



California Department of Fish and Wildlife Final Assessment of Marine Life Entanglement Risk and Management Recommendation

Date: March 15, 2023

An initial assessment and a preliminary recommendation were developed by California Department of Fish and Wildlife (CDFW) Marine Region staff for consideration by the California Dungeness Crab Fishing Gear Working Group (Working Group) for the Risk Assessment Mitigation Program (RAMP; Section 132.8, Title 14, California Code of Regulations) regarding Management Actions to address marine life entanglement risk in the commercial Dungeness crab fishery as well as Section 29.80, Title 14, California Code of Regulations (Gear Restrictions for Recreational Take of Saltwater Crustaceans). The initial assessment was shared with the Working Group on March 13, 2023, and finalized at the conclusion of the Working Group meeting which was held on March 15, 2023.

A. Confirmed Entanglements and Marine Life Concentrations Triggers for Management Action, RAMP subsection (c)

Entanglements:

As of March 13, 2023, no entanglements have been reported to CDFW by NOAA for the 2022-23 season. Therefore, the in-season Confirmed Entanglement Impact Score is currently zero. The Impact Score for calendar year 2021 is 1.89 for humpback whales. The total Impact Score for the calendar year 2022 is 5.28 for humpback whales which includes a recently identified humpback whale entanglement documented on February 13, 2022, off Cabo San Lucas Mexico. As a result, the current running 3-year average Impact Score is 2.39 for humpback whales for the years 2021-2023. Note: Entanglement data are subject to revision based on review and verification by NOAA.

Marine Life Concentrations:

USCG and CDFW aerial surveys for Fishing Zones 1, 2, and 3 did not observe humpback whales, blue whales, or leatherback sea turtles. Monterey Bay Whale Watch data documented one and three humpbacks whales during two trips over the most recent seven-day trip period in Fishing Zone 4. Cascadia Research small vessel surveys observed four humpback whales in Monterey Bay, Fishing Zone 4.

For additional details, see the Available Data document prepared for this Risk Assessment.

B. Recommended Management Action from options identified in subsection (e)

Recreational Fishery:

- **Continue Fleet Advisory for Fishing Zones 1-6**

Commercial Fishery:

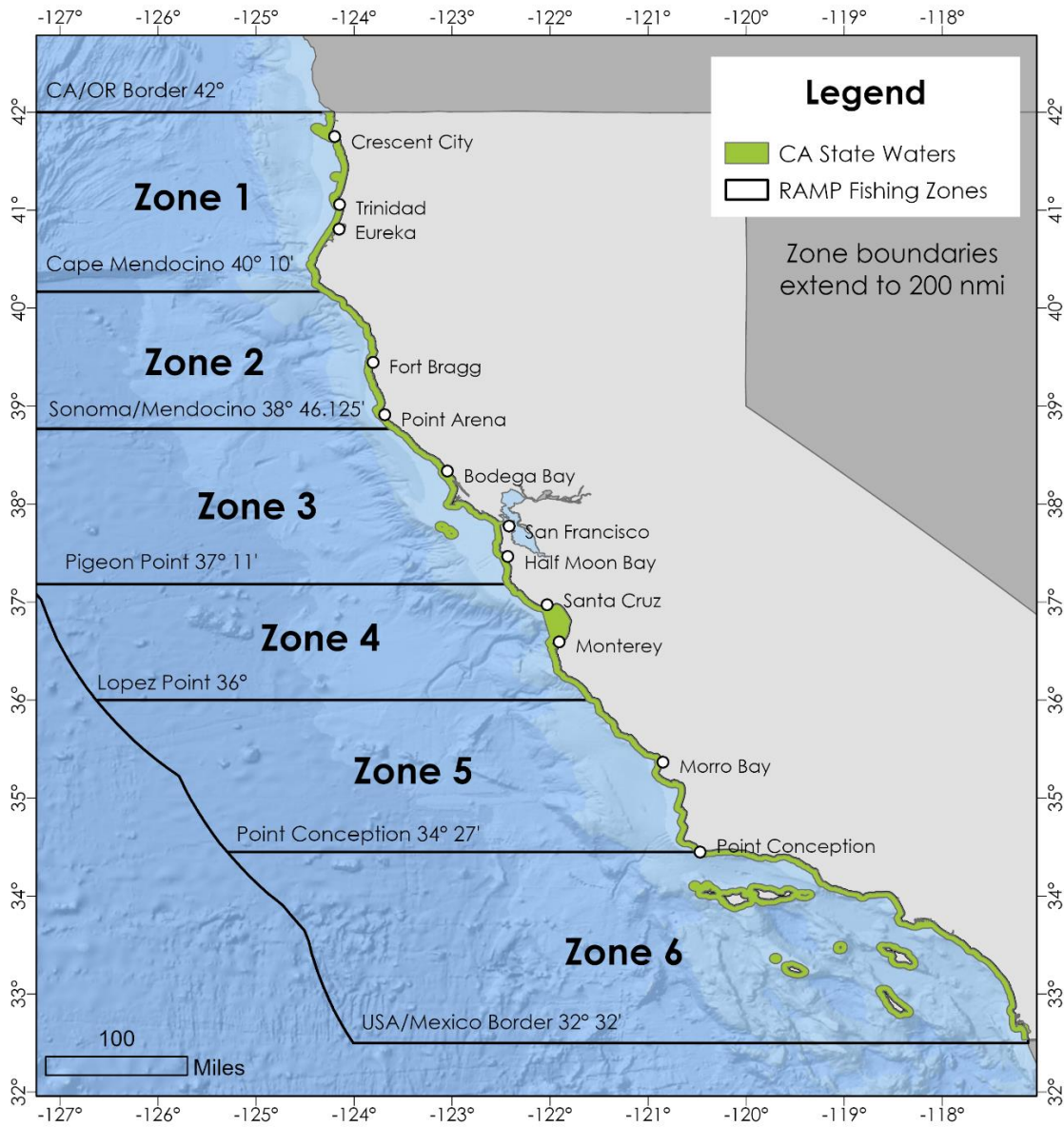
- **Continue Fleet Advisory for Fishing Zones 1-6**

Management Recommendation Summary Rationale:

No Marine Life Concentrations triggers were met for Actionable Species under RAMP. Humpback whale sightings are near seasonal lows, which is a strong indication that most humpback whales remain in their southern breeding grounds. Recent Whale Alert observations do indicate an aggregation of humpback whales approximately 25 miles offshore of Morro Bay, which falls outside of the typical Dungeness crab fishing grounds. Based on available data, known historic migration patterns, and supported by the totality of Management Considerations, entanglement risk remains low for Fishing Zones 1-6. However, given the current Entanglement Impact Score CDFW's staff recommendation is to continue the Fleet Advisory for both the recreational and commercial fishery in all Fishing Zones. Statewide, both the commercial and recreational fishing fleet should remain vigilant and move or avoid setting gear in areas where whales are transiting or foraging to further minimize risk of entanglement. This is especially important given the current entanglement Impact Score for the commercial fishery. It is also anticipated that humpback whales will begin to return to areas that overlap with the commercial and recreational Dungeness crab fishery over the coming weeks and months. CDFW will then consider additional Management Actions that minimize the risk of entanglement of returning humpback whales.

Alternatives Considered but Rejected

- Fishery Closure –CDFW considered implementing a fishery closure in Fishing Zone 5 given the proximity of humpback whale sightings west of Morro Bay and known migration patterns. However, given low fishing effort (fewer than three vessels actively fishing) and resulting low risk of entanglement, CDFW is not recommending a closure at this time.
- Gear Reduction – based on available data and historic migration patterns this management action is not required.
- Depth restriction – based on available data and historic migration patterns this management action is not required.
- Alternative Gear - can only be authorized after April 1st.





California Department of Fish and Wildlife Preliminary Assessment and Management Recommendation for the Risk Assessment Mitigation Program

Date: March 13, 2023

This preliminary assessment and management recommendation has been developed by California Department of Fish and Wildlife (CDFW) Marine Region staff for consideration by the California Dungeness Crab Fishing Gear Working Group for the Risk Assessment Mitigation Program (RAMP; Section 132.8, Title 14, California Code of Regulations) regarding Management Actions to address marine life entanglement risk in the commercial and recreational Dungeness crab fishery. CDFW will prepare a Final Assessment and Management Recommendation after review of the Working Group Recommendation and other relevant data.

A. Confirmed Entanglements and Marine Life Concentrations Triggers for Management Action, RAMP subsection (c)

Entanglements:

As of March 13, 2023, no entanglements have been reported to CDFW by NOAA for the 2022-23 season. Therefore, the in-season Confirmed Entanglement Impact Score is currently zero. The Impact Score for calendar year 2021 is 1.89 for humpback whales. The total Impact Score for the calendar year 2022 is 5.28 for humpback whales which includes a recently identified humpback whale entanglement documented on February 13, 2022 off Cabo San Lucas Mexico. As a result, the current running 3-year average Impact Score is 2.39 for humpback whales for the years 2021-2023. Note: Entanglement data are subject to revision based on review and verification by NOAA.

Marine Life Concentrations:

USCG and CDFW aerial surveys for Fishing Zones 1, 2, and 3 did not observe humpback whales, blue whales or leatherback sea turtles. Monterey Bay Whale Watch data documented one and three humpbacks whales during two trips over the most recent seven-day trip period in Fishing Zone 4. Cascadia Research small vessel surveys observed 4 humpback whales in Monterey Bay, Fishing Zone 4.

For additional details, see the Available Data document prepared for this Risk Assessment.

B. Recommended Management Action from options identified in subsection (e)

Recreational Fishery:

- **Continue Fleet Advisory for Fishing Zones 1-6**

Commercial Fishery:

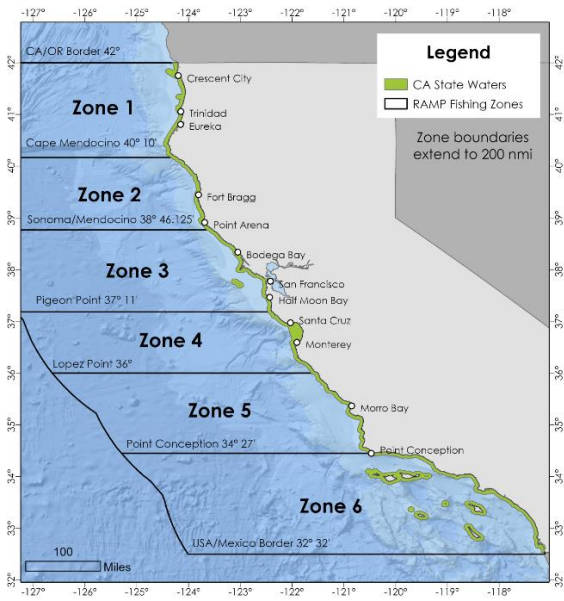
- **Continue Fleet Advisory for Fishing Zones 1-6**

Management Recommendation Summary Rationale:

No Marine Life Concentrations triggers were met for Actionable Species under RAMP. Humpback whale sightings are near seasonal lows, which is a strong indication that most humpback whales remain on their southern breeding grounds. Recent Whale Alert observations do indicate humpback whales outside known Dungeness crab fishing grounds (an area north of the Channel Islands) but based on available data, known historic migration patterns and supported by the totality of Management Considerations, entanglement risk remains low for Fishing Zones 1-6. However, given the current Entanglement Impact Score CDFW's staff recommendation is to continue the Fleet Advisory for both the recreational and commercial fishery in all Fishing Zones. Statewide, both the commercial and recreational fishing fleet should remain vigilant and move or avoid setting gear in areas where whales are transiting or foraging to further minimize risk of entanglement. This is especially important given the current entanglement Impact Score for the commercial fishery. It is also anticipated that humpback whales will begin to return to areas that overlap with the commercial and recreational Dungeness crab fishery over the coming weeks and months.

Alternatives Considered but Rejected

- **Fishery Closure** –The Department considered implementing a fishery closure in Fishing Zone 5 given the proximity of humpback whale sightings north of the Channel Islands and known migration patterns. However, given low fishing effort (fewer than three vessels actively fishing) and resulting low risk of entanglement, the Department is not recommending a closure at this time.
- **Gear Reduction** – based on available data and historic migration patterns this management action is not required.
- **Depth restriction** – based on available data and historic migration patterns this management action is not required.
- **Alternative Gear** - can only be authorized after April 1st.



2022-23 Risk Assessment: Available Data

Last updated: March 13, 2023

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TRIGGERS REQUIRING MANAGEMENT ACTION

Confirmed Entanglements: §132.8(c)(1)

Data provided by: Lauren Saez and Dan Lawson, National Marine Fisheries Service (NMFS)

As of March 10th, there have been 0 humpback whale entanglements, 0 blue whale entanglements and 0 leatherback sea turtle entanglements reported to West Coast Region during 2023.

Table 1. Actionable Species Entanglements during 2023, prepared by West Coast Region.

Actionable Species	Number Confirmed Entanglements in California Commercial Dungeness Crab Gear	Number Confirmed Entanglements in Unknown Fishing Gear Reported off California
Humpback whales	0	0
Blue whales	0	0
Leatherback sea turtles	0	0

There have been no reported entanglements in the 2023 calendar year in the Dungeness crab gear or unidentified gear.

Table 2. Impact Score Calculations based on Confirmed Entanglements in California commercial Dungeness crab gear and confirmed entanglements in Unknown Fishing Gear reported off California.

Actionable Species	Current Fishing Season Impact Score (2022-23)	Current Calendar Year Impact Score (2023)
Humpback whales	0	0
Blue whales	0	0
Leatherback sea turtles	0	0

The total calendar year Impact Score for 2021 was 1.89 for humpback whales and 0 for blue whales and leatherback sea turtles. The total calendar year Impact Score for 2022 has increased from the values reported in the [February 13, 2023 Available Data document](#) because of a past entanglement recently reported to NFMS.NMFS. Details regarding this entanglement can be found in the *Information from NOAA* section of this document. The Impact Score for 2022 is now 5.28 for humpback whales and zero for blue whales and leatherback sea turtles. The 3-Year Rolling Average Impact Score is now 2.39.

Table 3. Impact Score Calculations based on Confirmed Entanglements in California commercial Dungeness crab gear and confirmed entanglements in Unknown Fishing Gear reported off California underlying calculation of a 3-year rolling average.

Actionable Species	2021 Calendar Year Impact Score	2022 Calendar Year Impact Score	2023 Calendar Year Impact Score	3-Year Rolling Average
Humpback whales	1.89	5.28*	0	2.39
Blue whales	0	0	0	0
Leatherback sea turtles	0	0	0	0

Marine Life Concentrations: §132.8(c)(1)

Data provided by: USCG, CDFW, Monterey Bay Whale Watch (processed by Karin Forney, NOAA SWFSC), John Calambokidis (Cascadia Research).

Table 4. Summary of available CDFW-approved survey data for marine life concentrations for each Fishing Zone, and whether the triggers established in Section 132.8(c)(2) have been met for any Fishing Zone.

Fishing Zone	CDFW-approved survey data	Triggers attained?
Zone 1	USCG Aerial Survey	No
Zone 2	CDFW Aerial Survey	No
Zone 3	CDFW Aerial Survey	No
Zone 4	MBWW, Cascadia Vessel Survey	No
Zone 5	NA	Yes – no data
Zone 6	NA	Yes – no data

USCG Aerial Survey (Fishing Zone 1)

On March 7, 2023, the US Coast Guard observed zero whales on their flight of Fishing Zone 1.

CDFW Aerial Survey (Fishing Zones 2 and 3)

CDFW staff conducted an aerial survey on March 8, 2023, between Point Reyes (Fishing Zone 3) and Shelter Cove (Fishing Zone 2; Figure 1). Conditions were generally good, with Beaufort conditions of two or less across the surveyed Fishing Zones. Trap gear concentrations were observed between Point Reyes and the Russian River, Point Arena, at the mouth of the Navarro River and near Shelter Cove. No humpback or blue whales were observed, however there were 12 gray whales observed in Fishing Zone 2 and five gray whales observed in Fishing Zone 3 (Figure 1).

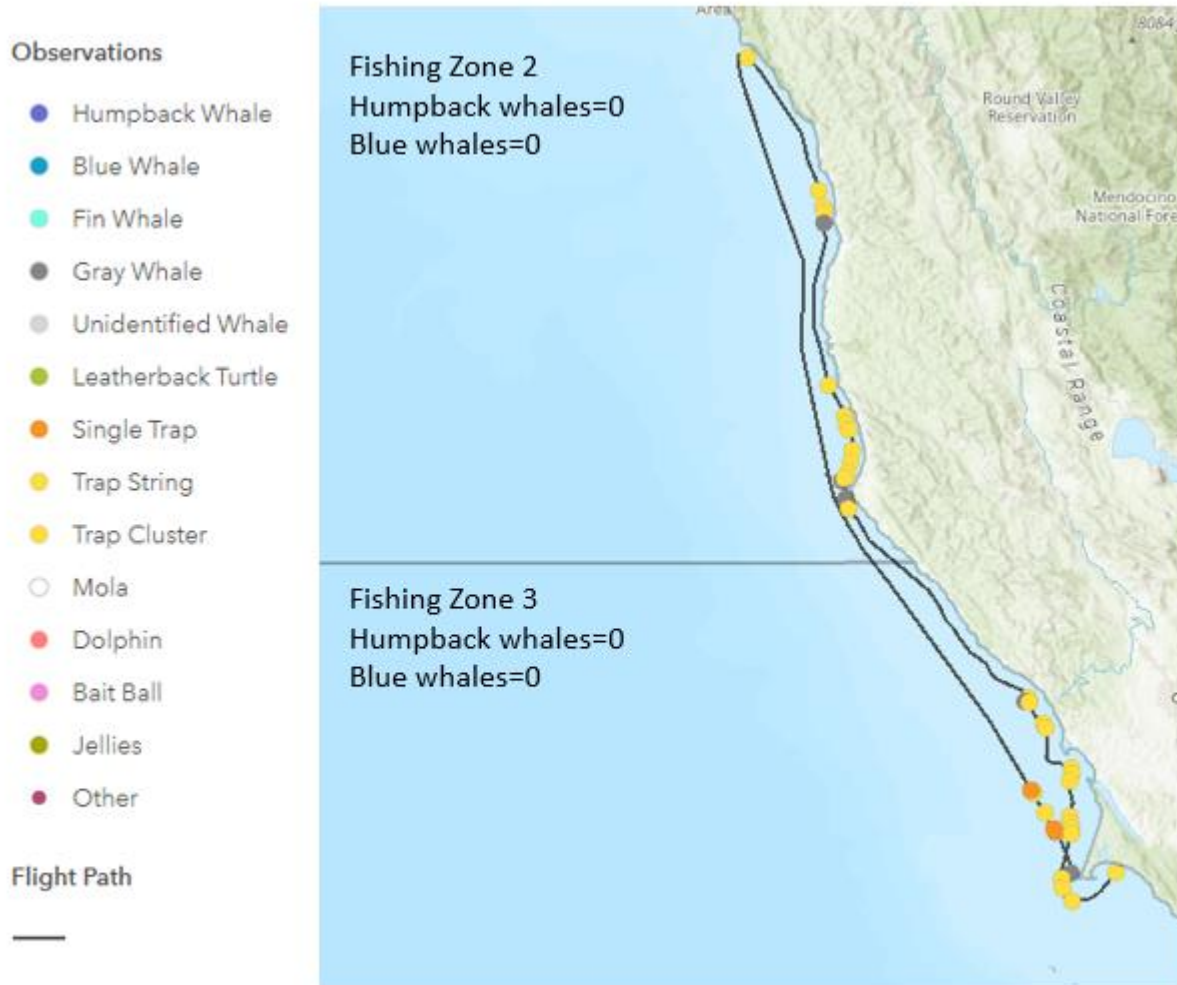


Figure 1. Map showing track lines and observations from CDFW aerial survey of Fishing Zones 2 and 3 on March 8, 2023.

Monterey Bay Whale Watch (Fishing Zone 4)

- Monterey Bay Whale Watch conducted whale-watching trips in southern Monterey Bay on five of seven days during the week of February 28, 2023-March 6, 2023.
- Humpback whales were documented twice during the five days that had trips within the last seven days (February 28, 2023-March 6, 2023). One humpback whale was observed on March 5th, and three humpback whales were observed on March 6th.
- No blue whales have been observed since December 18, 2022.

Cascadia Small Vessel Surveys (Fishing Zones 3 and 4)

On March 7, 2023, Cascadia Research conducted a survey of Fishing Zone 4. Four humpback whales, 0 blue whales, 0 leatherback sea turtles, and 12 gray whales were observed (Figure 3).

On March 8, 2023, Cascadia Research conducted a survey of Fishing Zones 3 and 4 from San Francisco to Moss Landing along the 70m depth contour. Weather conditions were good, and 0 humpback whales, 0 blue whales, and 0 leatherback sea turtles were observed. Numerous gray whales were sighted.

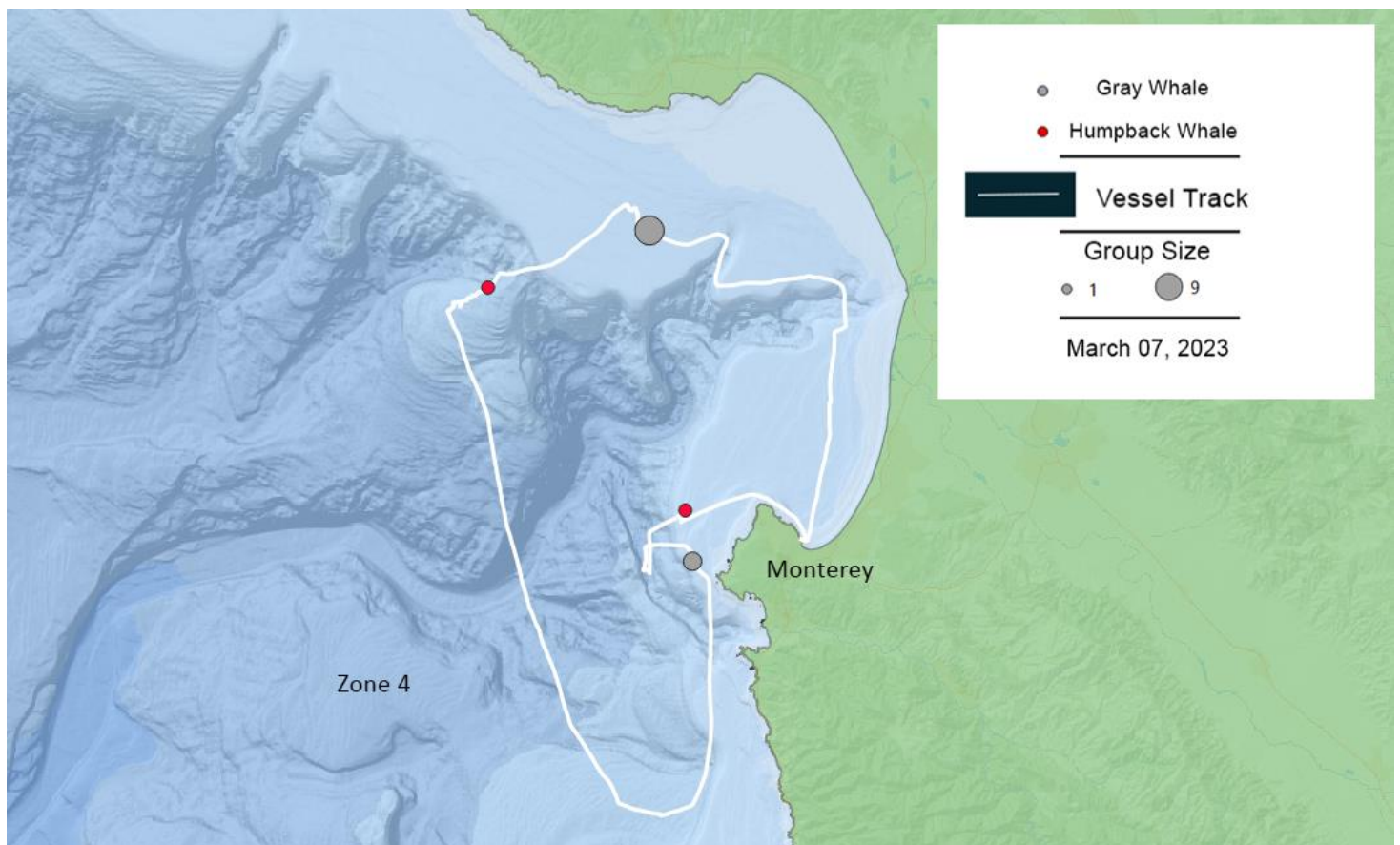


Figure 3. Track and sightings from survey by Cascadia Research vessel MUS in the Monterey Bay area (Fishing Zone 4) on March 7, 2023.

MANAGEMENT CONSIDERATIONS

Information from NOAA: §132.8(d)(2)

Data provided by: Lauren Saez and Dan Lawson, National Marine Fisheries Service, NMFS

An additional confirmed entanglement of a humpback whale from 2022 was shared with NMFS through the publication of a CNN underwater photography contest winning photo on February 17, 2023. NMFS staff contacted the photographer for more information. The photo was taken on February 13, 2022, off Cabo San Lucas, Mexico. The humpback whale was disentangled from line and two buoys, and the gear was thrown away. A CA

commercial Dungeness crab tag was documented in the gear that was photographed and removed. The tag was dated from the 2019-2021 season. The entanglement likely occurred in 2021 (given the bad health of the whale) and counts as an entanglement in calendar year 2022 when it was documented.

Effectiveness of management measures: §132.8(d)(3)

Data provided by: California Department of Fish and Wildlife

The 2023 calendar year does not currently have any reported entanglements; however the 2022 calendar year saw a high number of confirmed entanglements. Avoidance of any additional entanglements is a priority for CDFW, however very low presence of Actionable Species within the Fishing Grounds lessens the need for more restrictive management actions at this time. CDFW will put forward its recommended approach in the March 13, 2023, Initial Assessment.

Total economic impact to the fleet: §132.8(d)(4)

Data provided by: California Department of Fish and Wildlife

The RAMP regulations specify that, when deciding amongst multiple management measures which would equivalently reduce entanglement risk, CDFW shall consider total economic impact to the fleet and fishing communities. CDFW will provide this evaluation in the March 13, 2023, Initial Assessment.

Historic patterns and current Actionable Species migration: §132.8(d)(6) and (11)

Data provided by: Monterey Bay Whale Watch (processed by Karin Forney, NOAA SWFSC), Point Blue Conservation Science.

Monterey Bay Whale Watch (Fishing Zone 4)

The semi-monthly average number of whales-per-half-day-trip is 0.8, which is below the average historical value at this time of the year (Figure 4), suggesting that relatively few whales have returned from the breeding areas at this time. The recent absence of blue whales is consistent with their known seasonal migration patterns.

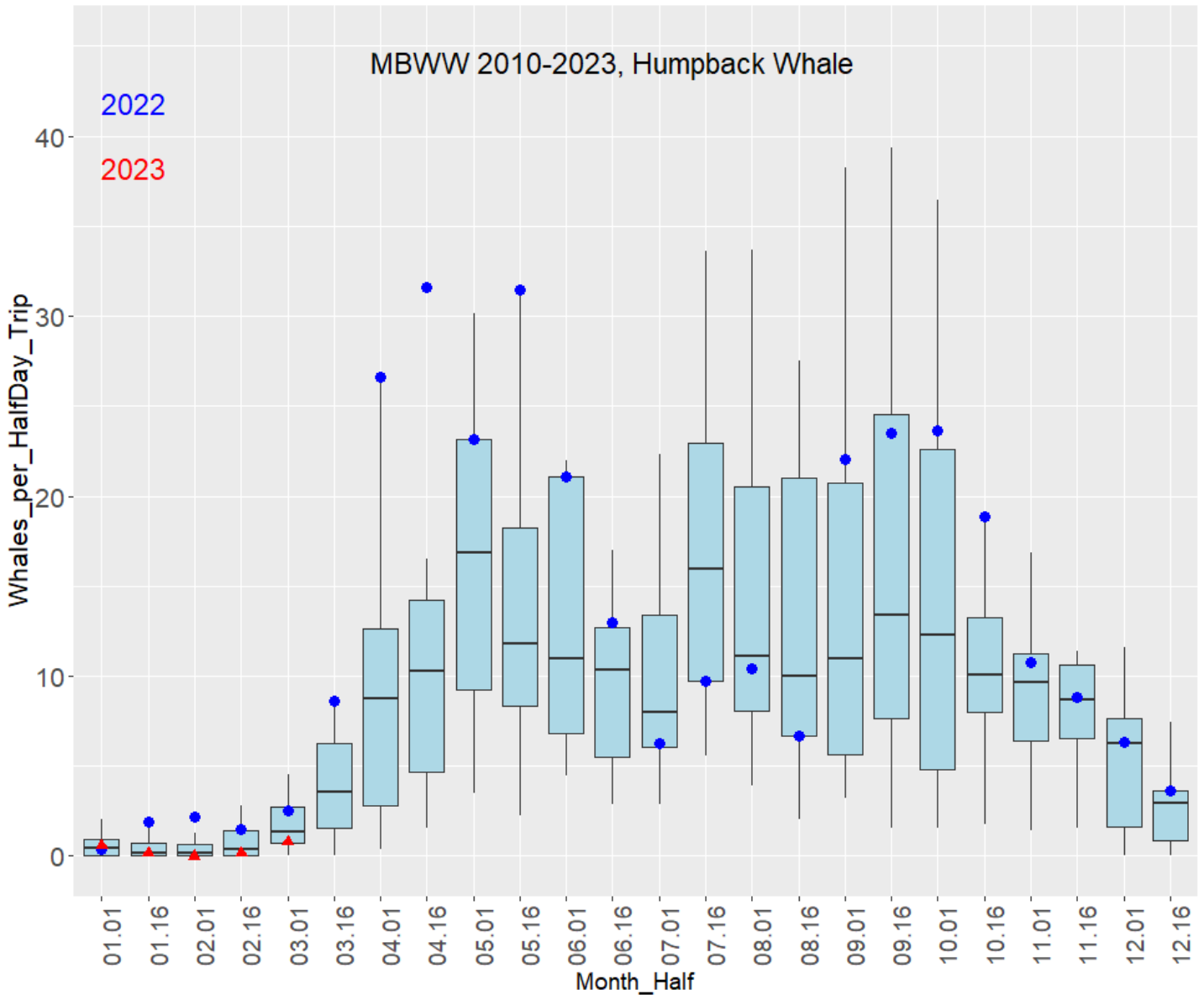


Figure 4. Historical Monterey Bay Whale Watch data for 2010-2023, summarizing the average and variation in the number of humpback whales per half-day trip on a semi-monthly basis (1st- 15th, 16th- end of month). This boxplot follows standard statistical practice in that the black horizontal line is the average number of whales; the blue box shows the 25th-75th percentiles (i.e., half of all past whale numbers are within the blue box); the vertical lines show the range of whale numbers excluding outliers, and outliers are shown as small black dots. Values for 2022 (large blue dots) and 2023 (red triangles) and are provided for reference, placing recent whale numbers in a historical context.

Point Blue Conservation Science Data Portal (*Fishing Zones 3, 5, and 6*)

During the seven-day period ending March 10, 2023, trained observers at the Farallon Islands reported one humpback whale in Fishing Zone 3, and trained naturalists from the Channel Islands National Marine Sanctuary and National Park Service reported three humpback whales in Fishing Zone 6. During the most recent seven-day period, large aggregations of humpback whales have been sighted in Fishing Zone 5 (Figure 5) at the southeastern edge of the Monterey Bay National Marine Sanctuary. On March 11, 2023, 37 humpback whales were observed. No blue whales were observed in any Fishing Zone during this period (Figure 5).

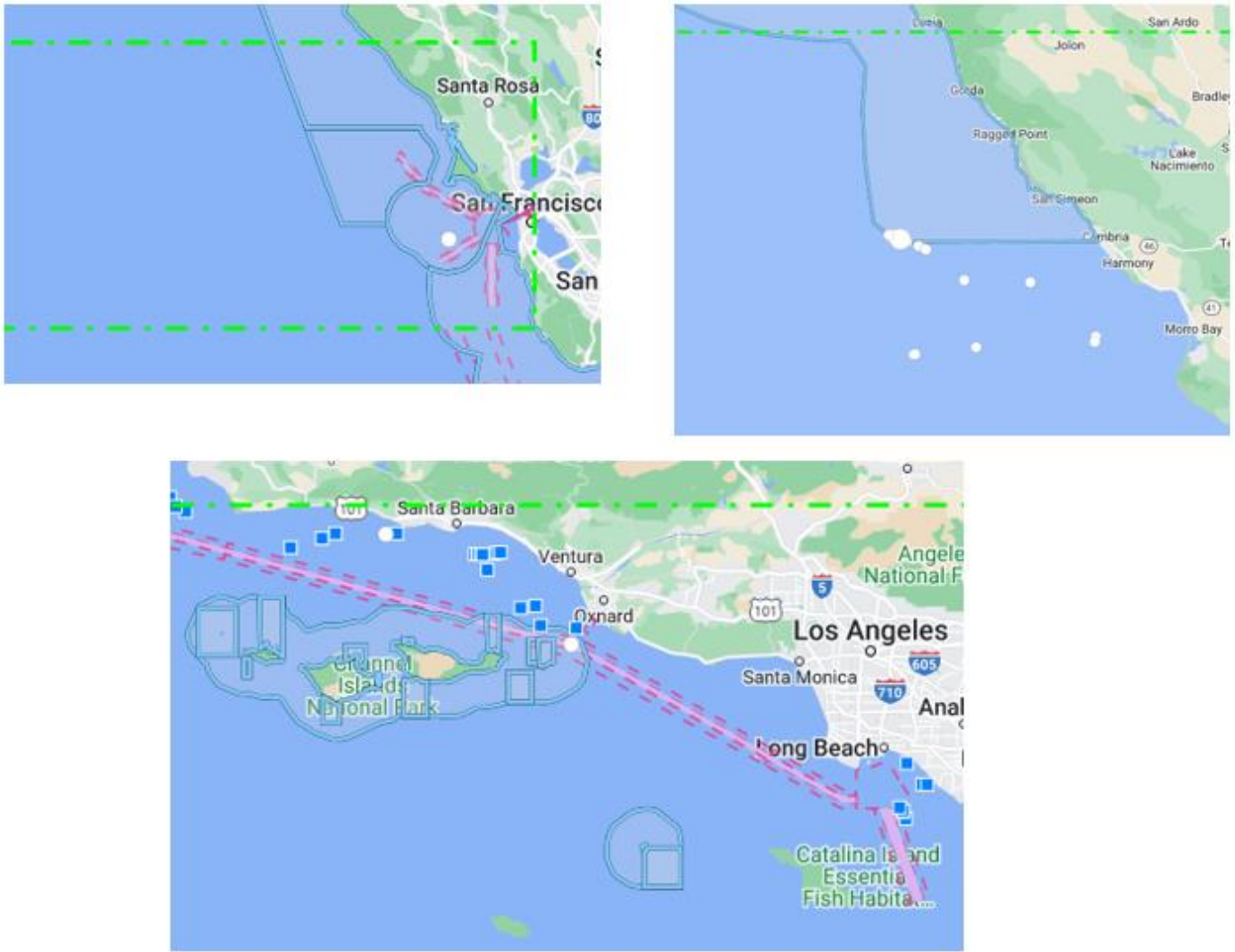


Figure 5. Locations of humpback whale sightings within Fishing Zone 3 (top left), Fishing Zone 5 (top right) and Fishing Zone 6 (bottom). Reporting locations are represented by white circles. A given report may or may not represent multiple individuals. Fishing Zone boundaries are represented by dashed lines.

Fishing Season dynamics: §132.8(d)(7)

Data provided by: California Department of Fish and Wildlife

CDFW data presented in this section is preliminary and subject to revision.

Marine Landings Data System (All Fishing Zones)

All Fishing Zones are open as of December 31, 2022, and a summary of landings from all Fishing Zones is provided below (Table 6).

Weekly total landings volume has decreased since the beginning of January, with the highest harvest coming from Fishing Zone 1, followed by Fishing Zone 3 (Figure 6). So far, 75% of the total volume harvested for this season has been from Fishing Zone 1, with 14% from Fishing Zone 3, five percent from Fishing Zone 2 and the remaining six percent

coming from the other Fishing Zones. Vessel activity by Fishing Zone follows the same pattern, with the highest activity in Fishing Zones 1 and 3 and less activity in the remaining Fishing Zones (Figure 7). All Fishing Zones have had decreased vessel activity since mid-February.

Weekly landings by port have declined since the beginning of January with the highest activity in Crescent City, Eureka, Half Moon Bay, and San Francisco (Figures 8). Overall, 48% of the total volume harvested for this season has been landed into Crescent City, 21% landed in Eureka, seven percent landed into San Francisco and Bodega Bay, six percent landed in Half Moon Bay, five percent landed into Trinidad, and less than five percent landed into Fort Bragg, Monterey, and Morro Bay.

Looking at vessel activity by port, over the course of the season, the highest activity has been in Crescent City (98 vessels) and Eureka (72 vessels), followed by San Francisco (34 vessels), Half Moon Bay (35 vessels), and Bodega Bay (32 vessels; Figure 8). Vessels have also made landings into Fort Bragg (25), Trinidad (14), Monterey (13), and Morro Bay (withheld due to confidentiality); Figure 9).

Table 6. Summary of fleet dynamics information. Accessed from CDFW's Marine Landings Data System database on March 10, 2023.

Metric	Value	Additional Info
Season status	Open	All Fishing Zones are Open
Number of daily landings	4,140	NA
Total volume (pounds)	17,291,816	NA
Total Ex-Vessel Value	\$41,943,885	NA
Average unit price	\$2.65	NA
Total number of active vessels	357	NA
Maximum potential traps (based on active permits)	116,250	Estimates are also provided in the Bi-Weekly Fishing Activity Reports subsection

Volume of Landings (Pounds), by Week and Fishing Zone, 2022-23 Season

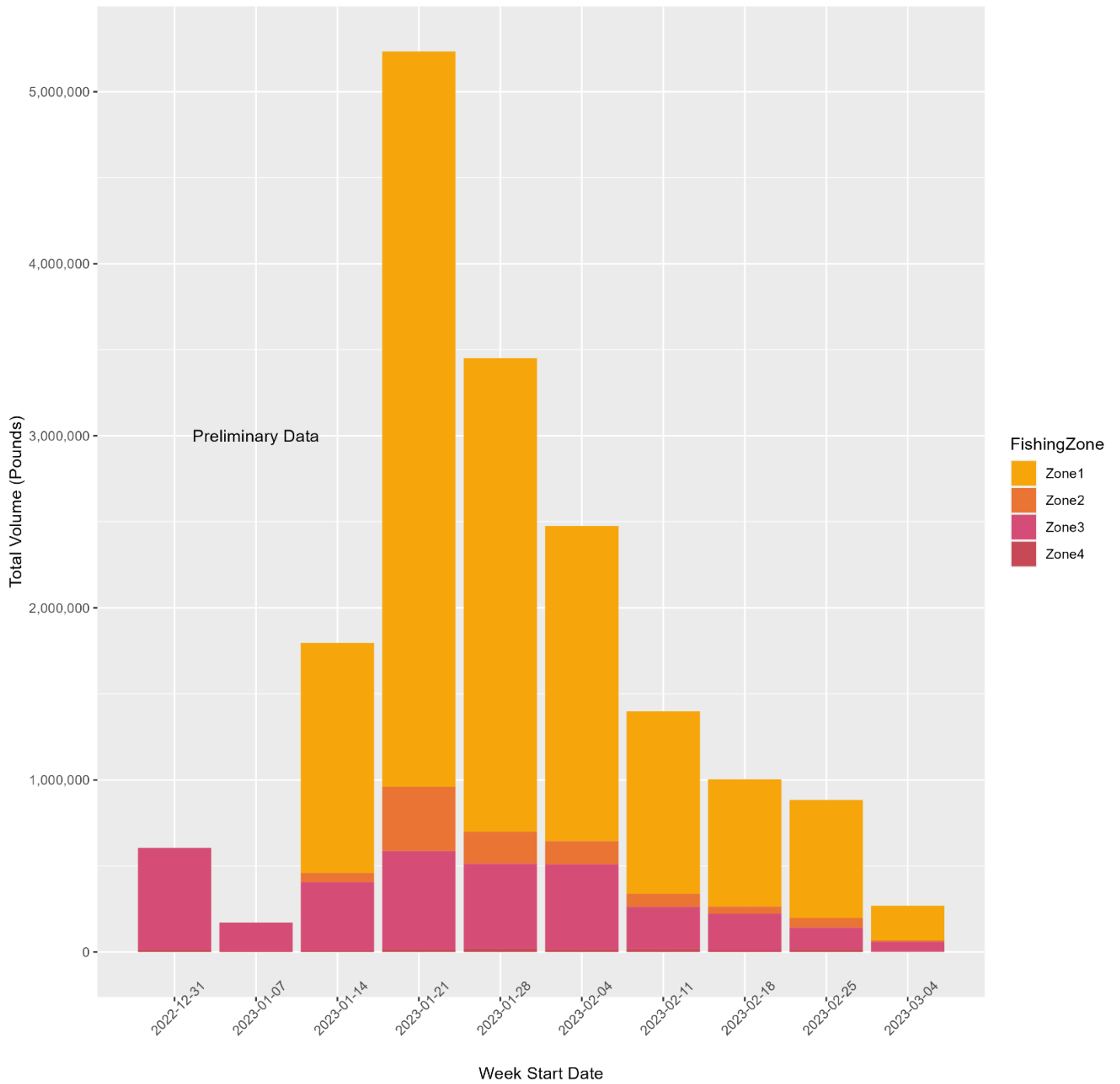


Figure 6. Cumulative volume (pounds) harvest by week and Fishing Zone. Week 1 starts with the first day the commercial Dungeness crab fishery was open in any area, December 31, 2022. All data are preliminary and subject to change.

Number of Active Vessels, by Week and Fishing Zone, 2022-23 Season

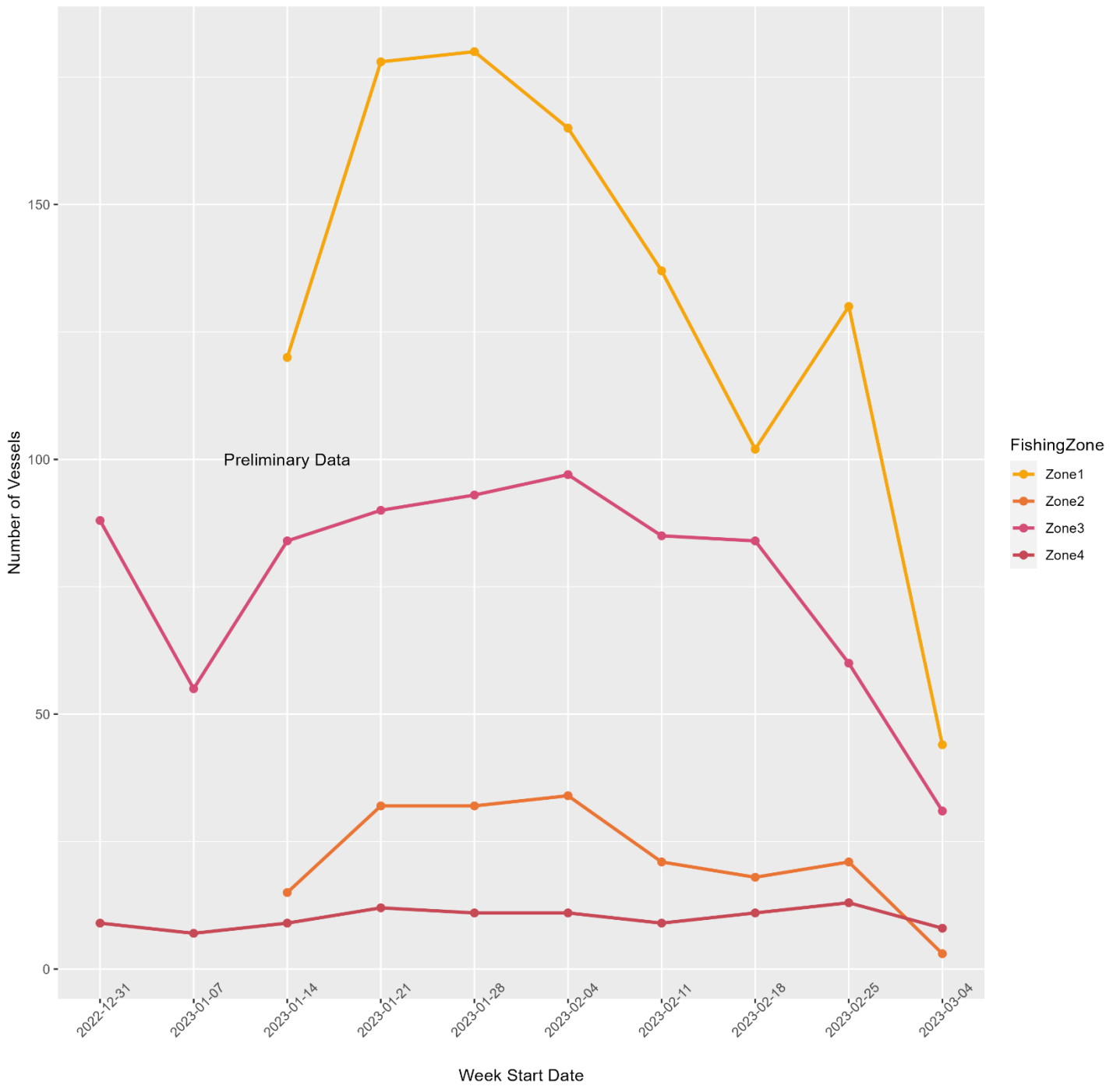


Figure 7. Number of active vessels by week and Fishing Zone. Week 1 starts with the first day the commercial Dungeness crab fishery was open in any area, December 31, 2022. All data are preliminary and subject to change. Some week*port complex combinations are withheld due to confidentiality constraints.

Volume of Landings (Pounds), by Week and Port Complex, 2022-23 Season

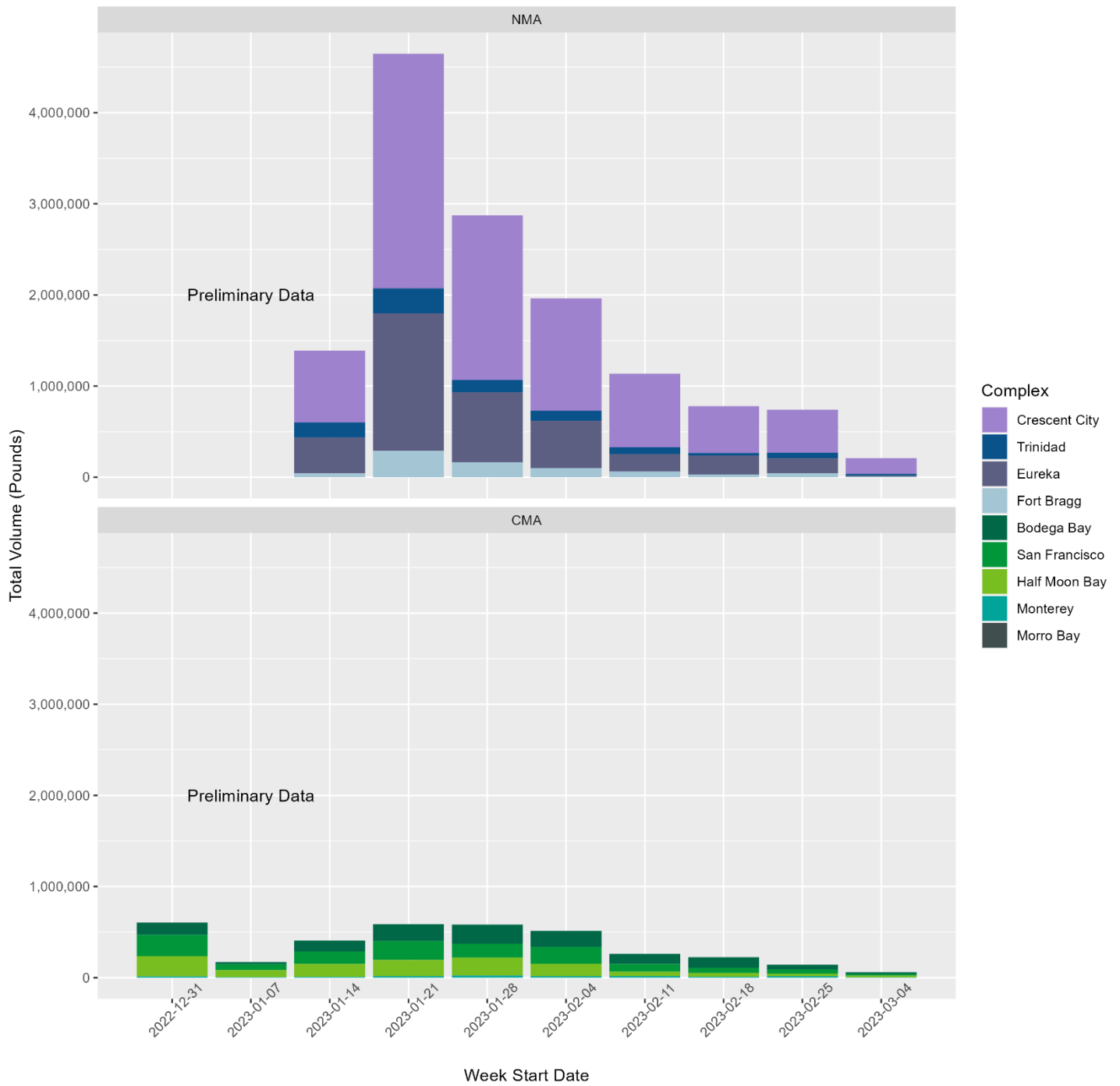


Figure 8. Cumulative volume (pounds) landed by week and port complex. Week 1 starts with the first day the commercial Dungeness crab fishery was open in any area, December 31, 2022. All data are preliminary and subject to change. Certain week*port complex combinations are withheld due to confidentiality constraints.

Number of Active Vessels, by Week and Port Complex, 2022-23 Season

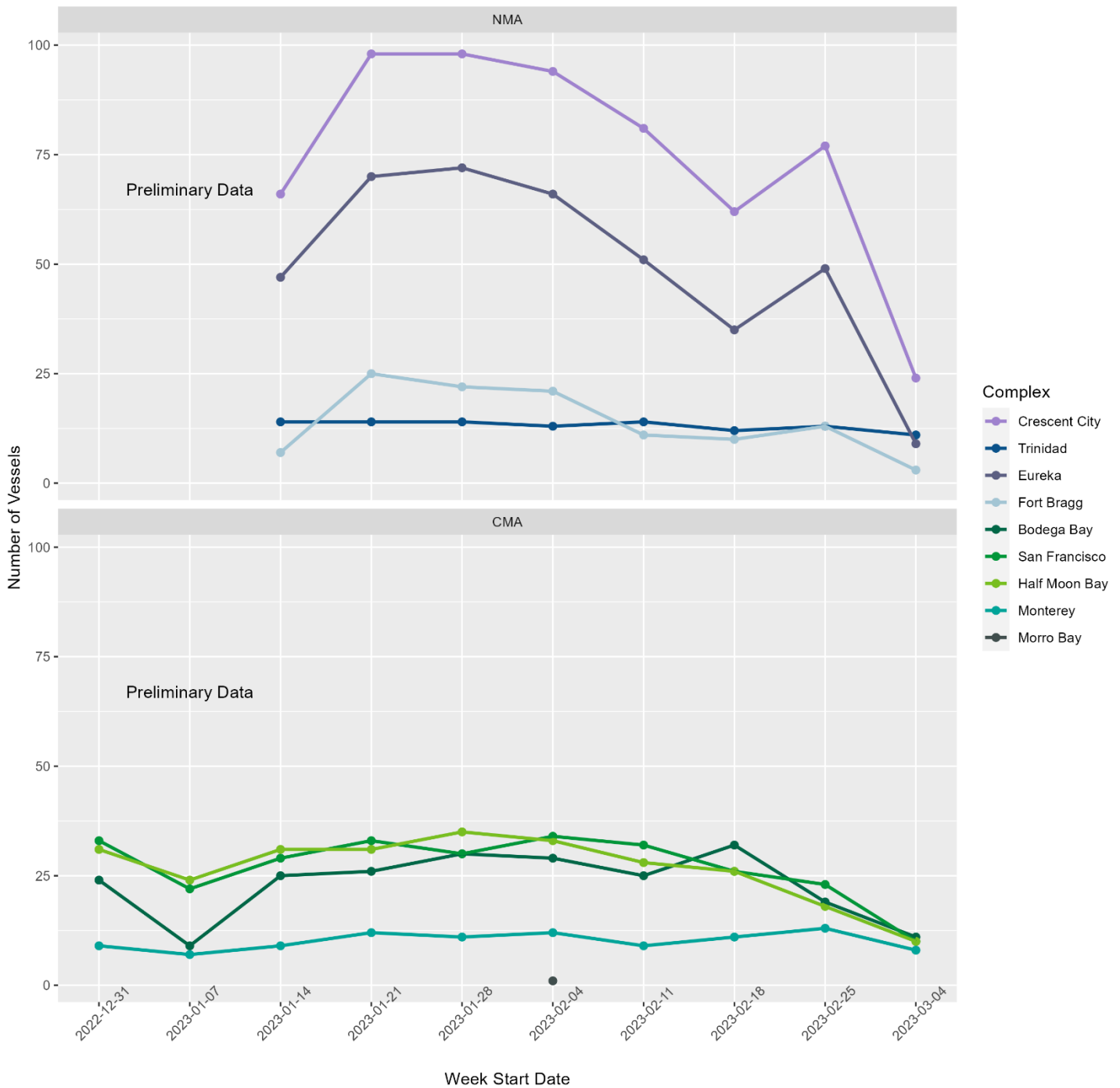


Figure 9. Number of active vessels by week and port complex. Week 1 starts with the first day the commercial Dungeness crab fishery was open in any area, December 31, 2022. All data are preliminary and subject to change. Some week*port complex combinations are withheld due to confidentiality concerns.

Bi-Weekly Fishing Activity Reports (All Fishing Zones)

CDFW has received bi-weekly reports since the first reporting period of January 1, 2023 through the most recent reporting period of March 1, 2023. A summary of reports received for February 16, 2023, is provided in Table 7 and those received for March 1, 2023, are provided in Table 8; note these summaries may not reflect all permitted vessels

participating in the fishery. In addition, Table 9 shows the summary of total traps by Fishing Zone for the five most recent reporting periods. Based on these overall totals, more than 60% of all estimated traps are deployed in Fishing Zone 1.

Table 7. Summary of information provided for the February 16, 2023 bi-weekly reporting period by Fishing Zone (1-6). Accessed from CDFW's Bi-Weekly Reporting database on March 10, 2023. NR-C refers to data withheld due to confidentiality and all data are preliminary and subject to change.

Fishing Zone	Permits Reporting	Avg. Trap Number	Total Traps	Avg. Min. Depth (fa.)	Avg. Max. Depth (fa.)	Max. Depth (fa.)	Final Report	Number of Lost Traps
Zone 1	131	362	47,318	14	32	75	7	29
Zone 2	19	221	4,186	13	26	40	3	2
Zone 3	88	242	21,294	20	36	90	4	62
Zone 4	13	159	2,055	24	40	60	0	NA
Zone 5	NR-C	NR-C	NR-C	NR-C	NR-C	NR-C	NR-C	NR-C
Zone 6	NA	NA	NA	NA	NA	NA	NA	NA
Totals	251	NA	74,853				14	93

Table 8. Summary of information provided for the March 1, 2023 bi-weekly reporting period by Fishing Zone (1-6). Accessed from CDFW's Bi-Weekly Reporting database on March 10, 2023. NR-C refers to data withheld due to confidentiality and all data are preliminary and subject to change.

Fishing Zone	Permits Reporting	Avg. Trap Number	Total Traps	Avg. Min. Depth (fa.)	Avg. Max. Depth (fa.)	Max. Depth (fa.)	Final Report	Number of Lost Traps
Zone 1	98	361	34,572	13	32	90	4	4
Zone 2	19	222	3,983	13	25	40	1	0
Zone 3	78	251	19,322	19	36	80	4	38
Zone 4	13	160	2,079	22	39	70	0	NA
Zone 5	NR-C	NR-C	NR-C	NR-C	NR-C	NR-C	NR-C	NR-C
Zone 6	NA	NA	NA	NA	NA	NA	NA	NA
Totals	208		59,956				9	42

Table 9. Total reported traps deployed in each Fishing Zone for the most recent five bi-weekly reporting periods. All data is preliminary and subject to change.

Fishing Zone	Jan 1 - Total Traps	Jan 16 - Total Traps	Feb 1 - Total Traps	Feb 16 - Total Traps	Mar 1 - Total Traps
Zone 1	NR-C	6,463	49,925	47,318	34,572
Zone 2	NA	1,076	5,008	4,186	3,983
Zone 3	9,917	14,526	21,768	21,294	19,322
Zone 4	1,093	1,356	1,994	2,055	2,079
Zone 5	NA	NA	NR-C	NR-C	NR-C
Zone 6	NA	NA	NA	NA	NA
Totals	11,010	23,421	78,695	74,853	59,956

Distribution and abundance of key forage: §132.8(d)(8)

Data provided by: Monterey Bay Aquarium Research Institute, Jarrod Santora (NMFS SWFSC)

MBARI Krill Model

See the [February 13, 2023, Available Data](#) document.

Forage Abundance Indices

See the [February 13, 2023, Available Data](#) document.

Ocean conditions: §132.8(d)(9)

Data provided by: National Weather Service Climate Prediction Center, California Current Integrated Ecosystem Assessment Program, Jarrod Santora (NMFS SWFSC)

El Niño/Southern Oscillation (ENSO) Diagnostic

As of March 9, 2023, La Niña conditions have ended, and ENSO-neutral conditions are present. Enso-neutral conditions are likely to continue through to the spring with El Niño forming in summer of 2023.

Large Marine Heatwave Tracker

As of February 16, 2023, the heatwave that developed in January 2022 has continued to shrink and recede from nearshore coastal waters. Nearshore coastal waters have continued to return to normal or slightly colder-than-normal temperatures. (Figure 10).

Feb-16-2023

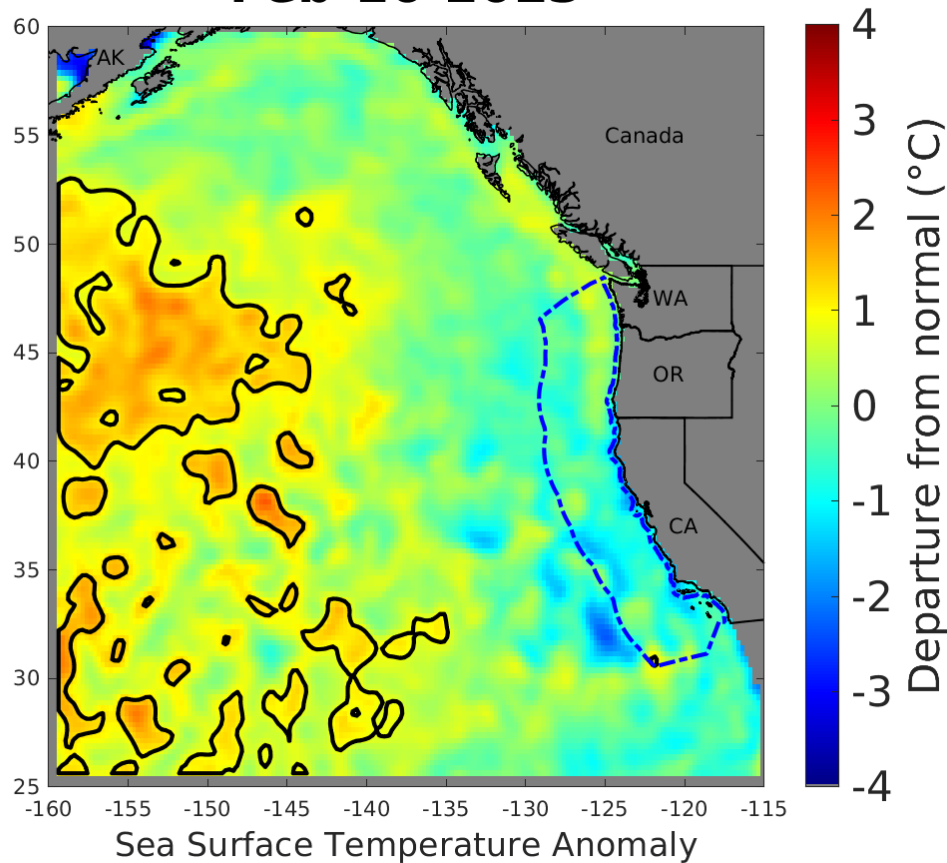


Figure 10. Science-quality (delayed 3-weeks) daily interpolated standardized sea surface temperature anomalies (SSTa) in the California Current ecosystem available for analysis of MHW presence. Dark outline shows the current extent of MHW conditions, as delineated by values of the normalized SST + 1.29 SD from normal. Blue dashed line represents the US West Coast EEZ. SST data from [NOAA's Optimum interpolation Sea Surface Temperature](#) analysis with the SST anomaly calculated using climatology from NOAA's AVHRR-only OISST dataset.

Habitat Compression Index

The most recent Habitat Compression Index values are for February 2023, when the northern region was experiencing medium compression and the central region was experiencing low compression (Figures 11 and 12). Neither of these conditions present a concern for concentrating whales and their forage closer to shore. These conditions favor increased abundance and distribution of krill offshore.

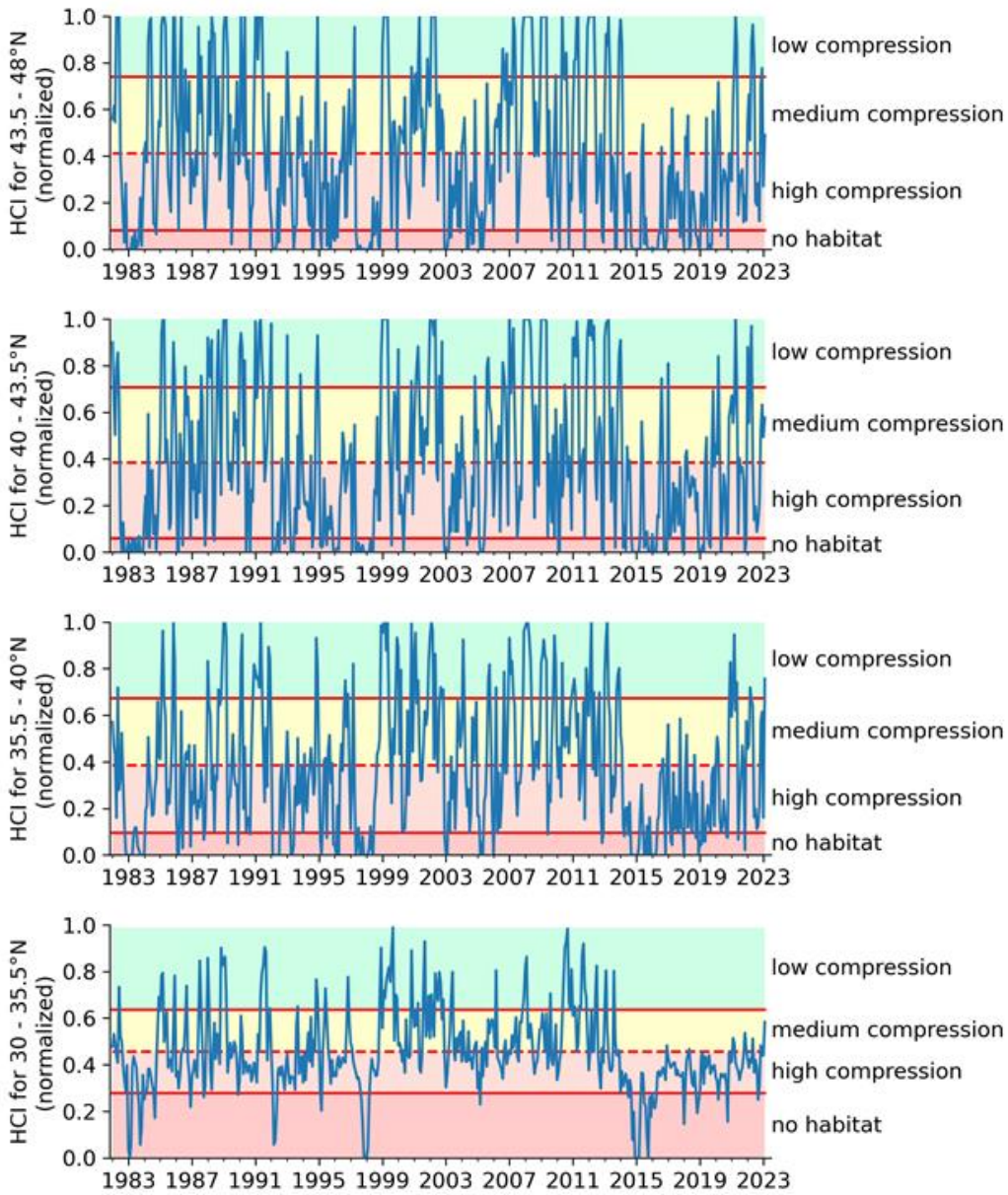


Figure 11. Monthly Habitat Compression Index (HCI), updated through February 2023. The HCI quantifies the available cool thermal habitat area and its relative shoreward compression. Dashed red line is the mean and solid red lines are +/- 1 Standard Deviations. See Figure 12 for spatial distribution of cool thermal habitat.

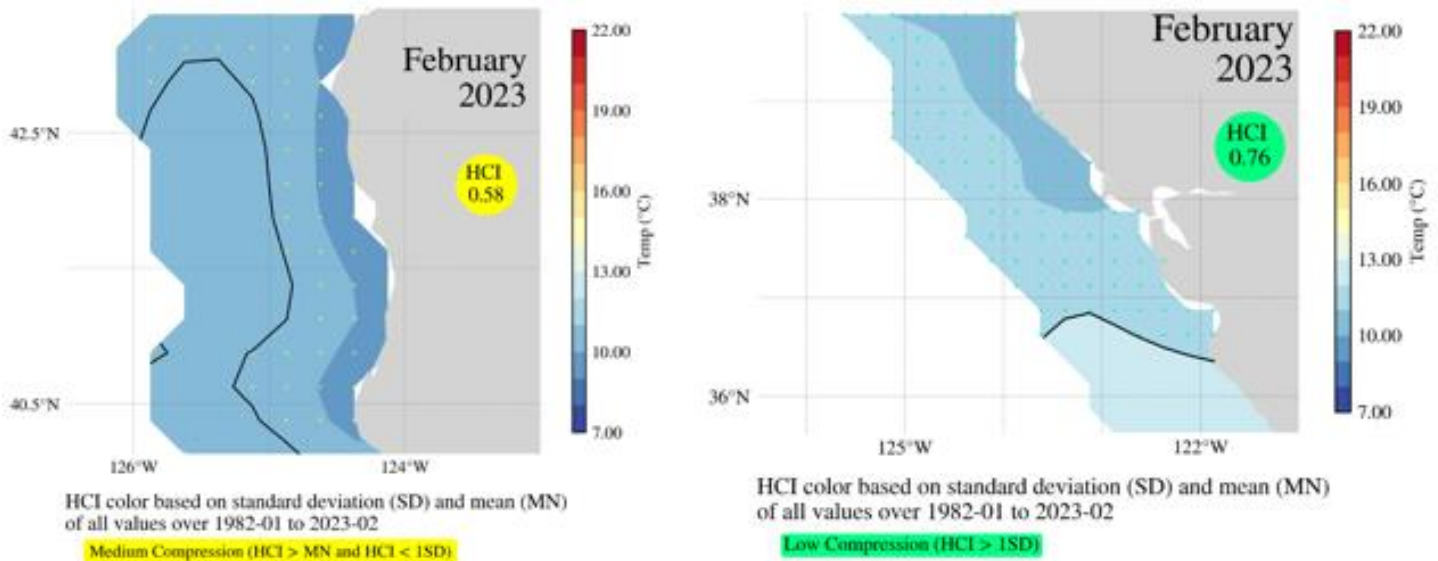


Figure 12. Spatial structure of the Habitat Compression Index for Region 3 (35.5 – 40 °N: left side) and Region 2 (40 to 43.5 °N: right side).

North Pacific High

The North Pacific High (NPH) area in February was well above average (Figure 12), indicating likely above average upwelling conditions (preconditioning effects) and springtime productivity that favors increased abundance and distribution of krill and juvenile forage fishes.

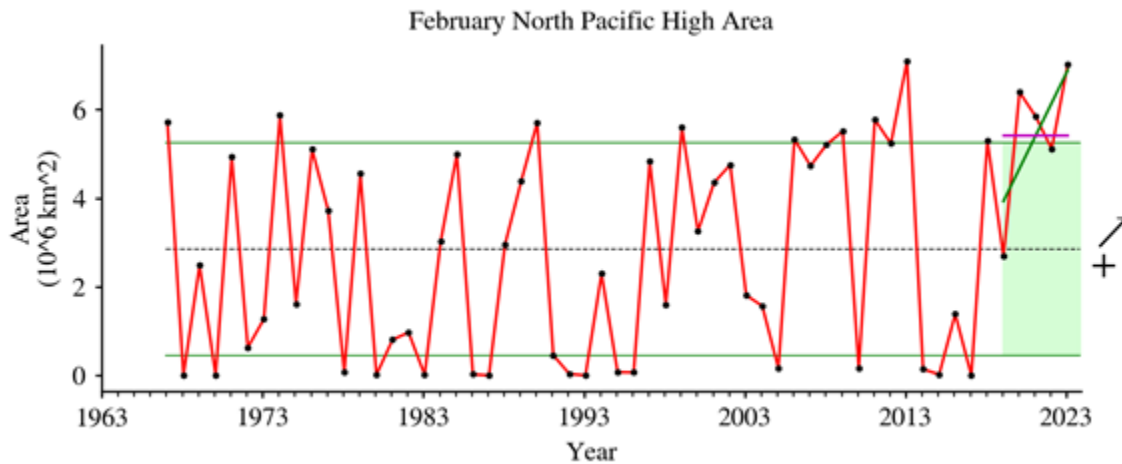


Figure 13. The North Pacific High (NPH) index monitors the area and intensity of the NPH atmospheric pressure cell off the US West Coast. The winter NPH informs potential spring ecosystem conditions within the coastal waters of California. Above average area of the NPH relates to earlier initiation and strength of upwelling and elevated krill concentrations off central California in April-May.

Current Impact Score Calculation: §132.8(d)(10)

Impact Score totals for the current fishing season (2022-23) and calendar year (2023) are provided in Table 2 above. Impact Score totals for calendar year 2021 and 2022 are provided in Table 3 above.