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

Date: May 31, 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 May 19, 2023, and finalized at the conclusion of the Working Group meeting which was held on May 23, 2023.

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

Entanglements:

As of May 19, 2023, two entanglements have been reported to CDFW by NOAA for the 2022-23 season that involved unidentified gear that is consistent with the type that is used in the commercial Dungeness crab fishery resulting in an in-season Confirmed Entanglement Impact Score of 0.76. A third entanglement with unidentified gear was reported on May 12, 2023, involving a humpback whale near Moss Landing. However, following a review of the entangling line, it is not consistent with the line used in the commercial Dungeness crab fishery. The line was identified as multistrand nylon, which is commonly used for moorings or groundlines, not as a vertical line for the commercial Dungeness crab trap fishery.

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. Therefore, the current running 3-year average Impact Score is 2.64 for humpback whales for the years 2021-2023, which exceeds the triggers in Section 132.8(c)(1)(C)(1). Note: Entanglement data are subject to revision based on review and verification by NOAA.

Marine Life Concentrations:

A CDFW aerial survey of Fishing Zones 1, 2 and a portion of 3 did not observe humpback whales, blue whales, or leatherback sea turtles. Small vessel surveys conducted by Cascadia Research observed 13 and 5 humpbacks during two surveys in Zone 1. Surveys conducted by the commercial fishing fleet in Fishing Zone 1 observed 10 humpback whales in depths ranging from 35 to 60 fathoms. This survey is informative as an indicator of humpback distribution in Fishing Zone 1. Monterey Bay Whale Watch data documented 21 humpback whales during a single trip and an average of 7 humpback whales per trip during the most recent seven-day period in Fishing Zone 4. Based on historical migration patterns, blue and humpback whale migration arrivals will increase over the coming weeks and remain across California waters through at least November.

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 Statewide Fleet Advisory for all gear types.**

**Commercial Fishery:**

- **Continue Fleet Advisory for Fishing Zones 1 and 2**
- **Continue Depth Constraint of 30 fathoms for Fishing Zones 1 and 2**

Management Recommendation Summary Rationale:

Two recent entanglements involving humpback whales with unknown fishing gear bring the total three-year average Impact Score to 2.64, which exceeds the Calendar Year Impact Score trigger as defined in RAMP for the commercial Dungeness crab fishery. In addition, based on recent Marine Life Concentration surveys for Fishing Zone 1 and 4, humpback whale sightings continue to increase, and humpback whales are expected to continue to migrate into all Fishing Zones over the coming weeks. However, at this time, CDFW Marine staff do not recommend additional management actions for Fishing Zones 1 and 2 for the commercial or recreational fisheries. Importantly, the reported entanglements were all documented in Zone 4 and because the whales are migrating from south to north from their winter breeding grounds, there is no indication that closing Zones 1 and 2 would have prevented those entanglements or would reduce risk given the low abundance of humpback whales in those Zones.

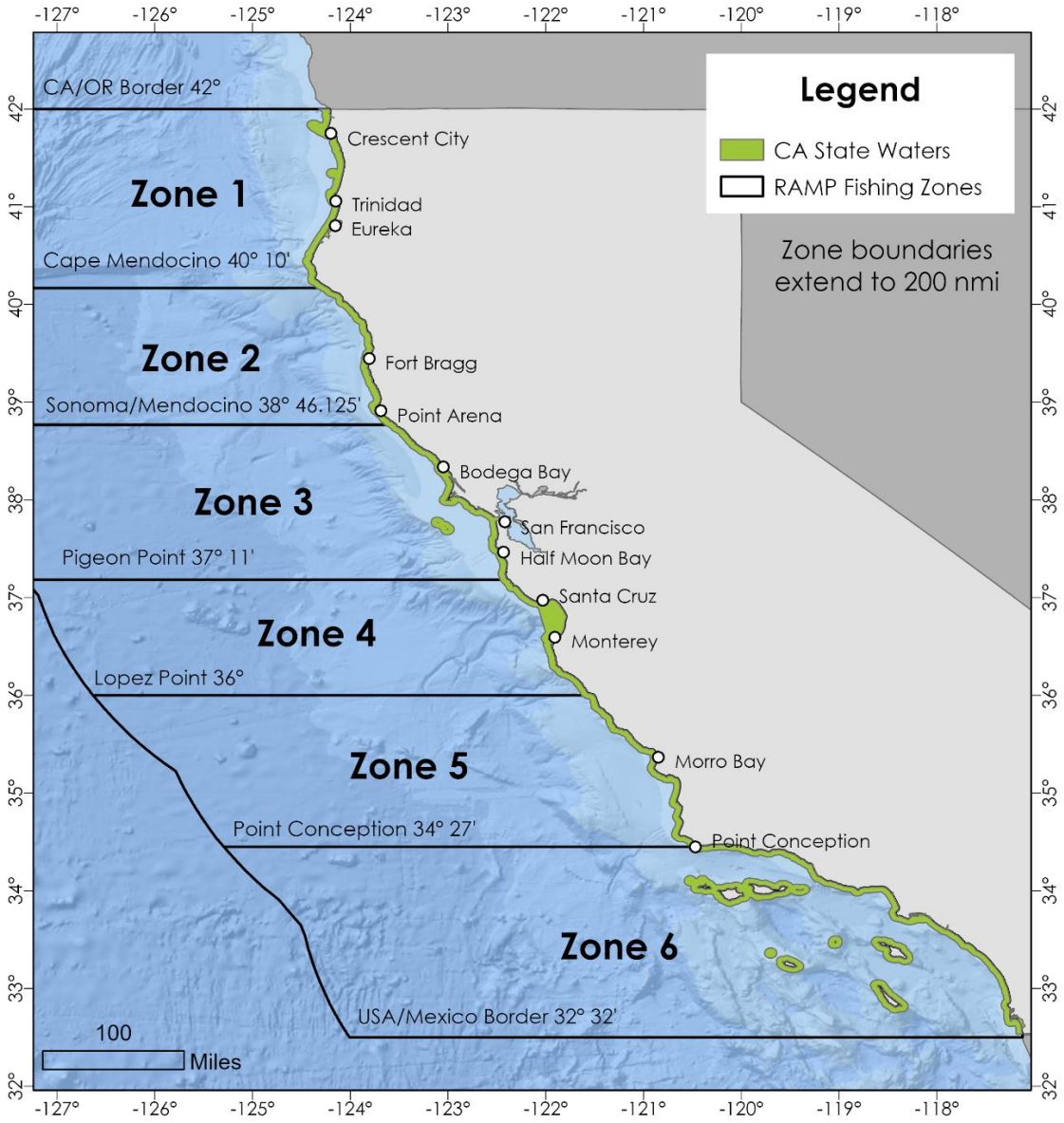
The 30-fathom Depth Constraint currently in place for the commercial fishery will minimize overlap with foraging humpback whales and limited recreational trap fishing in Fishing Zones 1 and 2 does not present an elevated risk at this time. Observation data indicate most humpback whales are foraging in deep water, greater than 30-fathoms, likely taking advantage of krill at or near the shelf and canyon edges. This is supported by oceanographic data and krill indices as reported in the Available Data documents this spring. The recommendation is to also continue the Fleet Advisory for both the recreational and commercial fishery in all Fishing Zones until season closures are in effect statewide.

The above recommendations are informed by historical migration patterns, recent entanglements, and exceedance of the running three-year average entanglement Impact Score for humpback whales which requires CDFW to implement precautionary management actions to avoid additional entanglements. The actions currently in place will provide sufficient risk reduction while allowing continued fishing opportunities for both fleets. CDFW reminds all fisherman to use best fishing practices to minimize risk of entanglement as whales begin to arrive in Fishing Zones that remain open to fishing, regardless of fishery or gear type. Both commercial and recreational fleets should however be prepared to modify fishing operations to minimize risk of entanglement. Staff will continue to monitor whale presence and entanglement risk, and it should be noted that the Director may implement a trap prohibition for the recreational fishery at a future date to further reduce the risk of entanglement.

The commercial fishery was closed in Fishing Zones 3-6 (effective April 15, 2023) and recreational traps were prohibited (effective May 15, 2023) in those same Zones until the season closure on June 30, 2023.

**Alternatives Considered but Rejected**

- Gear Reduction – based on available data this is not currently the recommended Management Action based on declining fishery participation.
- Fishery Closure – based on available data this is not currently the recommended Management Action but based on historical migration patterns CDFW anticipates this action will likely be required in the coming weeks.
- Alternative Gear - can be authorized after April 1st, but no gear currently is authorized for the commercial Dungeness crab fishery.


Legend
CA State Waters
RAMP Fishing Zones
Zone boundaries extend to 200 nmi
CA/OR Border 42°
Zone 1
Crescent City
Trinidad
Eureka
Cape Mendocino 40° 10'
Zone 2
Fort Bragg
Sonoma/Mendocino 38° 46.125'
Point Arena
Zone 3
Bodega Bay
San Francisco
Half Moon Bay
Pigeon Point 37° 11'
Santa Cruz
Zone 4
Monterey
Lopez Point 36°
Zone 5
Morro Bay
Point Conception 34° 27'
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Zone 6
USA/Mexico Border 32° 32'
100
Miles
-127°
-126°
-125°
-124°
-123°
-122°
-121°
-120°
-119°
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# California Department of Fish and Wildlife Preliminary Assessment and Management Recommendation for the Risk Assessment Mitigation Program

Date: May 19, 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 (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 Concentration Triggers for Management Action, RAMP subsection (c)

Entanglements:

As of May 19, 2023, two entanglements have been reported to CDFW by NOAA for the 2022-23 season that involved unidentified gear that is of the type that is used in the commercial Dungeness crab fishery resulting in an in-season Confirmed Entanglement Impact Score of 0.76. A third entanglement with unidentified gear was reported on May 12, 2023, involving a humpback near Moss Landing. However, following a review of the line type, it is not consistent with line used in the commercial Dungeness crab fishery.

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. Therefore, the current running 3-year average Impact Score is 2.64 for humpback whales for the years 2021-2023, which exceeds the triggers in Section 132.8(c)(1)(C)(1). Note: Entanglement data are subject to revision based on review and verification by NOAA.

Marine Life Concentrations:

A CDFW aerial survey of Fishing Zones 1, 2 and a portion of 3 did not observe humpback whales, blue whales, or leatherback sea turtles. Small vessel surveys conducted by Cascadia Research observed 13 and 5 humpbacks during two surveys in Zone 1. Surveys conducted by the commercial fishing fleet in Fishing Zone 1 observed 10 humpback whales in depths ranging from 35 to 60 fathoms. This survey is

informative as an indicator of humpback distribution in Fishing Zone 1. Monterey Bay Whale Watch data documented 21 humpback whales during a single trip and an average of 7 humpback whales per trip during the most recent seven-day period in Fishing Zone 4. Based on historical migration patterns, blue and humpback whale migration arrivals will increase over the coming weeks and remain across California waters through at least November.

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Management Recommendation Summary Rationale:

Two recent entanglements involving humpback whales with unknown fishing gear bring the total three-year average Impact Score to 2.64, which exceeds the Calendar Year Impact Score trigger as defined in RAMP for the commercial Dungeness crab fishery. In addition, based on recent Marine Life Concentration surveys for Fishing Zone 1 and 4, humpback whale sightings continue to increase and humpback whales are expected to continue to migrate into all Fishing Zones over the coming weeks. However, at this time, CDFW Marine staff do not recommend additional management actions for Fishing Zones 1 and 2 for the commercial or recreational fisheries. The commercial fishery is closed in Fishing Zones 3-6 and recreational traps have been prohibited in those same Zones until the season closure on June 30, 2023. Importantly, the reported entanglements were all documented in Zone 4 and because the whales are migrating from south to north from their winter breeding grounds, there is no indication that closing Zones 1 and 2 would have prevented those entanglements or would reduce risk given the low abundance of humpback whales in those Zones.

The 30-fathom Depth Constraint currently in place for the commercial fishery will minimize overlap with foraging humpback whales and limited recreational trap fishing in Fishing Zones 1 and 2 does not present an elevated risk at this time. Observation data indicate most humpback whales are foraging in deep water, greater than 30-fathoms, likely taking advantage of krill at or near the shelf and canyon edges. This is supported by oceanographic data and krill indices as reported in the Available Data documents this spring. The recommendation is to also continue the Fleet Advisory for both the

recreational and commercial fishery in all Fishing Zones until closures/trap prohibitions are in effect statewide.

The above recommendations are informed by historical migration patterns, recent entanglements, and exceedance of the running three-year average entanglement Impact Score for humpback whales which requires CDFW to implement precautionary management actions to avoid additional entanglements. The actions currently in place will provide sufficient risk reduction while allowing continued fishing opportunities for both fleets. CDFW reminds all fisherman to use best fishing practices to minimize risk of entanglement as whales begin to arrive in Fishing Zones that remain open to fishing, regardless of fishery or gear type. Both commercial and recreational fleets should however be prepared to modify fishing operations to minimize risk of entanglement. Staff will continue to monitor whale presence and entanglement risk, and it should be noted that the Director may implement a trap prohibition for the recreational fishery at a future date to further reduce the risk of entanglement.

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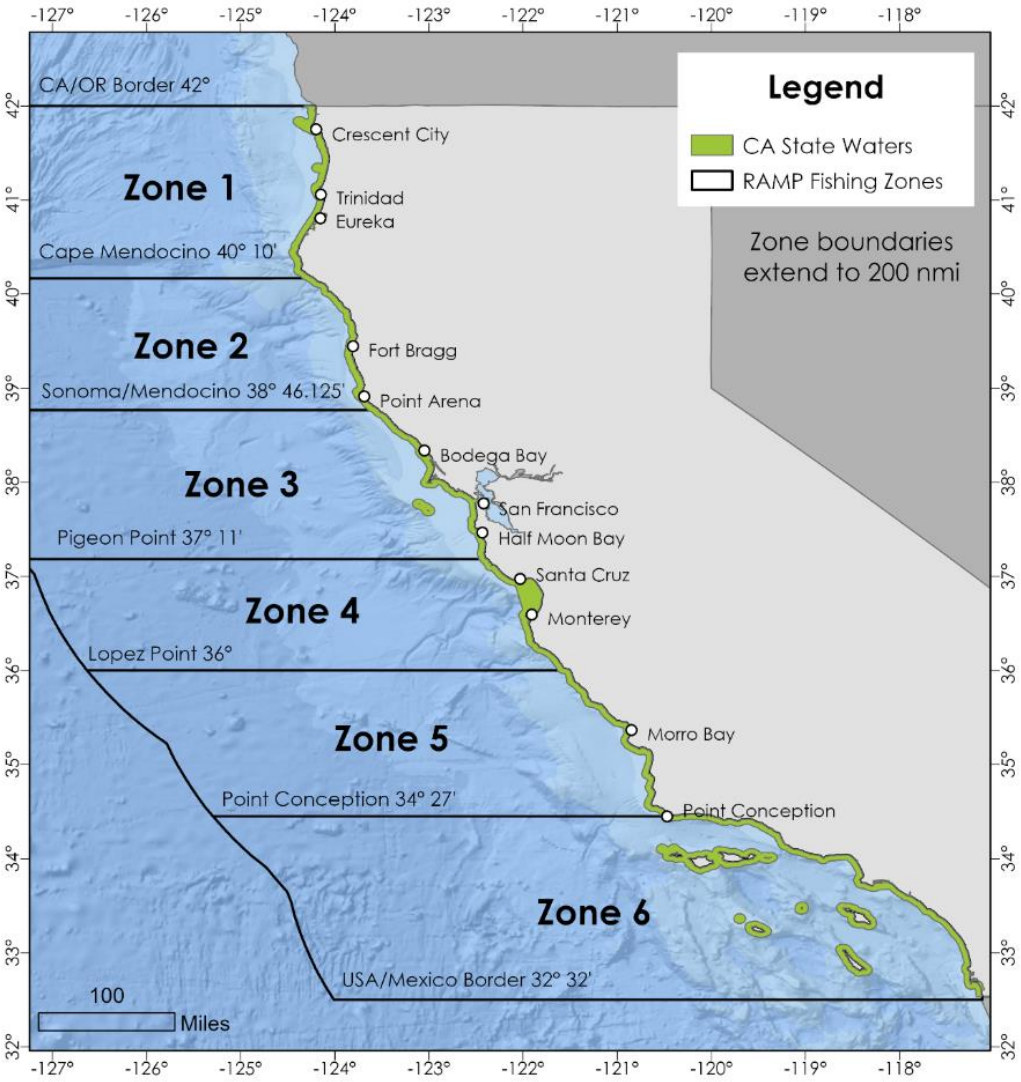
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-119°
-118°
42°
41°
40°
39°
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34°
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32°

# 2022-23 Risk Assessment: Available Data

Last updated: ~~May 19, 2023~~ May 24, 2023.

Minor non-substantive updates to the version originally provided.

## Contents

Items with updated information are followed by an *.



## 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 May 19, 2023, there have been a total of two confirmed humpback whale entanglements, zero confirmed blue whale entanglements, and zero confirmed leatherback sea turtle entanglements reported to the West Coast Region during 2023. Note: Other entanglements have occurred in California during 2023 but are not actionable under RAMP.

**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 | 2 |
| Blue whales | 0 | 0 |
| Leatherback sea turtles | 0 | 0 |

Both the current fishing season Impact Score and the calendar year Impact Score for humpback whales is 0.76. During 2022 and 2023 there have been no confirmed entanglements of either blue whales or leatherback sea turtles in California commercial Dungeness crab gear or Unknown Fishing Gear. Therefore, the cumulative Impact Score for 2023 and the current fishing season is 0 for these two species.

**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 | 0.76 | 0.76 |
| 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 Impact Score for 2022 was 5.28 for humpback whales and 0 for blue whales and leatherback sea turtles. The 2023 calendar year Impact Score is 0.76 for humpback whales and 0 for blue whales and leatherback sea turtles. Therefore, the 3-year Rolling Average Impact Score is now 2.64.

**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 | 0.76 | 2.64 |
| Blue whales | 0 | 0 | 0 | 0 |
| Leatherback sea turtles | 0 | 0 | 0 | 0 |

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

*Data provided by: California Department of Fish and Wildlife and Cascadia Research Collective*

**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 | CDFW Aerial Survey, Cascadia Research Collective | Yes |
| Zone 2 | CDFW Aerial Survey | No |
| Zone 3 | CDFW Aerial Survey | No |
| Zone 4 | None | No |
| Zone 5 | None | No |
| Zone 6 | None | NA |

### CDFW Aerial Survey *(Fishing Zones 1, 2, and 3)*

CDFW staff conducted an aerial survey on May 9, 2023, between Trinidad (Fishing Zone 1) and Point Reyes (Fishing Zone 3). Weather conditions were good with high visibility, no humpback or blue whales were observed for Fishing Zones 1, 2, or 3 (Figure 1).

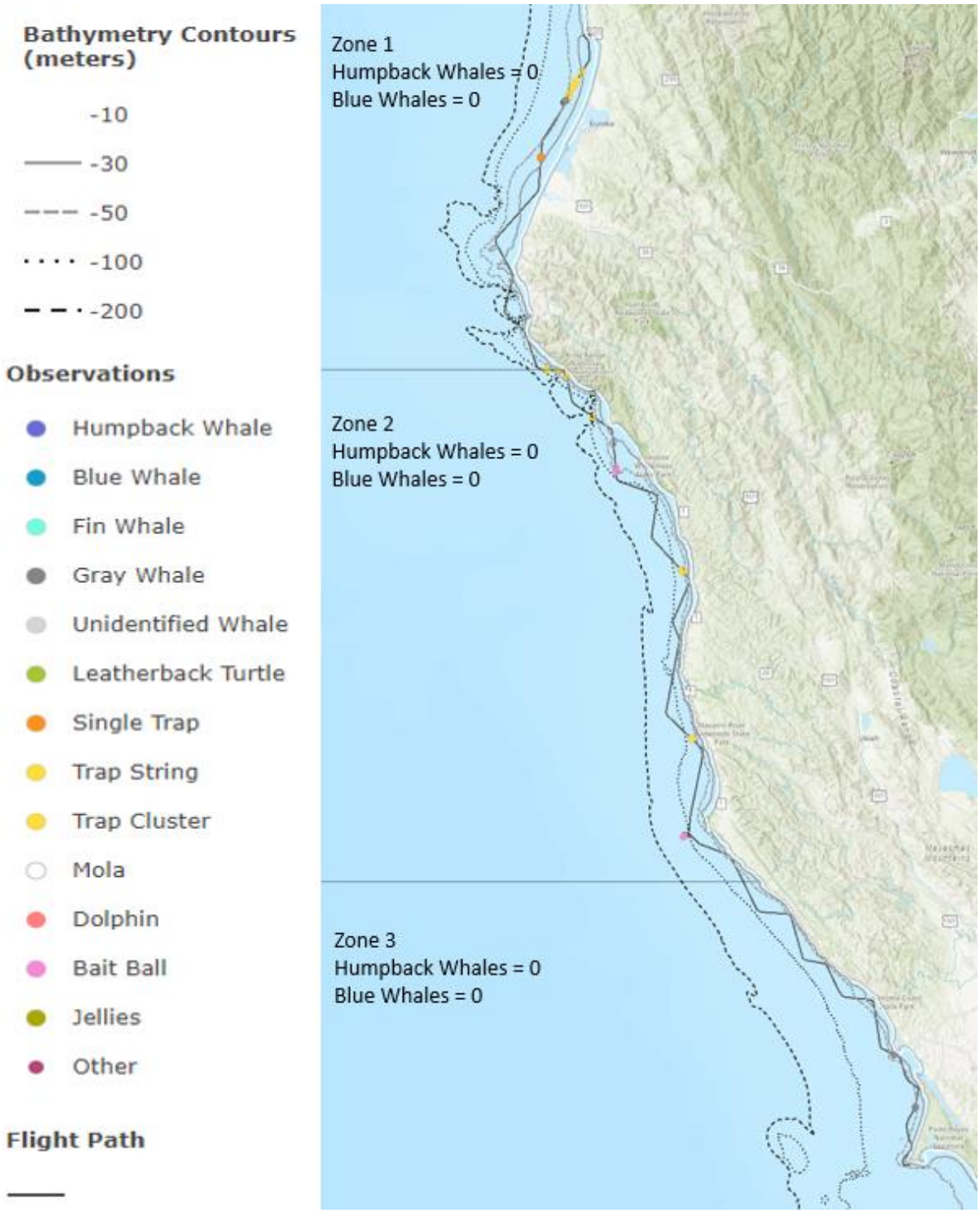


**Figure 1. Map showing track lines and observations from CDFW aerial survey of Fishing Zones 1, 2, and 3 on May 9, 2023.**

## Cascadia Research Collective *(Fishing Zone 1)*

Cascadia Research conducted two surveys on April 29, and April 30, 2023, out of Eureka and Crescent City. 13 humpback whales were sighted on the first survey and five were sighted on the second survey.


**Figure 2. Track and sightings from survey by Cascadia Research out of Eureka and Crescent City on April 29 and April 30, 2023.**

## MANAGEMENT CONSIDERATIONS

### Information from NOAA: §132.8(d)(2)*

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

On May 12, 2023, there was a confirmed entanglement of a humpback whale in Unknown Fishing Gear in Monterey Bay (Fishing Zone 4). See Preliminary Assessment for information regarding the CDFW assessment of the gear/line type.

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

*Data provided by: California Department of Fish and Wildlife*

CDFW's effectiveness evaluation for the management actions specified in §132.8(e) will be provided in the May 19, 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.

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

*Data provided by: Point Blue Conservation Society, California Coast Crab Association*

### Point Blue Conservation Science *(Fishing Zones 3, 4, and 6)*

During the seven-day period ending May 18, 2023, trained observers at the Farallon Islands reported 16 humpback whales in Fishing Zone 3, observers and naturalists from Monterey Bay Whale Watch and Marine Life Studies observed four humpback whales in Fishing Zone 4, and observers from the Channel Islands National Marine Sanctuary and National Park Service reported 108 humpbacks in Fishing Zone 6. No blue whales were observed in any Fishing Zone during this period (Figure 3).

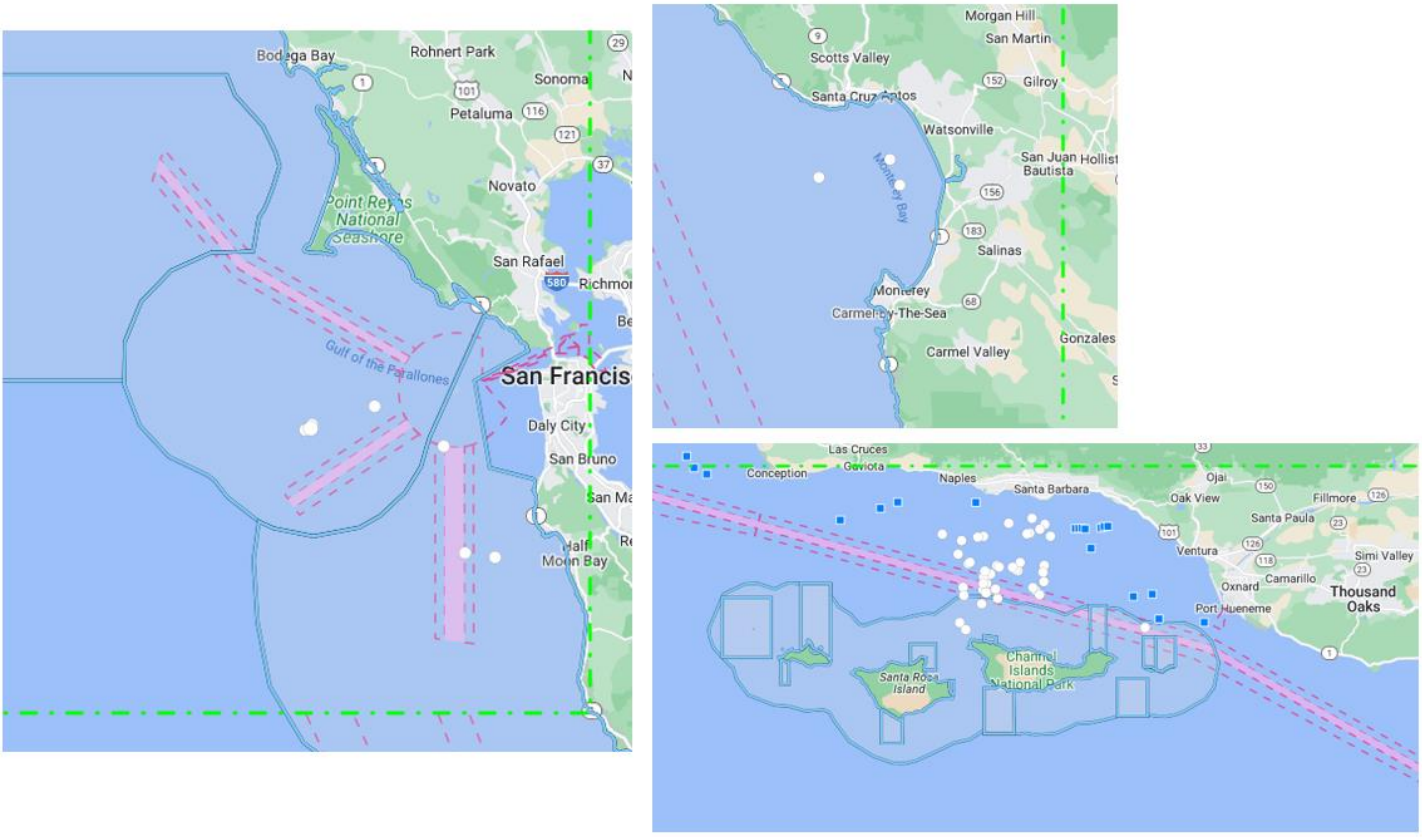


**Figure 3. Locations of humpback whale sightings within Fishing Zone 3 (left), Fishing Zone 4 (upper right) and Fishing Zone 5 (lower right). Reporting locations are represented by white circles. A given report may or may not represent multiple individuals. Fishing Zone boundaries are represented by green dashed lines.**

### California Coast Crab Association *(Fishing Zone 1)*

The California Coast Crab Association conducted surveys on April 28, 2023, and May 11, 2023, out of Eureka and Crescent City.

Surveys were conducted on May 11, 2023, using two industry vessels out of Crescent City (F/V Resolution, F/V Amylyn) and two industry vessels out of Eureka (F/V Celtic Aire, F/V Seaila) (Figure 4)

- An observer from CDFW was on the F/V Celtic Aire and an observer from Cal Poly Humboldt was on the F/V Amylyn.
- Visibility was nearly unlimited, and the sea was nearly flat.

- A total of 10 humpbacks whales were observed. All 10 humpback whale sightings were outside 35 fathoms (One at 35 fathoms, One at 45 fathoms, and eight greater than 65 fathoms).

Surveys were conducted on April 28, 2023, using two industry vessels out of Crescent City (F/V MistaSea, F/V Sprit of America), and two industry vessels out of Eureka (F/V Sally Kay, F/V Seaila)(Figure 4).

- An observer from CDFW was on the F/V Sally Kay and an observer from Cal Poly Humboldt was on the F/V MistaSea.
- Fog delayed departure, so surveys began around 9am. Visibility was nearly unlimited once the fog cleared. The sea was nearly flat.
- A total of 5 humpbacks whales were observed, and 8 unknown whales were observed. All sightings were between 50-100 fathoms.

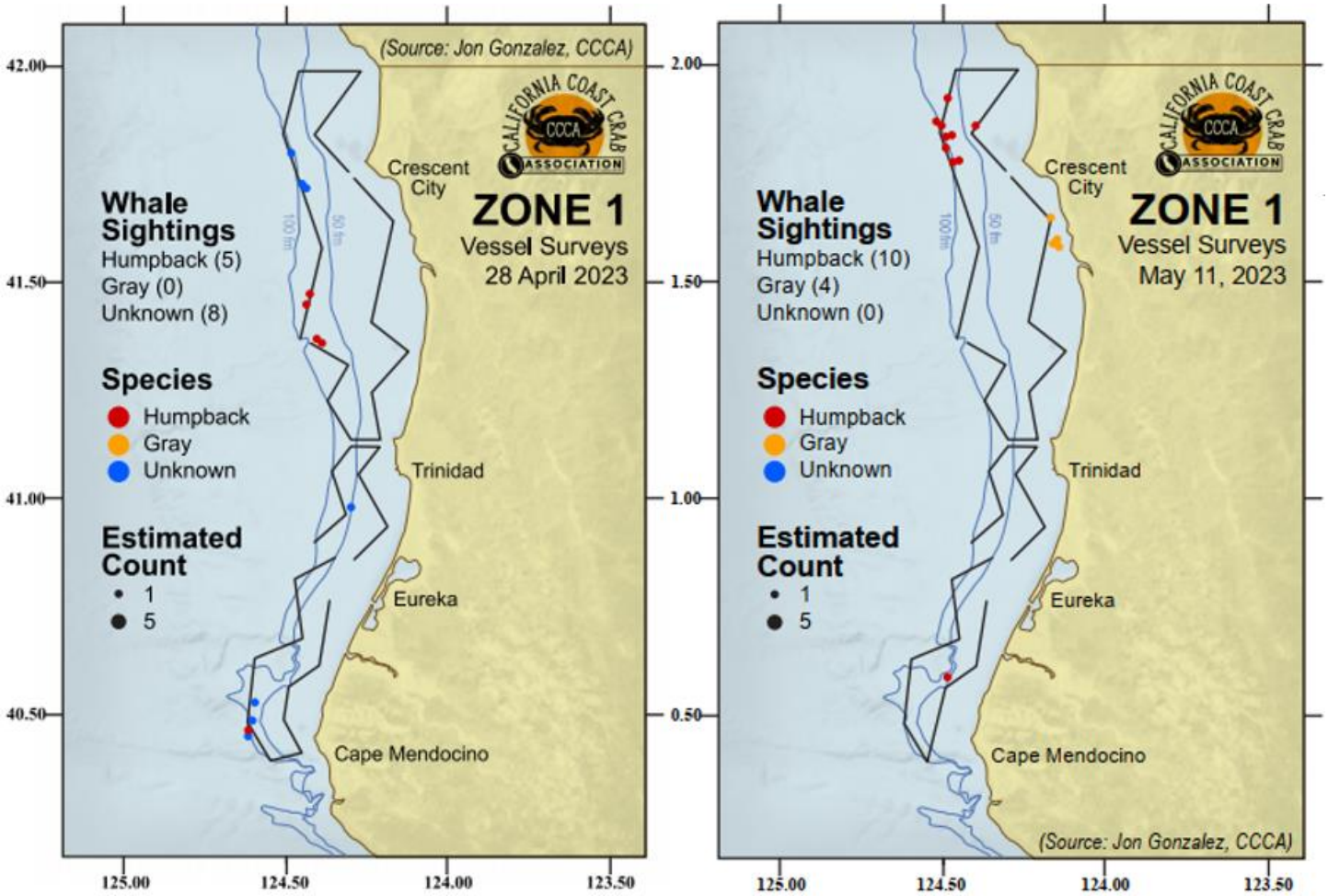


**Figure 4. Maps showing track lines and observations on surveys conducted on April 28, 2023 using two industry vessels out of Crescent City (F/V MistaSea, F/V Sprit of America), and two industry vessels out of Eureka (F/V Sally Kay, F/V Seaila; left) and on May 11, 2023, using two industry vessels out of Crescent City (F/V Resolution, F/V Amylyn) and two industry vessels out of Eureka (F/V Celtic Aire, F/V Seaila; right).**

## 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)*

Fishing Zones 1 and 2 are open as of May 19, 2023, and all other Fishing Zones are closed, a summary of landings from all Fishing Zones is provided below (Table 5).

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 5). So far, 74% of the total volume harvested for this season has been from Fishing Zone 1, with 18% from Fishing Zone 3, six percent from Fishing Zone 2 and the remaining 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 6). All Fishing Zones have had a continued decrease in vessel activity since mid-February.

Weekly landings by port have declined since the beginning of January with the highest activity in Crescent City, Eureka, Bodega Bay, Half Moon Bay, and San Francisco (Figure 7). Overall, 47% of the total volume harvested for this season has been landed into Crescent City, 23% landed in Eureka, six percent landed into Bodega Bay, Half Moon Bay, Trinidad, and San Francisco, and five percent or less 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 Half Moon Bay (35 vessels), San Francisco (34 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 8). Vessel activity by Fishing Zone has significantly decreased since the beginning of April. After the closure of the Central Management Area vessel activity in Crescent City, Trinidad, Fort Bragg, and Eureka has remained steady.

**Table 5. Summary of fleet dynamics information, as of May 19, 2023.**

| Metric | Value | Additional Info |
|---|---|---|
| Season status | Partial Closure | Fishing Zones 1 and 2 Open |
| Number of daily landings | 6,189 | NA |
| Total volume (pounds) | 20,762,739 | NA |
| Total Ex-Vessel Value | $52,673,765 | NA |
| Average unit price | %2.83 | NA |
| Total number of active vessels | 366 | NA |
| Maximum potential traps (based on active permits) | 121,775 | Estimates are also provided in the Bi-Weekly Fishing Activity Reports subsection |

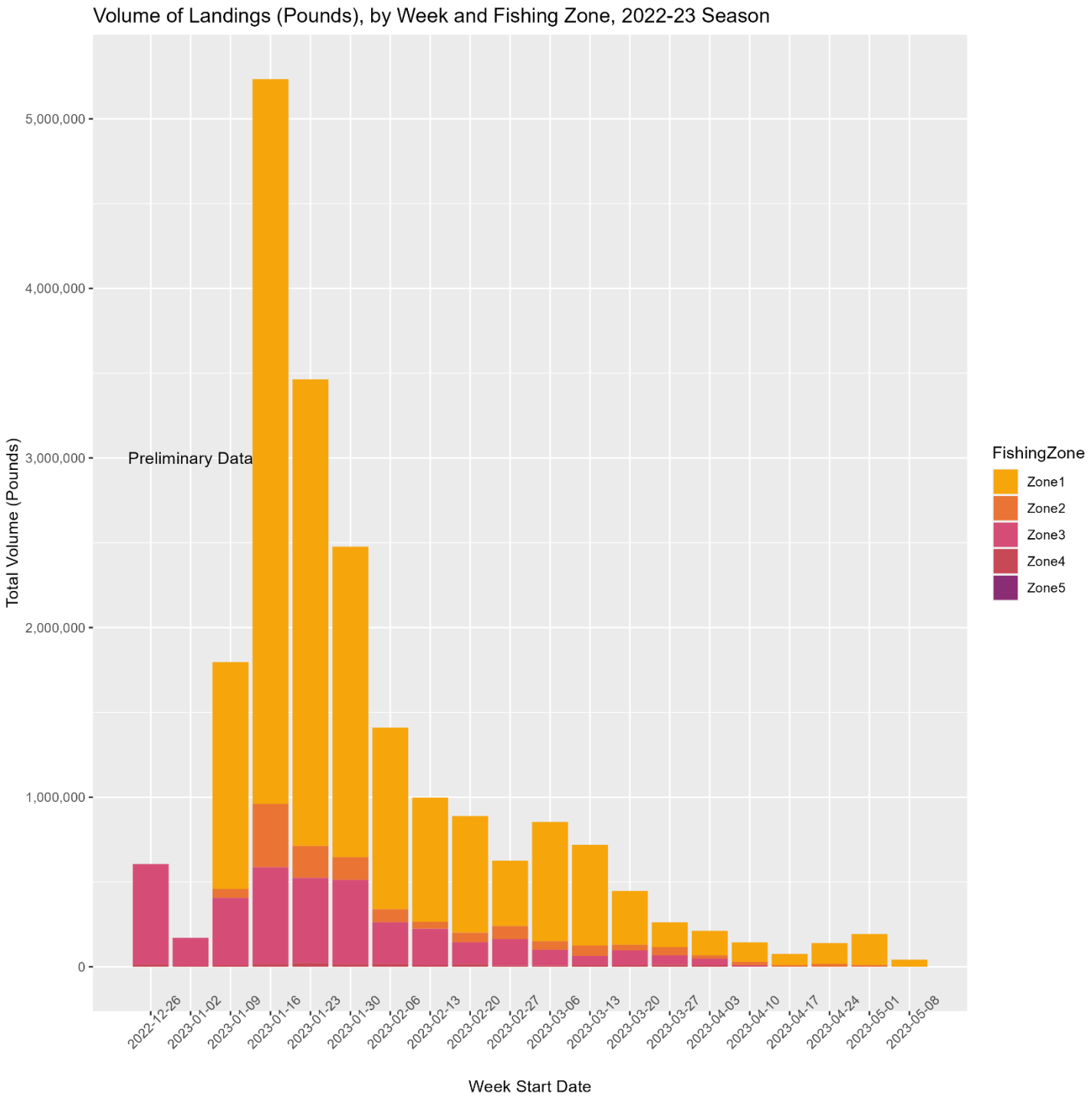


**Figure 5. Cumulative volume (pounds) harvest by week and Fishing Zone. Week 1 starts with the first day the commercial Dungeness crab fishery was open in any area, December 31, 2022. All data are preliminary and subject to change.**

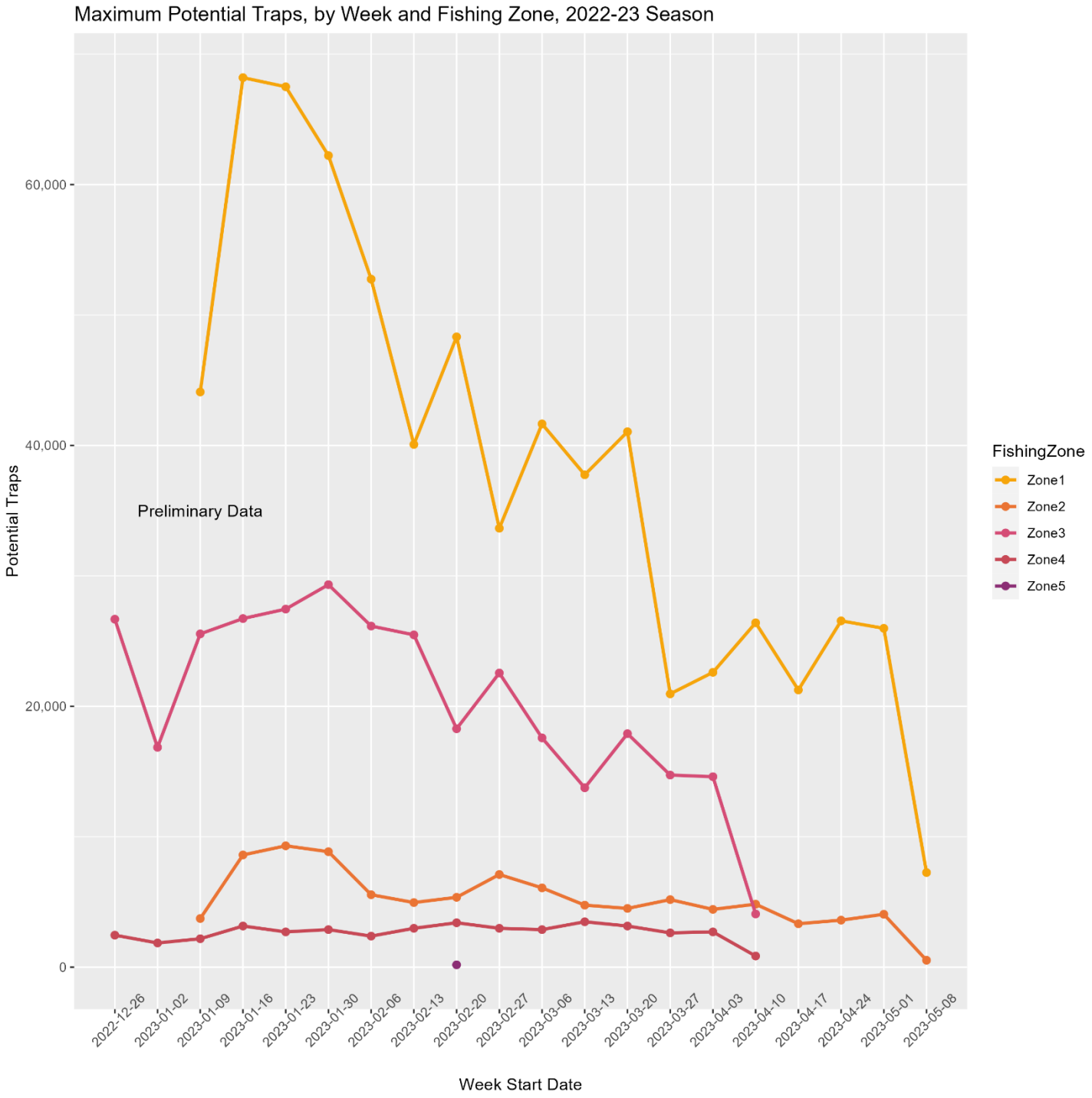


**Figure 6. Number of traps by week and Fishing Zone. Week 1 starts with the first day the commercial Dungeness crab fishery was open in any area, December 31, 2022. All data are preliminary and subject to change. Some week* Fishing Zone combinations are withheld due to confidentiality constraints.**

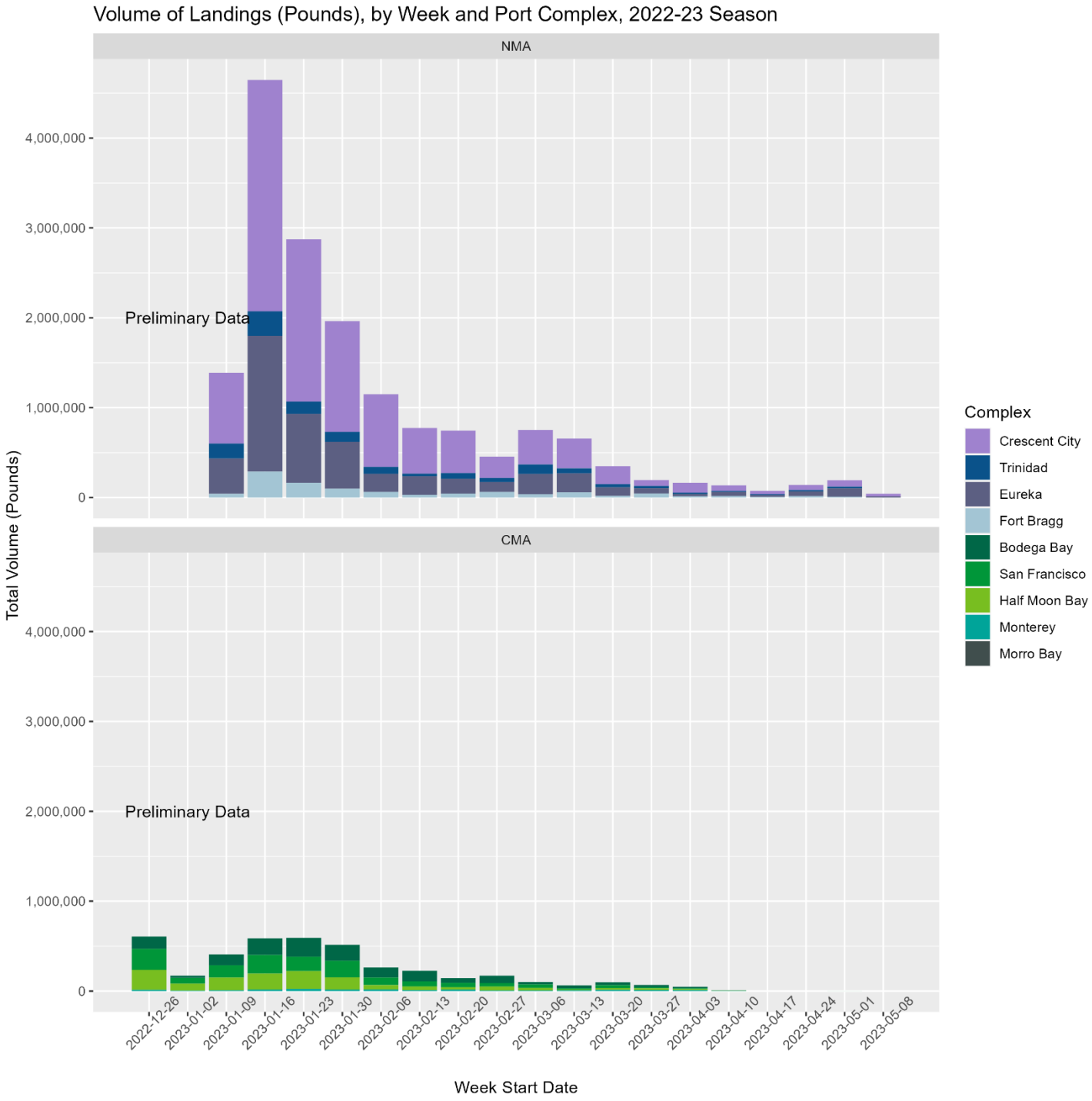


**Figure 7. Cumulative volume (pounds) landed by week and port complex. Week 1 starts with the first day the commercial Dungeness crab fishery was open in any area, December 31, 2022. All data are preliminary and subject to change. Certain week*port complex combinations are withheld due to confidentiality constraints.**

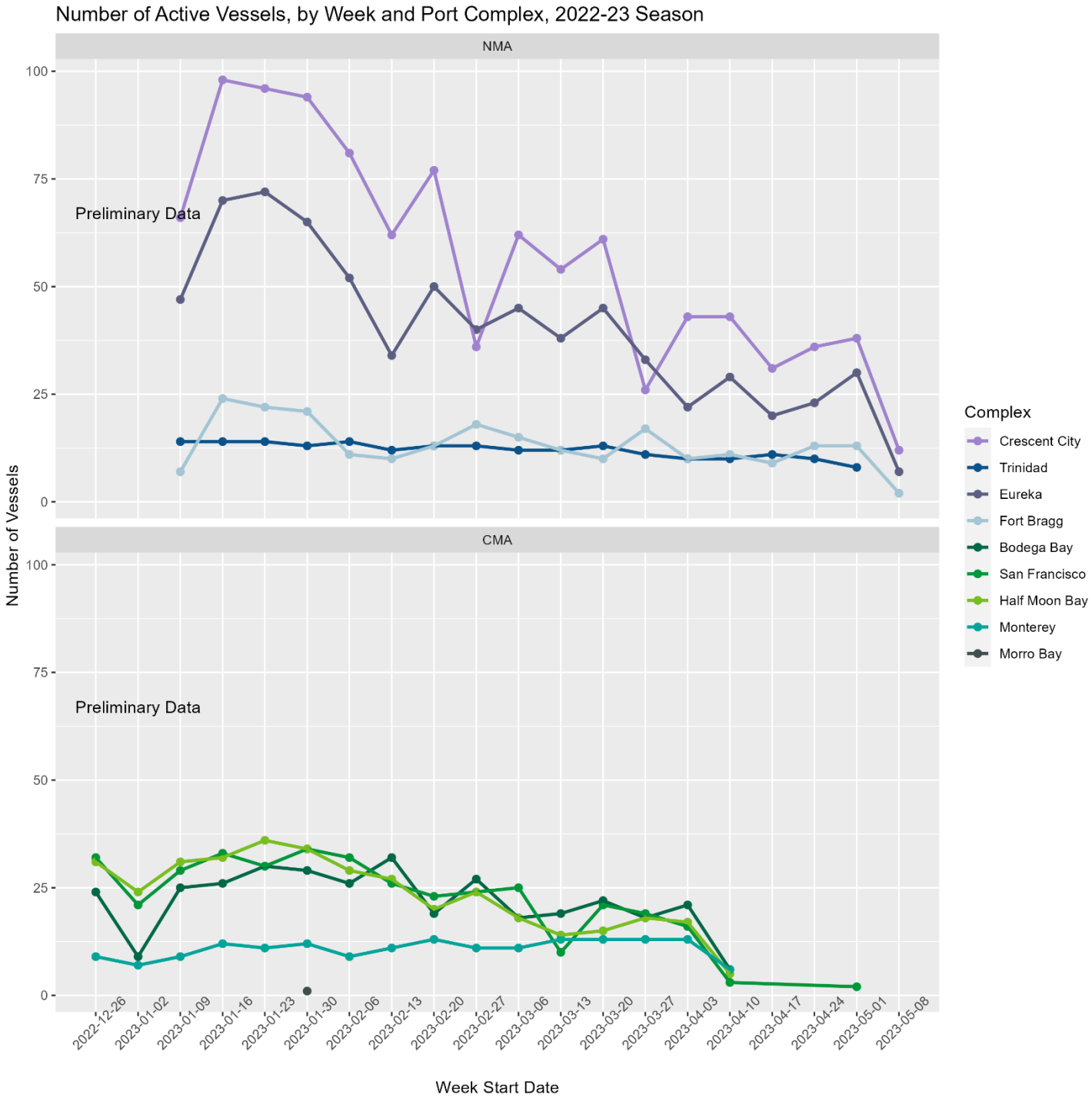


**Figure 8. Number of active vessels by week and port complex. Week 1 starts with the first day the commercial Dungeness crab fishery was open in any area, December 31, 2022. All data are preliminary and subject to change. Some week*port complex combinations are withheld due to confidentiality constraints.**

## Bi-Weekly Fishing Activity Reports *(All Fishing Zones)*

CDFW has received bi-weekly reports since the first reporting period on January 1, 2023 through the most recent reporting period of May 1, 2023. A summary of reports received for May 1, 2023, is provided in Table 6; note this summary may not reflect all permitted vessels participating in the fishery. Based on this total, 86% of all estimated traps are being reported in Fishing Zone 1.

**Table 6. Summary of information provided for the May 1, 2023, bi-weekly reporting period by Fishing Zone (1-6). Accessed from CDFW's Bi-Weekly Reporting database on May 18, 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 | 51 | 319 | 16,239 | 11 | 27 | 40 | 4 | 30 |
| Zone 2 | 16 | 173 | 2,591 | 13 | 24 | 38 | 3 | 5 |
| Zone 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Zone 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Zone 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Zone 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Totals | 67 | | 18,830 | | | | 7 | 35 |

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

*Data provided by: Monterey Bay Aquarium Research Institute*

### MBARI Krill Model

Modeled zooplankton conditions for April 2023 indicate below average conditions from the CA/OR border to Cape Blanco, higher than expected concentrations from Cape Blanco to Cape Mendocino, south of Point Arena and at Point Conception (Figure 9).

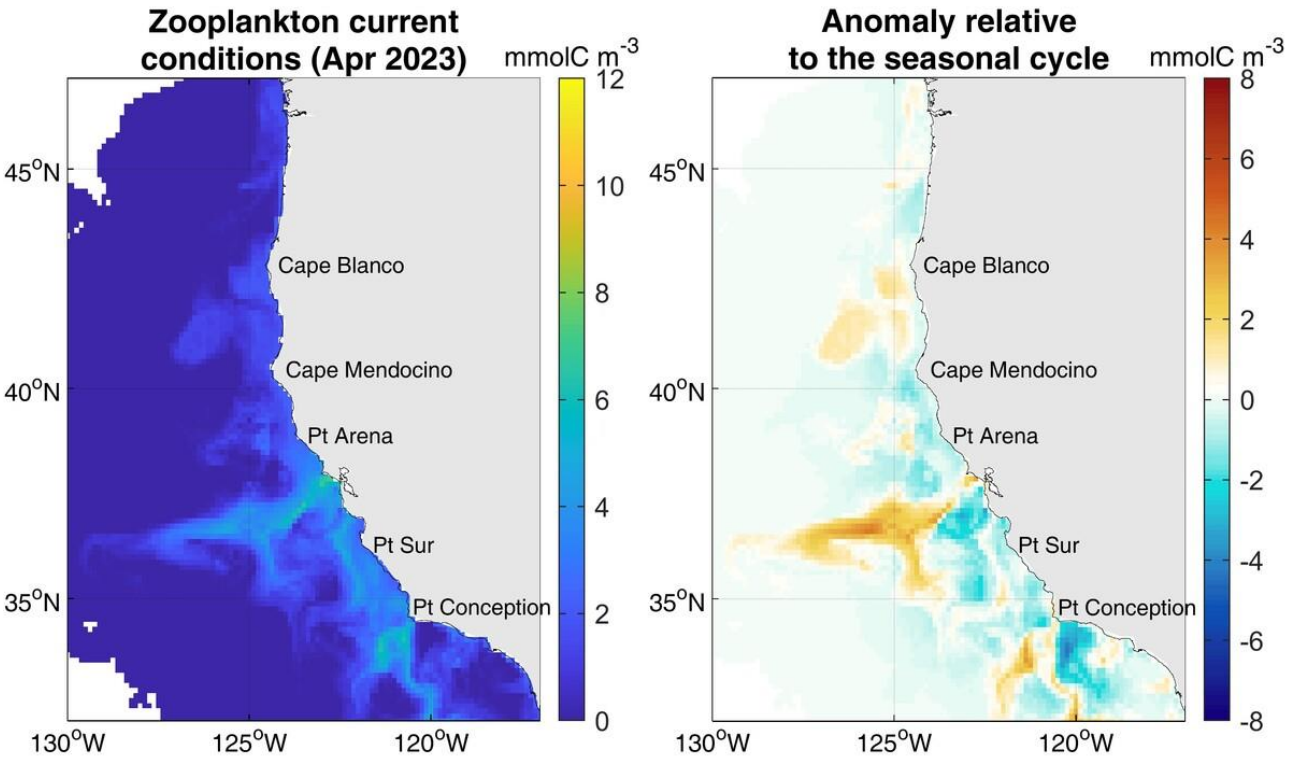


**Figure 9. Latest modeled zooplankton concentrations in the California Current (left) and corresponding anomaly relative to the 1993-2018 seasonal cycle (right).**

## Ocean conditions: §132.8(d)(9)*

*Data provided by: National Weather Service Climate Prediction Center*

## El Niño/Southern Oscillation (ENSO) Diagnostic

As of May 11, 2023, a transition from ENSO neutral is expected in the next couple of months, with a greater than 90% chance of El Niño persisting into the Northern Hemisphere winter.

## Large Marine Heatwave Tracker

As of April 28, 2023, the large marine heatwave remains strong but remains far offshore. Nearshore conditions have generally been colder than normal during the last month (Figure 10).

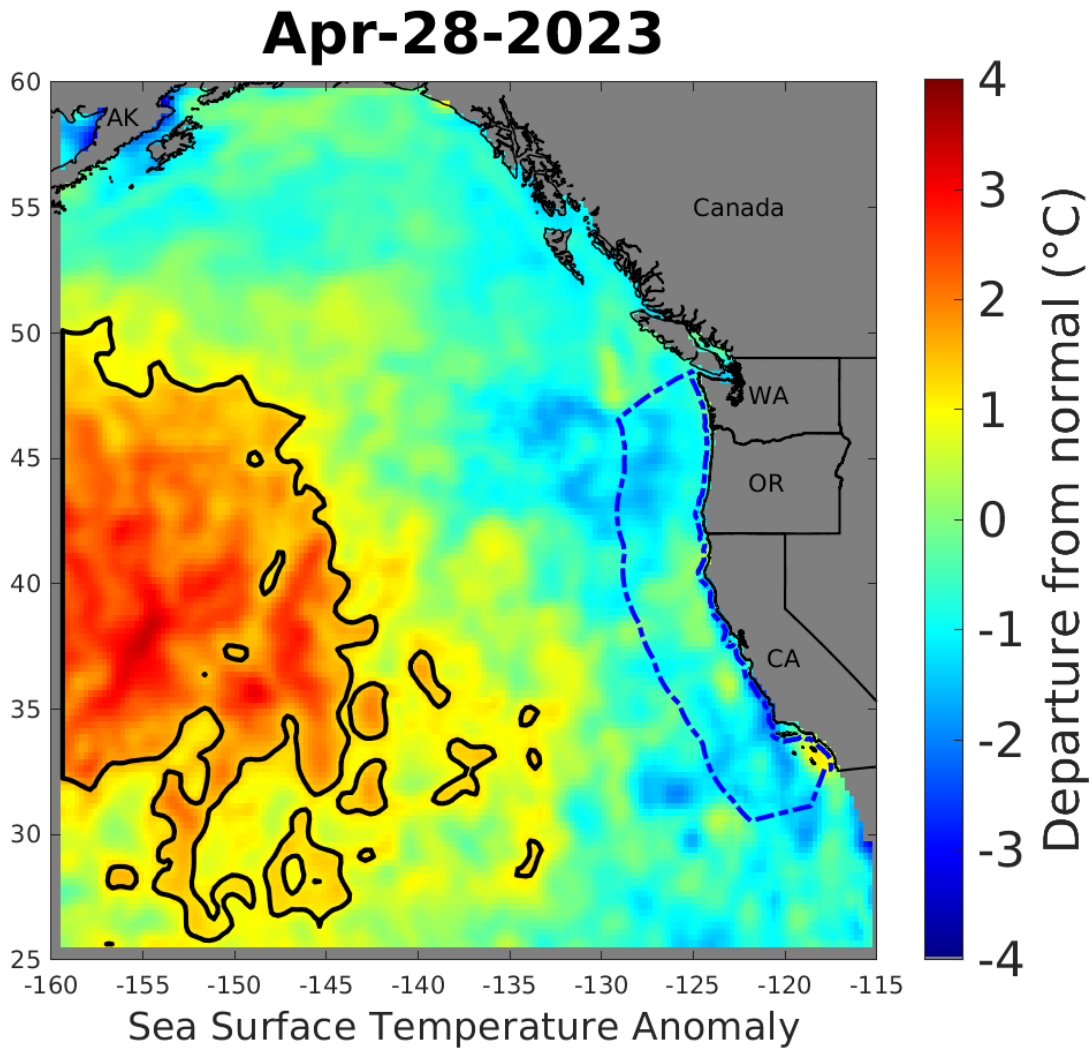


**Figure 10. Science-quality (delayed 3 weeks), daily interpolated standardized sea surface temperature anomalies (SSTa) in the California Current ecosystem available for analysis of Marine Heatwave (MHW) presence. Dark outline shows the current extent of MHW conditions, as delineated by values of the 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 (OISST), with the SST anomaly calculated used climatology from NOAA's AVHRR-only OISST dataset.**

## Habitat Compression Index

The most recent habitat compression index values are for April 2023. For Region 2, between 40 and 43.5 degrees north, habitat compression values show medium compression (Figure 11). For Region 3, between 35.5 and 40 degrees north, habitat compression values show low compression (Figure 12).

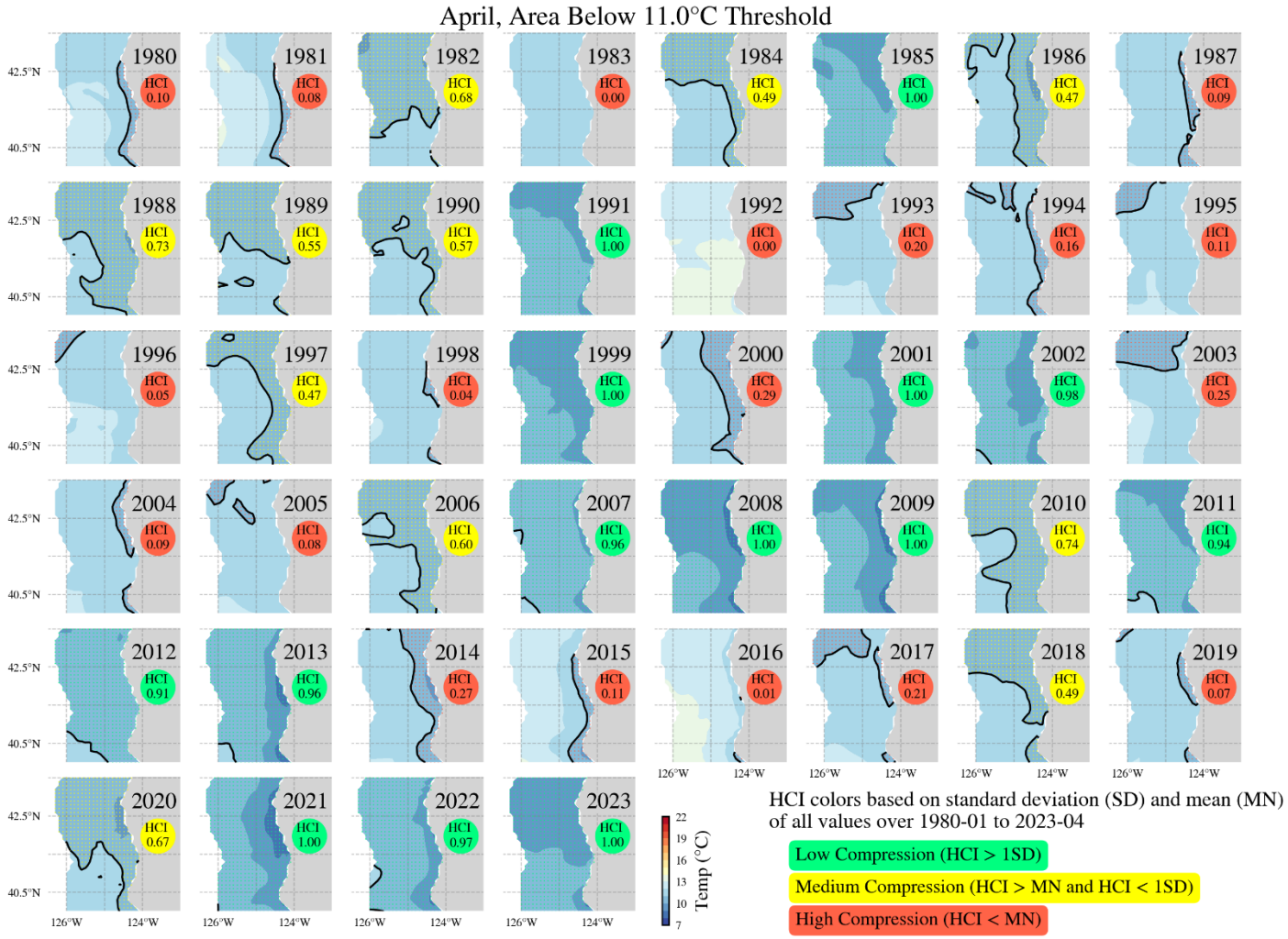


**Figure 11. Maps of historical April sea surface temperature in Region 2 (between 40 and 43.5 degrees north) and location of the Habitat Compression Index Boundary (thin black line) between 1980 and 2023.**

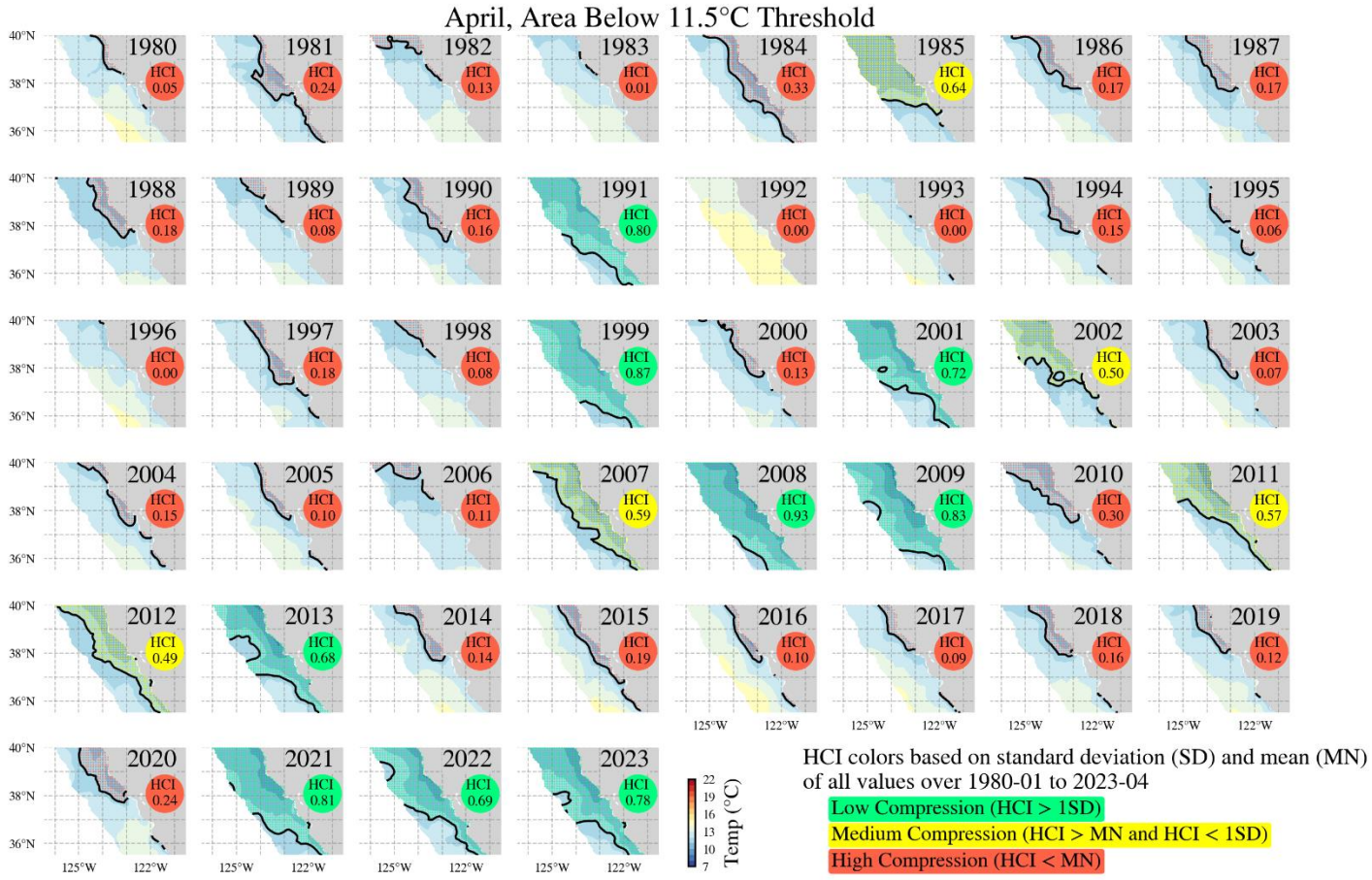


**Figure 12. Maps of historical May sea surface temperature in Region 3 (between 35.5 and 40 degrees) and location of the Habitat Compression Index Boundary (thin black line) between 1980 and 2023.**

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

*Data provided by: California Department of Fish and Wildlife*

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.