# Crab Team Coastal Sentinel Site Summary 2023

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## Background

This is an analytical summary of 2023 WSG Crab Team data from monitoring sites in coastal estuaries. One new site (Tsoo-Yess, Makah Bay) was added in 2023, bringing the total number of coastal Crab Team sites to 11 (see map below). All sites were surveyed for European green crabs (EGC) and associated intertidal and shallow subtidal communities using Fukui and minnow (1” opening) traps and via molt searches from April through September as per standard WSG monitoring protocols. Note that one site (Dohman Creek, 610) did not capture any live green crabs but did find one green crab molt.


Wa'atch
Tsoo-Yess
Strait of Juan de Fuca
CANADA
UNITED STATES
Strait of Juan de Fuca
WASHINGTON
Ocean Shores
Grays Harbor NWR
Aberdeen
Brady's Oysters
Tokeland
Stackpole
Nahcotta
Cutthroat Creek (Willapa NWR)
Dohman Creek (Willapa NWR)

## Figure 1. Cumulative Number of EGC Captured

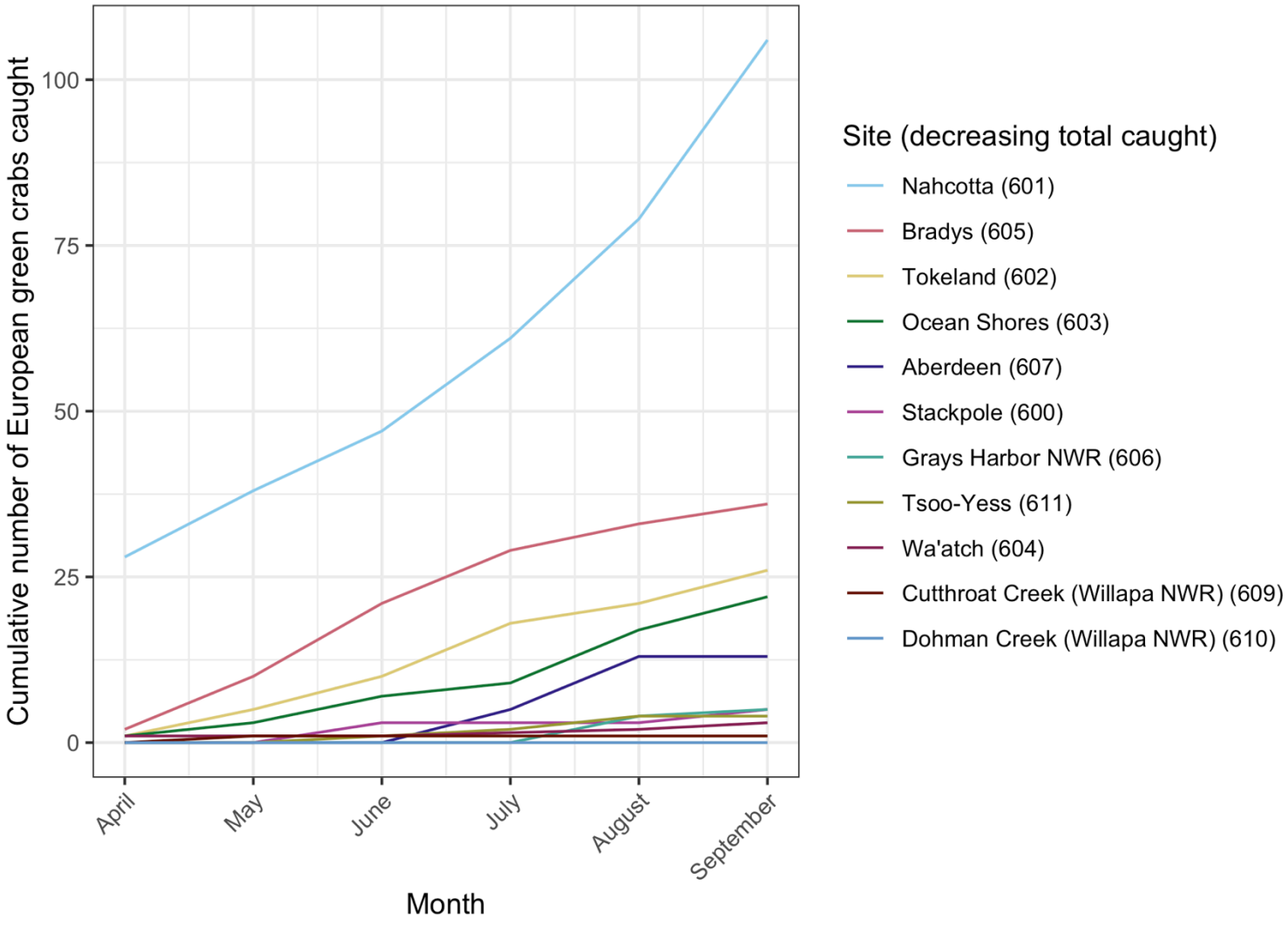


Figure 1 shows the cumulative total number of EGC caught at each of the sites across the 2023 season. Nahcotta captured the most EGC (106), and the capture rate increased over the season, indicated by the steeper slope of the line in later months. Brady's Oysters captured the second highest total of green crabs (36), though the capture rate peaked in June and slowed through the end of the season. Tokeland, Ocean Shores, and Aberdeen captured the third, fourth, and fifth highest totals respectively, and the remaining sites captured fewer than 10 EGC per site.

## Figure 2. CPUE of EGC Across Sites and Years

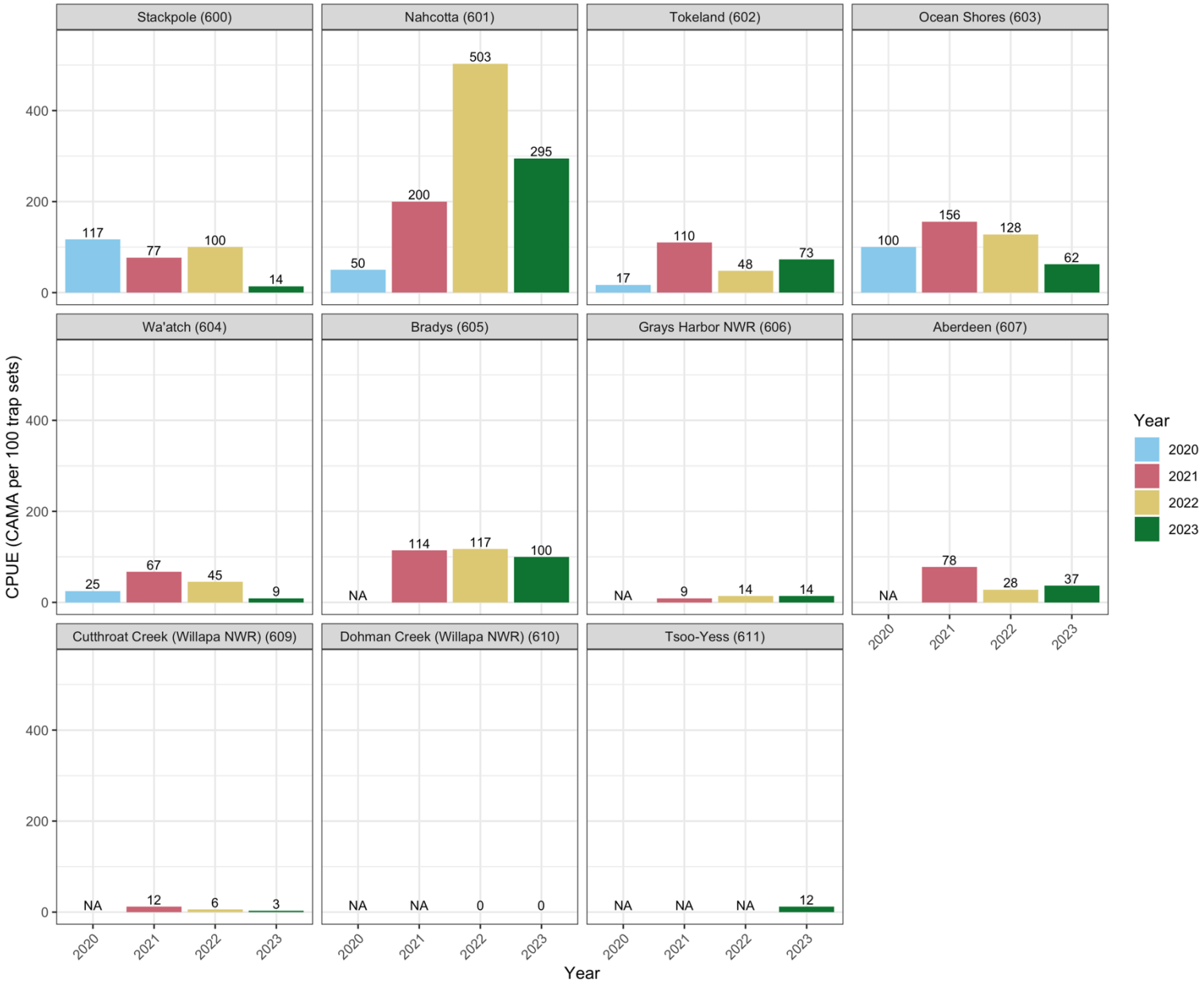


Figure 2 shows catch per unit effort of green crabs (CPUE, per 100 trap sets) across all sites since coastal Crab Team monitoring was piloted in 2020. Note that in 2020, sites were sampled in August and September only. The number above each bar indicates the CPUE value for that site and year, and "NA" indicates the site was not established during that year. As in previous years, Nahcotta had the highest CPUE of all the coastal sites in 2023, though this most recent year's catch rate was substantially lower than was observed at that site in 2022. Across all sites, the CPUE either decreased (slightly or substantially, depending on the site), or remained relatively stable, such as at Brady's, Tokeland, and Aberdeen. The biggest takeaway is that none of the sites experienced a substantial increase in 2023.

## Figure 3. EGC Size Demographics in 2023

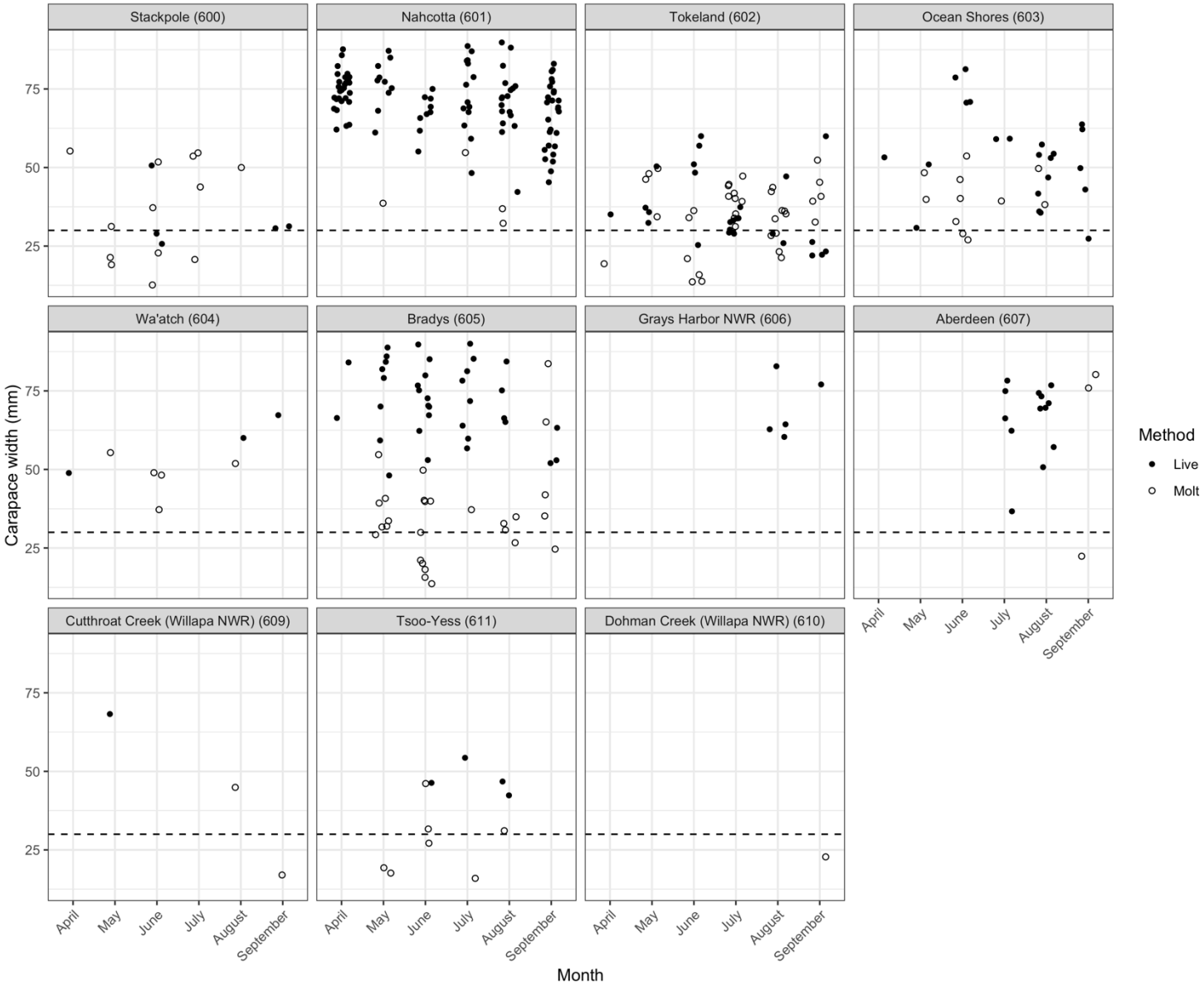


Figure 3 shows the sizes of live EGC and green crab shells recorded at each site over the season. Solid points represent live crabs and open points represent molts. The dotted line (y = 30mm) represents the threshold between adults (carapace width > 30 mm) and young of year (YOY, carapace width < 30 mm). Note that the 30mm cutoff used here is a conservative estimate since late in the season (July – September), YOY crabs can reach up to 55mm. Nahcotta and Brady's, both sites near shellfish aquaculture pallets, captured the largest crabs. Meanwhile, Stackpole, Tokeland, Wa'atch, and Tsoo-Yess, all sites that have been trapped extensively in previous years, recorded smaller crabs on average. YOY were captured at 8 of 11 sites, though there is no consistent seasonality to their arrival. Many of the YOY were detected as molts, showing the importance of both live trapping and molt searches in better understanding how population structure varies over space and time.

## Figure 4. EGC Size Demographics Across Years

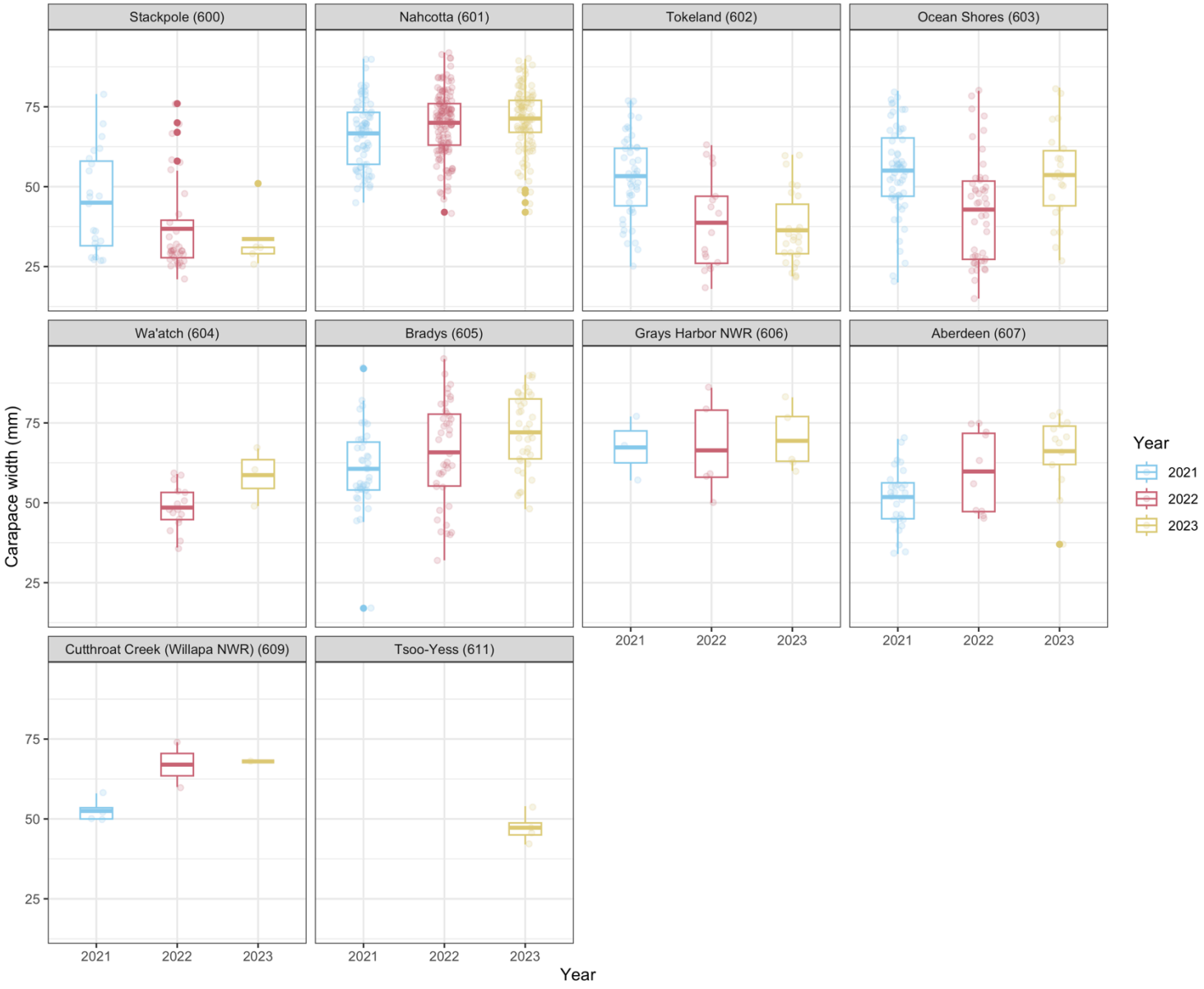


Figure 4 shows box plots of EGC sizes from 2021 to 2023. The thick line in the middle of each box represents the mean carapace width. In 2021, the Wa'atch was sampled in April only and therefore sizes are not included for that year. EGC average size has increased over time at Nahcotta, Brady's, Aberdeen, Cutthroat Creek, and potentially Wa'atch. EGC average size has decreased at Stackpole and Tokeland, sites that have been trapped extensively from 2020-2023 outside of Crab Team monitoring. EGC average size was consistent across years at Grays Harbor NWR and was variable across years at Ocean Shores.

## Figure 5. Differences in Community Metrics Across Sites in 2023

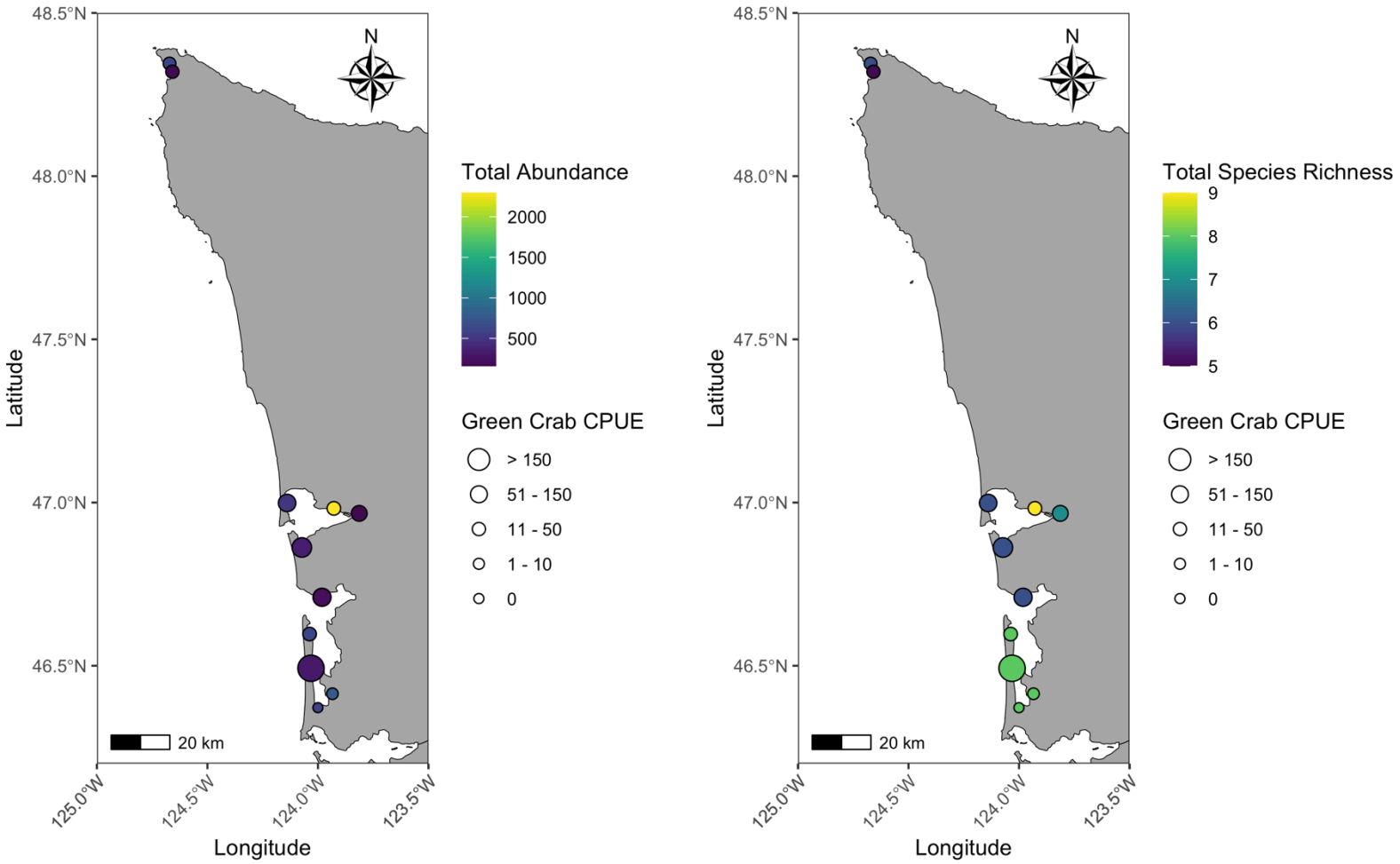


Figure 5 shows the EGC CPUE as size of circle while the color represents abundance of individuals (left) and total species richness (right) of all organisms (green crab and other species) captured in traps. There doesn't appear to be a significant relationship between EGC CPUE and total abundance, though the site with the most EGC (Nahcotta) also had a low total abundance of organisms captured. Nor does there appear to be a relationship between EGC CPUE and species richness. The site with the highest total abundance of organisms (Grays Harbor NWR) also recorded the most total species (9).

## Figure 6. Community Composition Across Sites in 2023

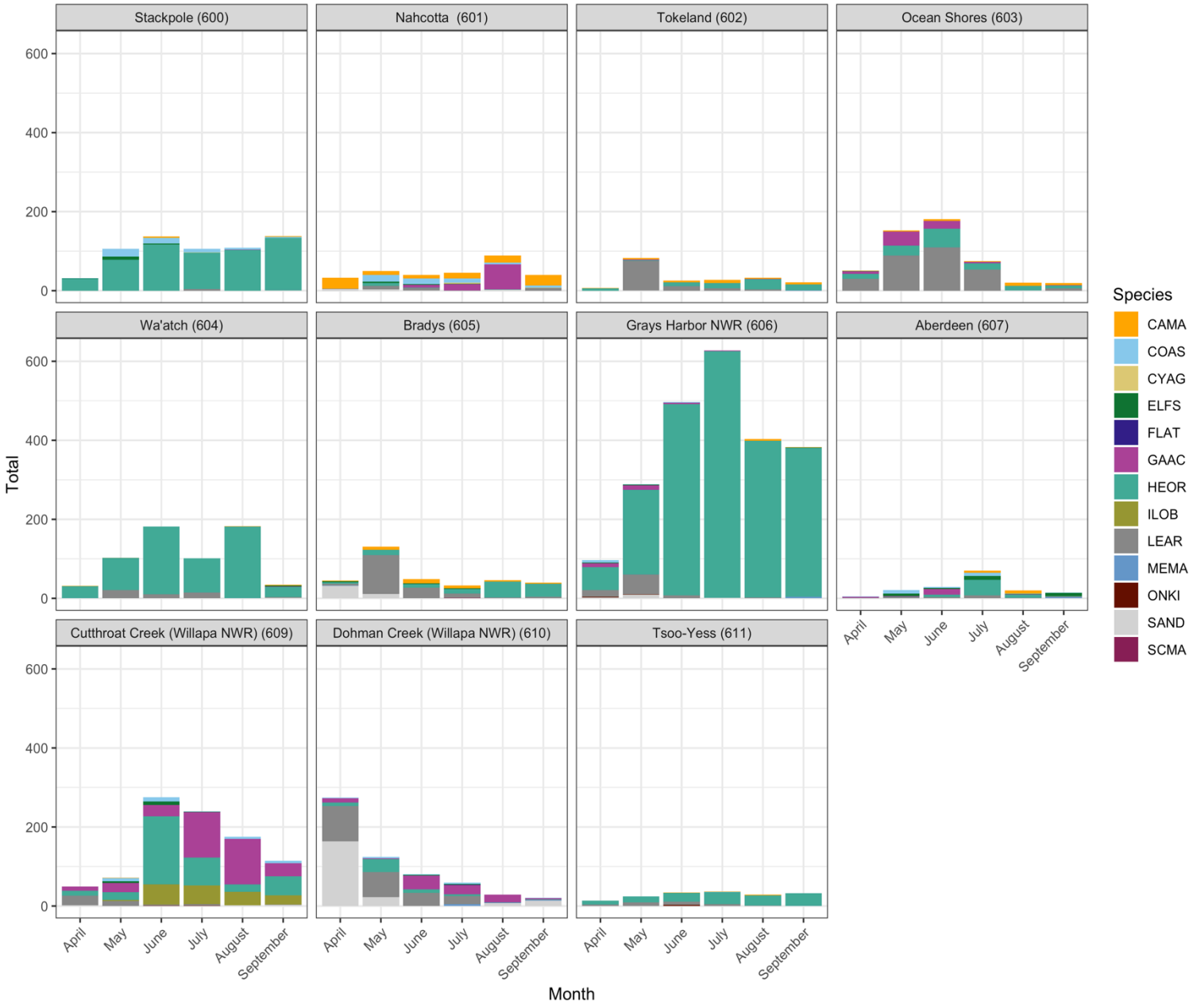


Figure 6 shows community composition through colors and total abundance in the height of each bar across sites and months. The most common species found was the hairy shore crab (HEOR), which showed up at every site except Nahcotta in 2023. At some sites, seasonal peaks of organismal abundance were clear (e.g. Dohman Creek in April, Brady's in May, Cutthroat Creek/Ocean Shores in June, and Grays Harbor Wildlife Refuge in July) but the timing of the peak may have been driven by different species. For instance, the mid or late season peaks are often the result of a high relative abundance of HEOR at a site, while early season peaks are sites with a greater number of staghorn sculpin (LEAR). These species are drivers of overall abundance and seasonality at their sites.

## Figure 7. EGC Size Across the 2023 Season

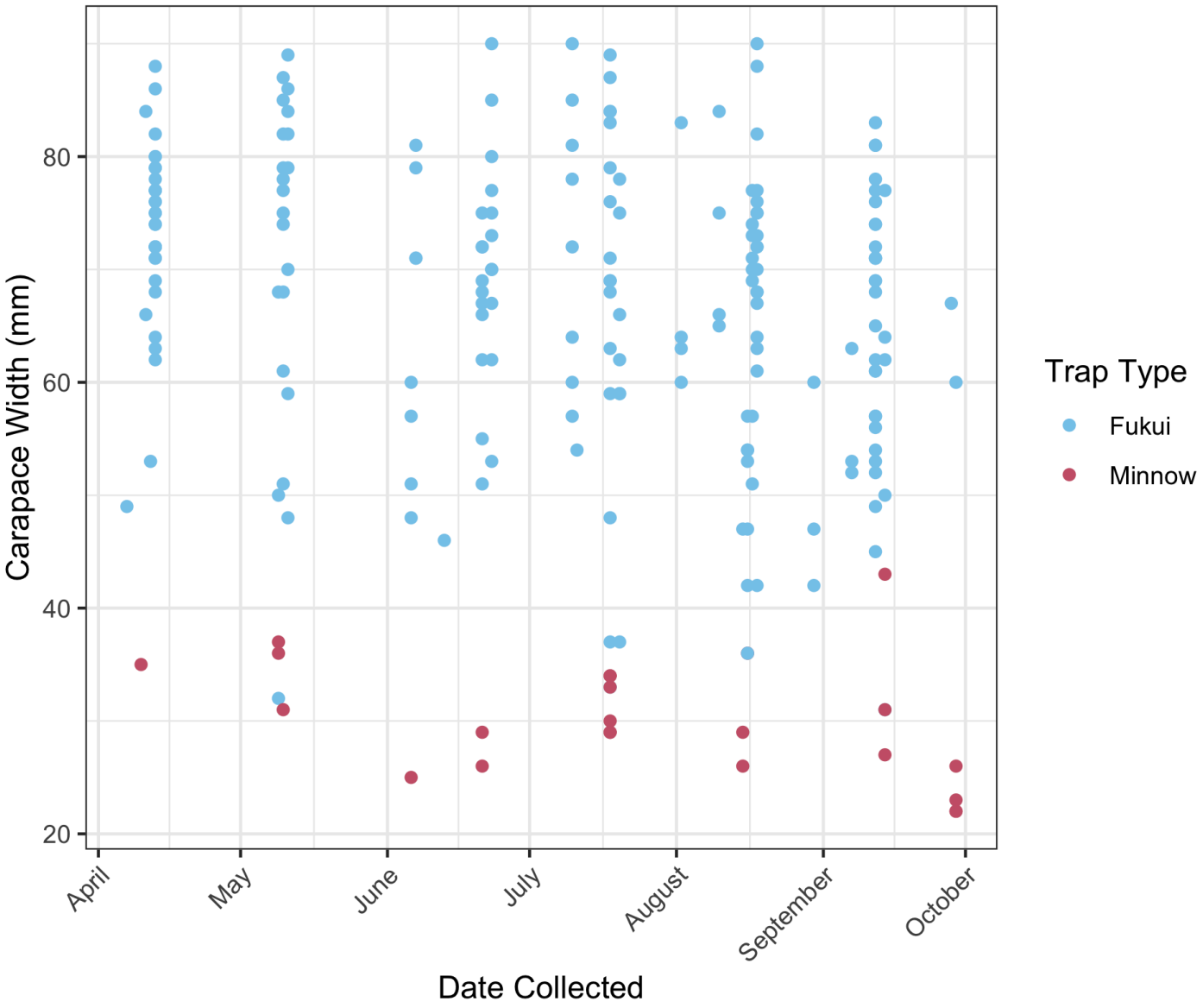


Figure 7 shows EGC size across the season for all sites with blue dots representing Fukui trap captures and red dots representing 1” minnow trap captures. In this protocol, the minnow trap outperformed Fukui traps in capturing the smallest segment of the population. YOY EGC were only captured in the minnows and, even where the two traps overlapped in their size range, minnows captured a greater number of EGC. These observations underscore the importance of using both trap types to fully characterize the size structure of an EGC population.