2023

Molt Search Launch

Crab Team kicked off a new early detection community science program called Molt Search in April, expanding Crab Team outreach to new audiences and growing the miles of Salish Sea shoreline combed for new signs of green crab. The goal of this program is to dramatically increase the accessibility of participation in early detection efforts and increase scope and efficiency of management overall. The program relies on conducting beach searches for molted exoskeletons of European green crabs. Although a less sensitive detection technique relative to trapping, these surveys are logistically much simpler, and more scalable. Getting more members of the community on beaches to search for molts helps fill gaps in other search efforts and increase confidence that we are not missing large populations in locations that have not yet been trapped.



This quarter, 20 training events reached 288 community members, including 21 local facilitators, across all 12 Salish Sea counties. WSG finalized the app-based reporting tool with MyCoast, and the brand-new corps of searchers conducted 149 Molt Search surveys. To date, none of the surveys have detected European green crab, but many Molt Searchers are also collecting data on molts they do find from Dungeness crabs, which will help inform managers about the status of that species.

Monitoring Network

This quarter comprised the first half of the annual Crab Team monitoring season. This year, 68 sites (11 coastal, 57 inland) are actively implementing consistent monthly monitoring protocols from April through September. Crab Team staff support the teams conducting sampling through frequent communication (monthly newsletters and frequent emails to answer questions and solve challenges), site visits for additional training (34 site visits completed 4/1-6/30), and review and QA/QC of all submitted data. Inland captures of green crabs during monitoring at Dungeness Spit, Hood Canal, Discovery and Padilla Bay were early indicators of the increased crab numbers being observed across inland sites this year. While many groups are reporting increased captures in the Salish Sea, the Crab Team monitoring network offers the most robust interannual comparison since the same protocol has been implemented as far back as 2015 at some sites. So far this year, the number of crabs captured in the inland network monitoring efforts during this period - 7 - exceeds all previous years of monitoring captures, and this pattern is consistent with partner trapping efforts across removal and assessment style of efforts.

On the Pacific coast, a total of 91 green crabs was captured across 11 sites from April through June. In contrast to the inland monitoring sites, this represents a decline from 2022, where 150 crabs were captured at 10 sites during this same period. While it is still too early to discern population trends from these data alone, the generally lower capture rates align with anecdotes from other groups performing large scale trapping in the coastal estuaries, who note that, in general, average captures rates are lower this year compared to this period last year.

Partner Training and Capacity Support

WSG has expanded its focus on building local partner trapping capacity and during this quarter provided more classroom and field training for staff at partner organizations than ever before. WSG hosted five classroom sessions focused on topics including species ID, green crab background, and how to plan a field effort, and an additional five field training days focused on best practices such as trap placement, field safety, and data collection. In total, 14 new trapping staff were trained through these sessions. Together, the classroom sessions and field trainings, plus supplemental materials to support the onboarding process, represent the building blocks of the Trappers' Training Program, a WSG collaboration with WDFW whereby new partner groups receive the technical training they need to plug into the ecosystem of European green crab trapping.

A list of partners trained during this period include:

- Department of Natural Resources
- Grays Harbor Conservation District
- Hama Hama Oysters
- Markham Oyster
- US Navy
- Washington Department of Fish and Wildlife



In addition to building the Trappers' Training Program, WSG remains committed to providing support to veteran partners in the field whenever possible. An additional 3 days of field support were provided during this period to the Makah Fisheries Department (2 days) and Pacific County Vegetation Management (1 day).

Regional and National Management Support

WSG helps interface local management approaches with regional and national efforts. During this period WSG staff supported WDFW directly through preparation for Management Area planning meetings held in Willapa Bay and Grays Harbor, as well as scientific advisement in developing data standards for trapping programs. More broadly, WSG Staff also participated in the completion and finalization of the new national European Green Crab Management plan via a working group convened by the Aquatic Nuisance Species Taskforce and led by Ted Grosholz (UC Davis). In addition, WSG staff participated in two training workshops in southeast Alaska, for the Southeast Alaska Tribal Ocean Research group, and a training workshop in Ketchikan hosted by Alaska Sea Grant and the Metlakatla Tribe. Participating in these events will help integrate Washington's efforts into larger coast-wide efforts, and to build local expertise in Washington relative to broader geographic scales.

Communications and Outreach Support

In addition to the monitoring network and contribution to the statewide management of green crab, WSG's Crab Team also supports communications and outreach by publishing a semi-regular blog. Highlights included:

Introducing Molt Search, <https://wsg.washington.edu/introducing-molt-search/>

2022 Season Wrap-up: The Washington Coast, <https://wsg.washington.edu/2022-season-wrap-up-wa-coast/>

Washington State University



The WSU Long Beach Research and Extension Unit continued to increase capacity to provide Research and Extension to coastal Washington during this period. In early April, we joined WDFW to provide outreach materials to the Long Beach Razor Clam Festival. We had over 300 visitors come to our booth to learn more about identifying EGC and what they could do to help stop the spread depending on the region they were visiting from. We had several visitors who were commercial Dungeness fishermen and their families.

WSU Long Beach also partnered with Professor Emeritus Kim Patten to support SeaGrant trapping at Nahcotta.

Additionally, WSU Long Beach submitted a proposal to study the potential impact of EGC to shellfish growers on coastal Washington to the WDFW MAC Group. The proposal outlined to



conduct choice/no-choice assays at a Taylor Shellfish hatchery in order to determine preference of EGC predation on species of commercial or ecological importance depending on EGC size and sex. This research was funded in July, and we will provide further updates in the next quarterly update.

WSU Extension collaborated with WA Sea Grant to provide 12 citizen science-based trainings in all 12 Salish Sea counties, along with 6 bioblitzes. These programs engaged over 250 participants in using a simple survey protocol to look for and report EGC molts through a specially designed app. This effort is an early detection program focused on the Salish Sea region.

