



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

Date: February 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 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 February 13, 2023 and finalized at the conclusion of the Working Group meeting which was held on February 15, 2023.

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

Entanglements:

As of February 13, 2023, no entanglements have been reported to CDFW by NOAA. The in-season Confirmed Entanglement Impact Score is currently zero. The Impact Score for the calendar year 2022 was 4.53 for humpback whales (subject to revision based on review and verification with NOAA). The Impact Score for calendar year 2021 was 1.89 for humpback whales. As a result, the current running 3-year average Impact Score is 2.14 for humpback whales for the start of 2023.

Marine Life Concentrations:

USCG and CDFW aerial surveys for Zones 1, 3 and 4 did not observe any humpback whales, blue whales or leatherback sea turtles. Monterey Bay Whale Watch data documented no humpback whales during the most recent seven-day trip period.

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:

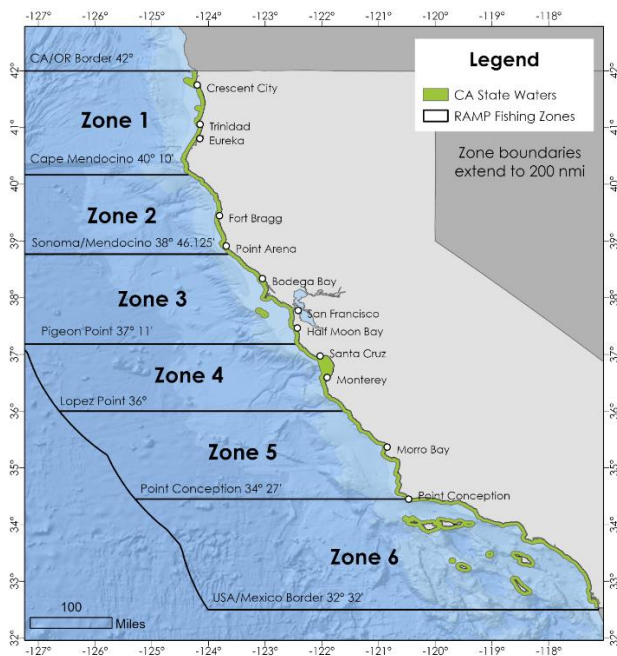
- **Continue Fleet Advisory for Fishing Zones 1-6**

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 have migrated to their southern breeding grounds from California waters. Based on previously available data, known historic migration patterns and supported by the totality of Management Considerations, entanglement risk is therefore 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.

Alternatives Considered but Rejected

- Fishery Closure – based on available data and historic migration patterns this management action is not required.
- 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: February 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.

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Commercial Fishery:

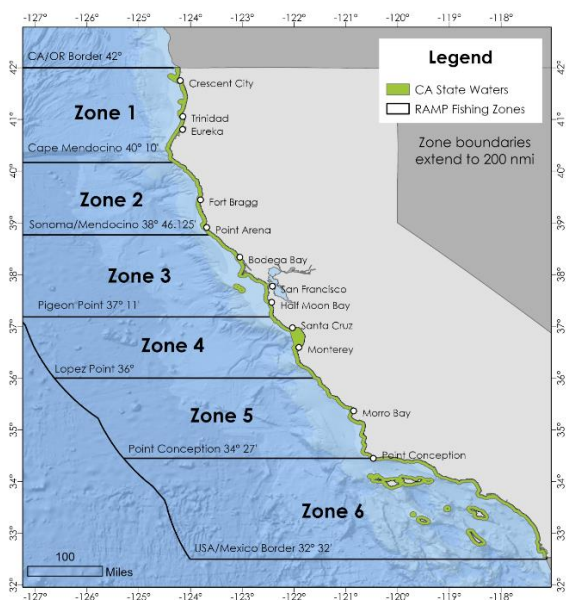
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No Marine Life Concentrations triggers were met for Actionable Species under RAMP. Humpback whale sightings are near seasonal lows, which is a strong indication that most humpback whales have migrated to their southern breeding grounds from California waters. Based on previously available data, known historic migration patterns and supported by the totality of Management Considerations, entanglement risk is therefore 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.

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2022-23 Risk Assessment: Available Data

Last updated: February 13, 2022

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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 February 13, 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 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 was 4.53 for humpback whales and 0 for blue whales and leatherback sea turtles. The total calendar year impact score for 2023 is 0 for humpback whales, blue whales, and leatherback sea turtles.

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	4.53	0	2.14
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, and Monterey Bay Whale Watch (processed by Karin Forney, NOAA SWFSC)

Table 44. 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/CDFW Aerial Survey	No
Zone 2	NA	NA
Zone 3	CDFW Aerial Survey	No
Zone 4	CDFW Aerial Survey, MBWW	No
Zone 5	NA	NA
Zone 6	NA	NA

USCG/CDFW Aerial Survey (Fishing Zone 1)

- USCG and CDFW flew a joint aerial survey on January 31, 2023, between the Oregon border and Sea Lion Gulch State Marine Reserve (Fishing Zone 1; Figure 1).
- No humpback or blue whales were observed, however there were two gray whales and one unidentified whale observations.

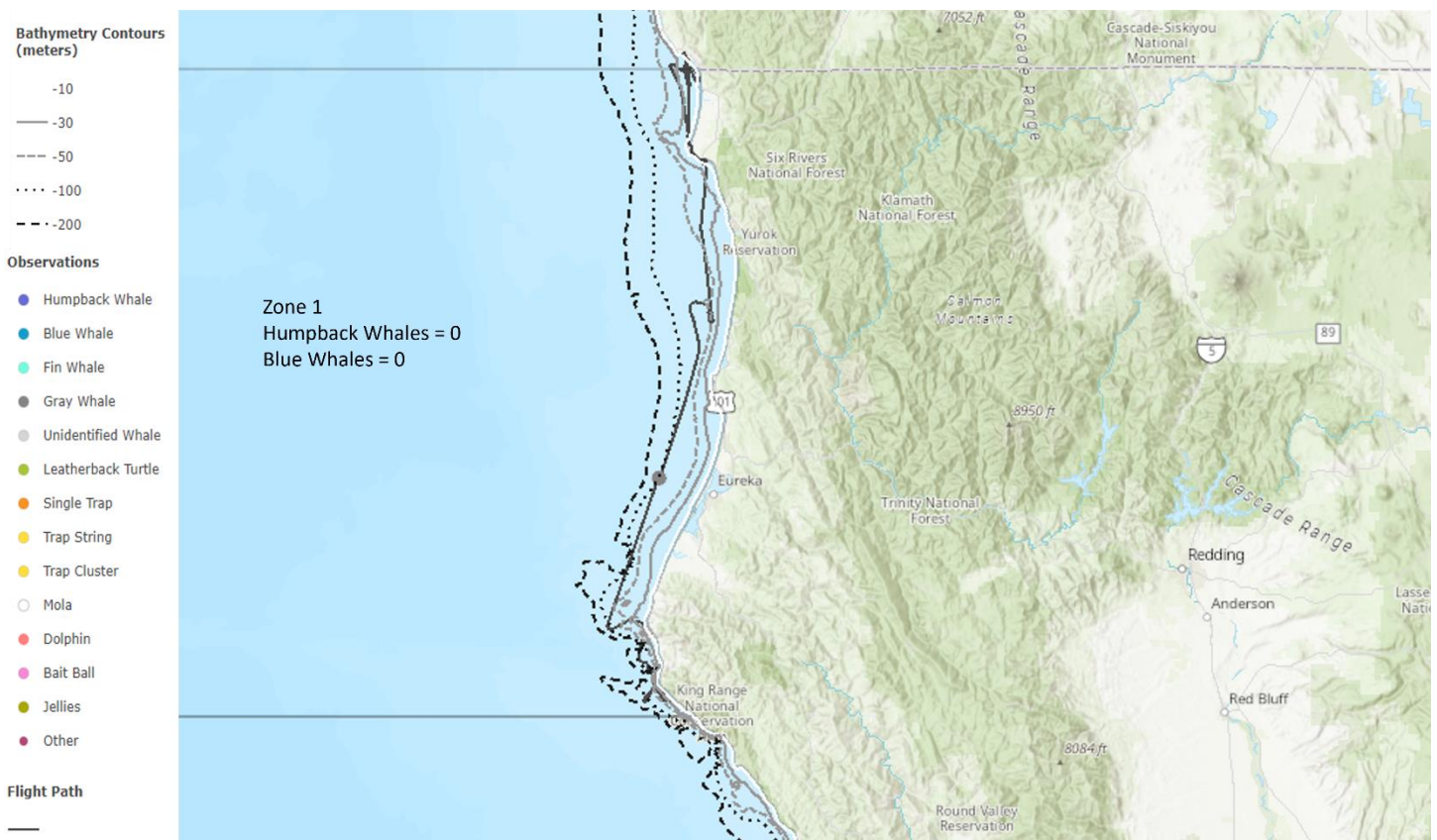


Figure 1. Map showing track lines and observations from USCG/CDFW aerial survey of Fishing Zone 1 on January 31, 2023. Survey information is overlaid onto contours showing 10m, 30m, 50m, 100m, and 200m bathymetry lines.

CDFW Aerial Survey (Fishing Zones 3-4)

- CDFW staff conducted an aerial survey on February 7, 2023 between Point Piños (Fishing Zone 4) and Point Arena (border of Fishing Zones 2 and 3; Figure 2). Survey conditions were marginal due to fog and wind across the surveyed area.
- No humpback or blue whales were observed, however there were three gray whales and three unidentified whale observations in Fishing Zone 3.
- Gear concentrations were noted but it is not an absolute count of all gear deployed.

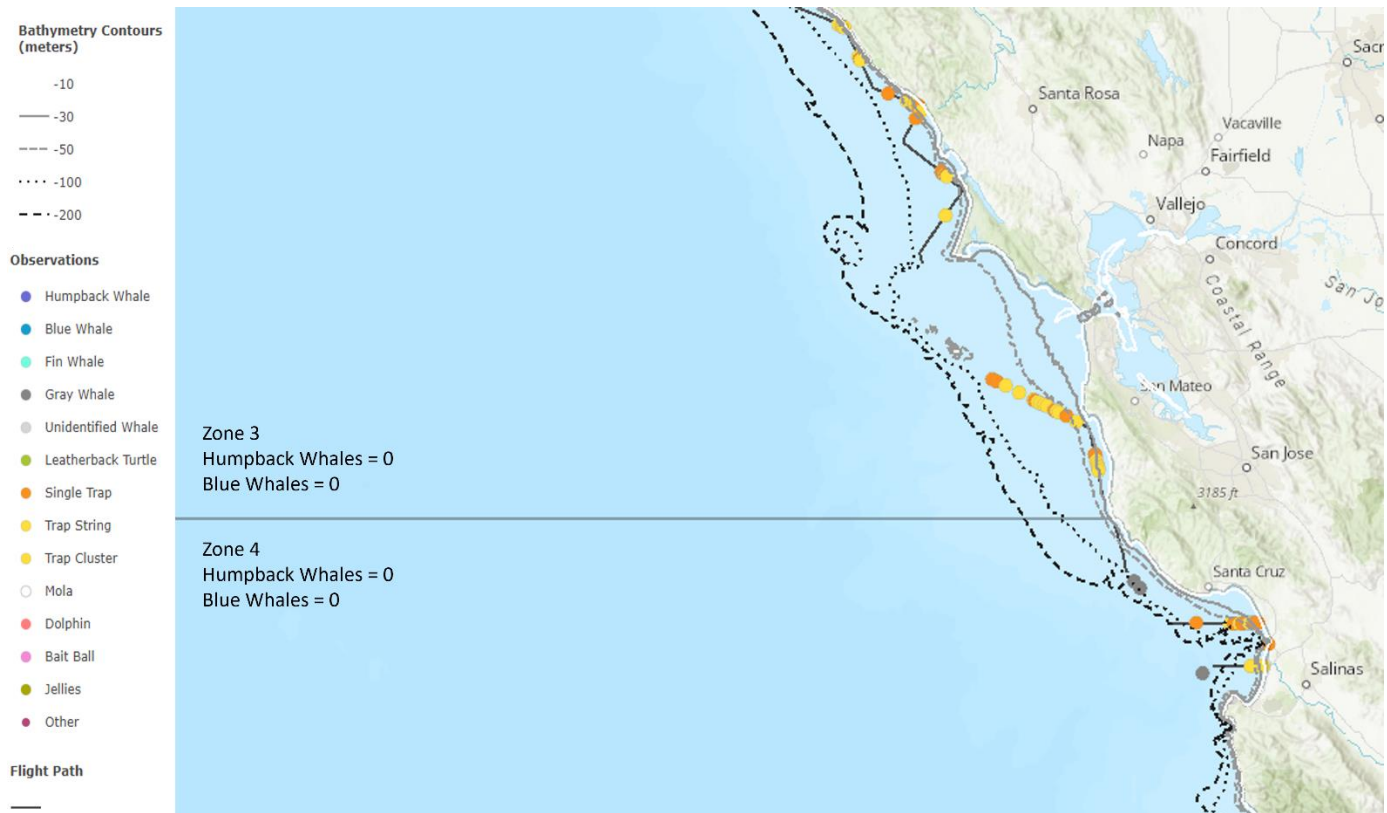


Figure 2. Map showing track lines and observations from CDFW aerial survey of Fishing Zones 3 and 4 on February 7, 2023. Survey information is overlaid onto contours showing 10m, 30m, 50m, 100m, and 200m bathymetry lines.

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 1-7, 2023.
- No humpback whales were documented during the five days that had trips within the last seven days (February 1-7, 2023). The most recent humpback whale sighting was a group of two humpback whales on January 23, 2023.
- One blue whale was observed by Monterey Bay Whale Watch on December 18, 2022, but none have been observed since that date.

MANAGEMENT CONSIDERATIONS

Information from NOAA: §132.8(d)(2)

No additional information was provided for this Risk Assessment.

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 it's recommended approach in the February 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 February 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, NMFS, Point Blue Conservation Science, NOAA Coast Watch

Monterey Bay Whale Watch (Fishing Zone 4)

The semi-monthly average number of whales per half day trips is at a winter low and below the average historical value at this time of the year (Figure 3).

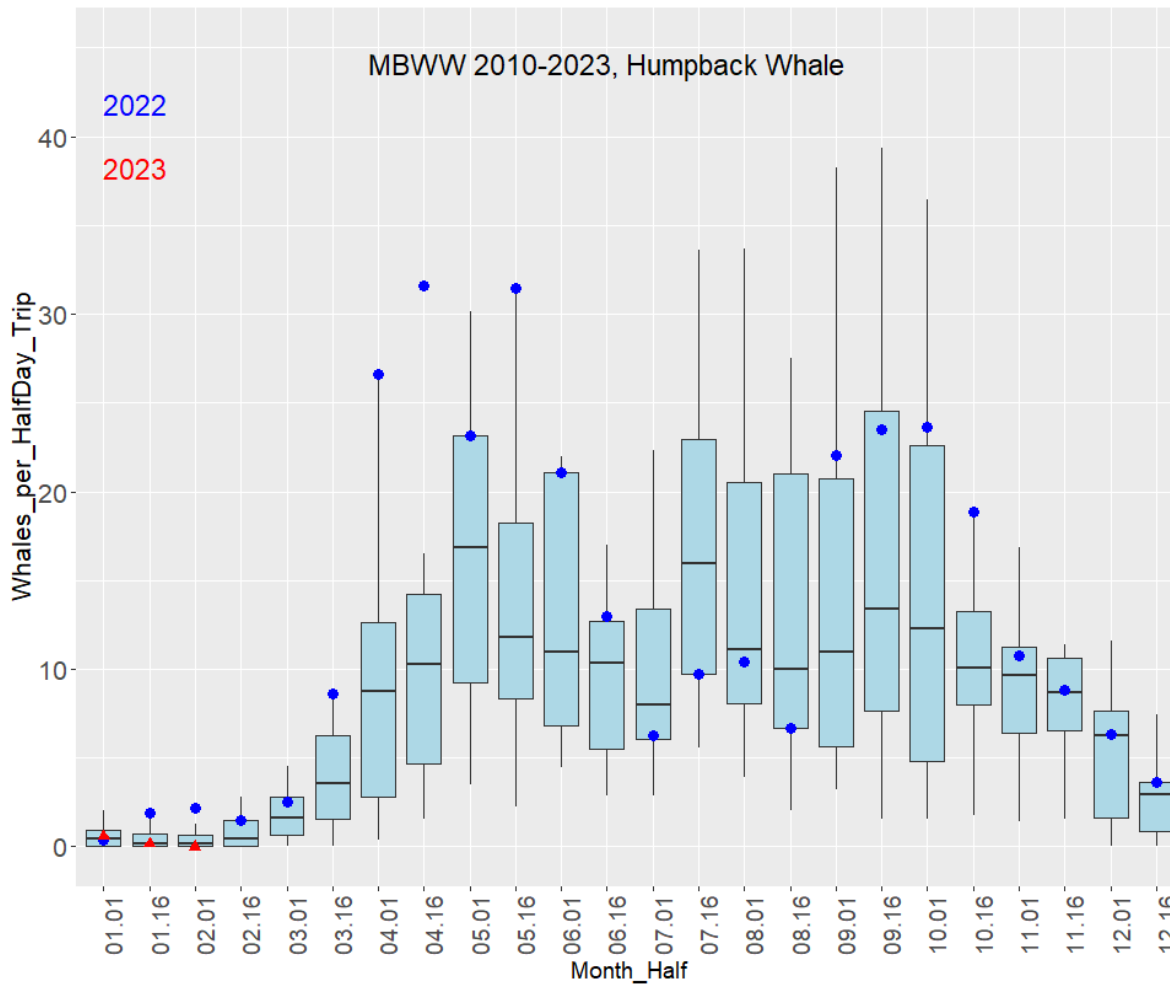


Figure 3. Historical Monterey Bay Whale Watch data for 2010-2023, summarizing the average and variation in the number of humpback whales per half-day trip on a semi-monthly basis (1st- 15th, 16th- end of month). This boxplot follows standard statistical practice in that the black horizontal line is the 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 and 6*)

During the seven-day period ending February 10, 2023, trained observers at the Farallon Islands reported eleven humpback whales in Fishing Zone 3 and trained naturalists from the Channel Islands National Marine Sanctuary and National Park Service reported one humpback whale in Fishing Zone 6. No blue whales were observed in any of the Fishing Zones during this period (Figure 4).

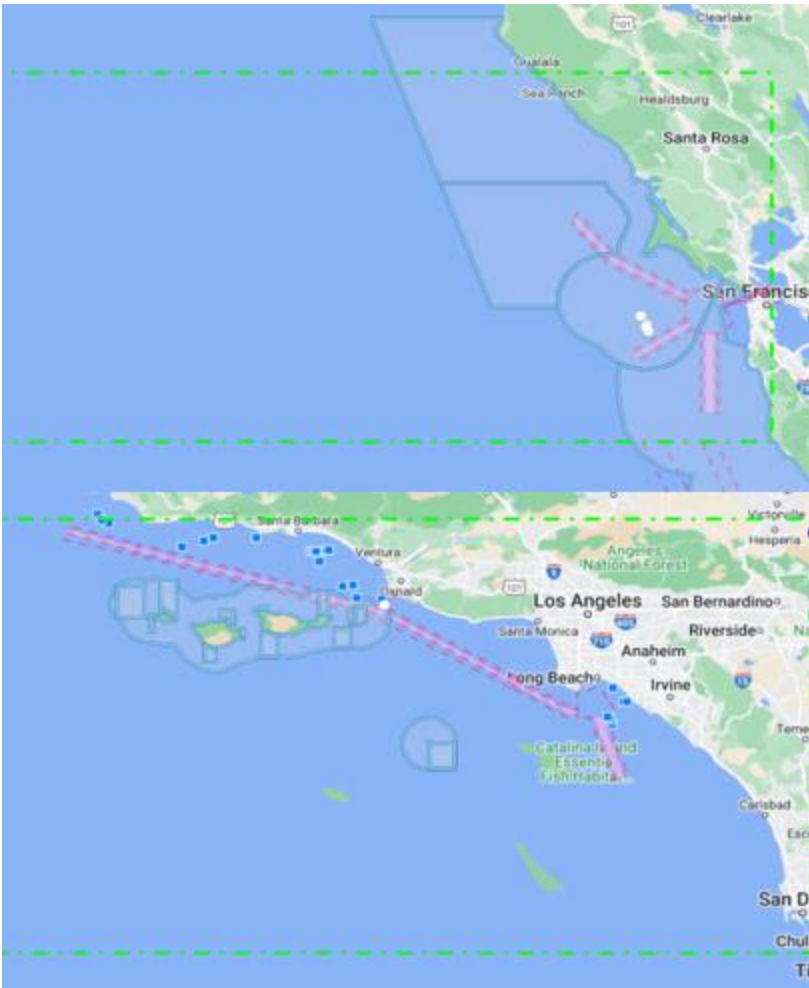


Figure 4. Locations of humpback whale sightings within Fishing Zones 3 and 6. Reporting locations are represented by white circles. A given report may or may not represent multiple individuals. Fishing Zone boundaries are represented by the dashed lines.

WhaleWatch 2.0 (All Fishing Zones)
 See the [January 9, 2023 Available Data document](#).

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 5).

Weekly total landing volume increased from early to mid-January, with the highest harvest coming from Fishing Zone 1, followed by Fishing Zone 3 (Figure 5). Total volume landed has since declined, with similar proportions across Fishing Zones. Similar trends are seen in volume landed by port, with the highest volume landed into Crescent City and Eureka.

Trends in vessel activity by port (Figure 6) and Fishing Zone (Figure 7) mirror those for landing volume. Looking at vessel activity by port over the course of the season, the

highest activity has been in Crescent City (98 vessels) and Eureka (71 vessels), followed by Half Moon Bay (34 vessels) and San Francisco (33 vessels). The number of active vessels was highest in Fishing Zones 1 and 3. Vessel activity peaked in mid/late January and has since begun to decline.

Table 5. Summary of fleet dynamics information, as of February 10, 2023. Accessed from CDFW's Marine Landings Data System database on February 10, 2023.

Metric	Value	Additional Info
Season status	Open	All Fishing Zones are open.
Number of daily landings	2,633	NA
Total volume (pounds)	12,541,367	NA
Total Ex-Vessel Value	\$30,431,883	NA
Average unit price	\$2.72	NA
Total number of active vessels	333	NA
Maximum potential traps (based on active permits)	112,800	Estimates are also provided in the Bi-Weekly Fishing Activity Reports subsection

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

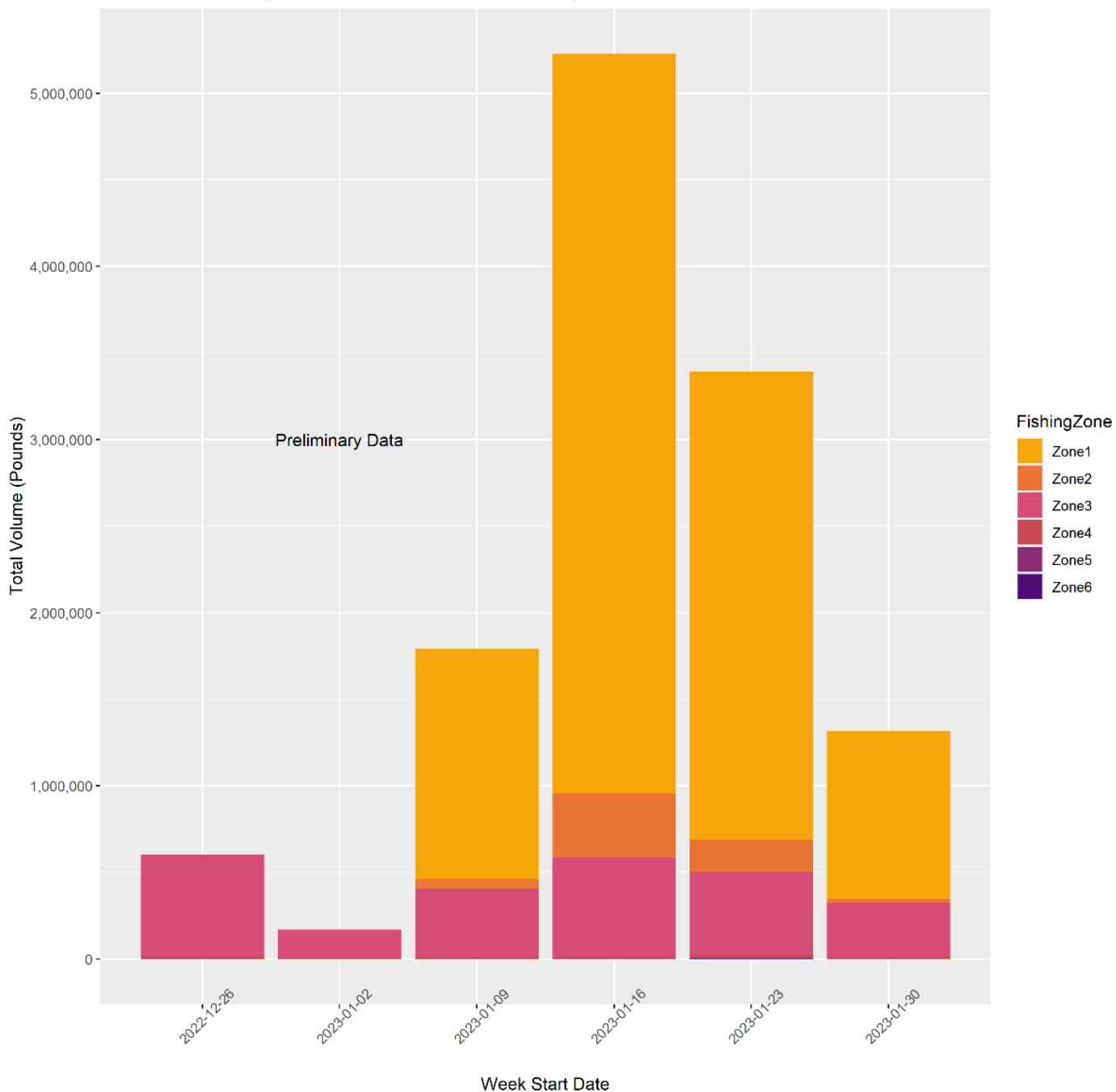


Figure 5. Cumulative volume (pounds) harvest by week and Fishing Zone. Week 1 starts with the first day the commercial Dungeness crab fishery was open in any area, December 31, 2022. All data are preliminary and subject to change.

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

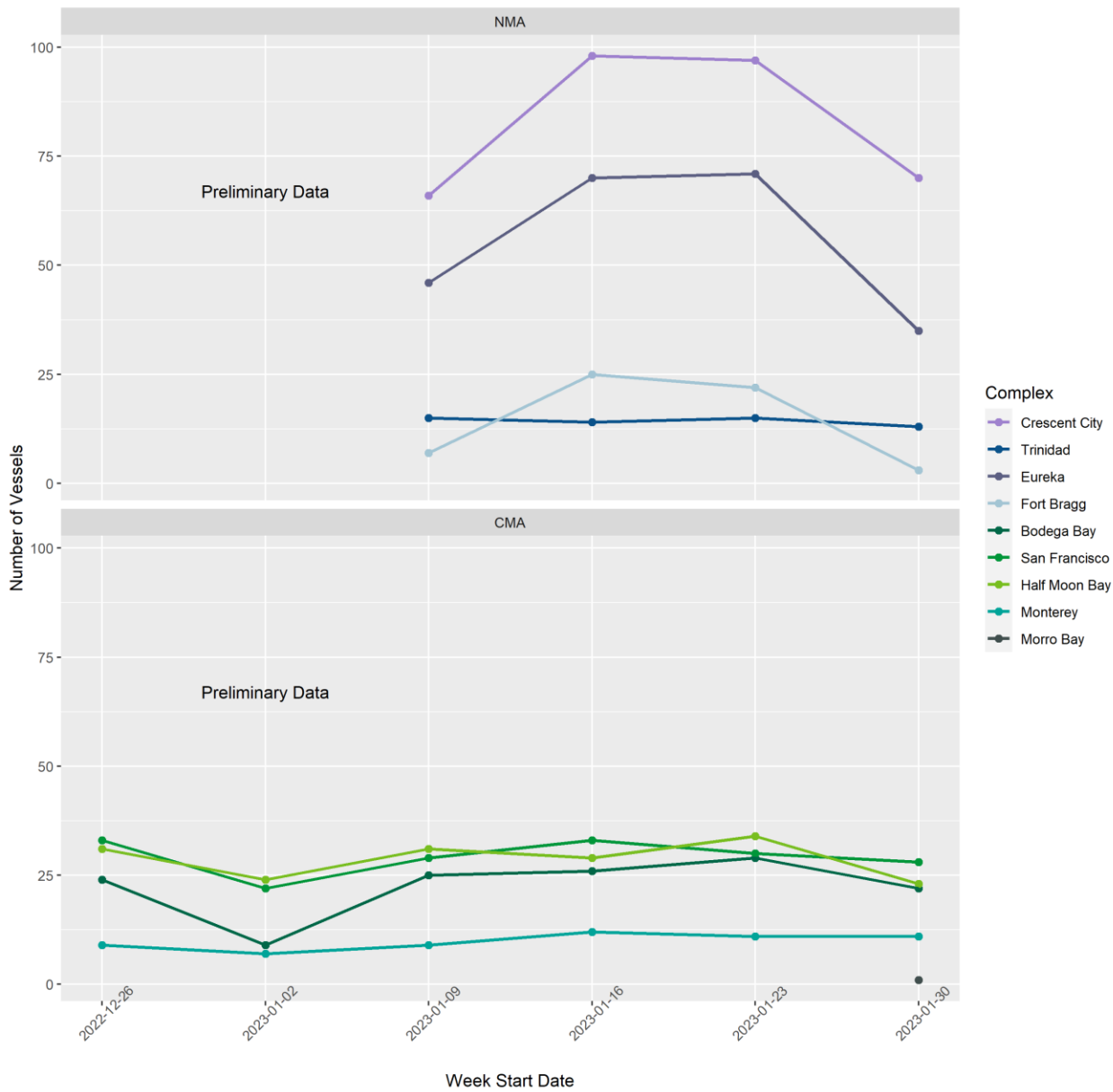


Figure 6. Number of active vessels by week and port complex. Week 1 starts with the first day the commercial Dungeness crab fishery was open in any area, December 31, 2022. All data are preliminary and subject to change. Some week*port complex combinations are withheld due to confidentiality concerns.

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

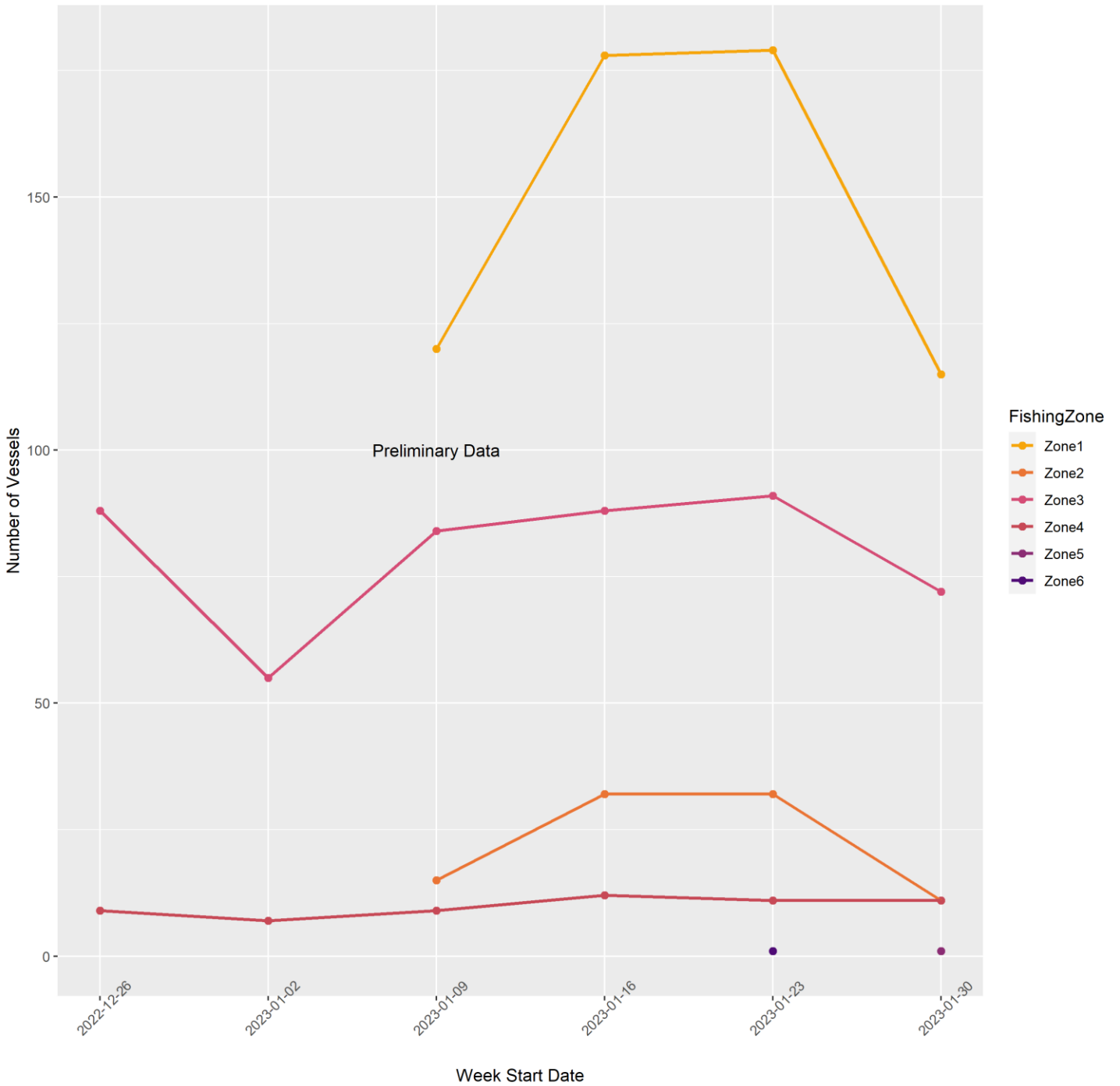


Figure 7. Number of active vessels by week and Fishing Zone. Week 1 starts with the first day the commercial Dungeness crab fishery was open in any area, December 31, 2022. All data are preliminary and subject to change. Some week*port complex combinations are withheld due to confidentiality constraints.

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 February 1, 2023. A summary of reports received for January 16, 2023 is provided in Table 6 and those received for February 1, 2023 are provided in Table 7; note this summary may not reflect all permitted vessels participating in the fishery.

Table 5. Summary of information provided for the January 16, 2023 bi-weekly reporting period by Fishing Zone (1-6). Accessed from CDFW's Bi-Weekly Reporting database on February 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	13	384	4,980	14	34	50	0	NA
Zone 2	3	359	1,076	13	29	33	0	NA
Zone 3	68	162	10,967	23	36	80	0	NA
Zone 4	10	114	1,136	23	43	70	1	16
Zone 5	NA	NA	NA	NA	NA	NA	NA	NA
Zone 6	NA	NA	NA	NA	NA	NA	NA	NA
Totals	94	NA	18,159	NA	NA	NA	NA	NA

Table 7. Summary of information provided for the February 1, 2023 bi-weekly reporting period by Fishing Zone (1-6). Accessed from CDFW's Bi-Weekly Reporting database on February 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	72	368	26,433	13	34	80	0	NA
Zone 2	14	134	1,874	16	29	45	0	NA
Zone 3	74	240	17,707	20	36	58	0	NA
Zone 4	11	158	1,734	25	41	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	171	NA	47,748	NA	NA	NA	NA	NA

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

Modeled zooplankton conditions for January 2023 indicate expected concentrations from the CA/OR border to Point Arena and areas offshore from Point Arena to Point Conception with higher-than-expected concentrations (Figure 8).

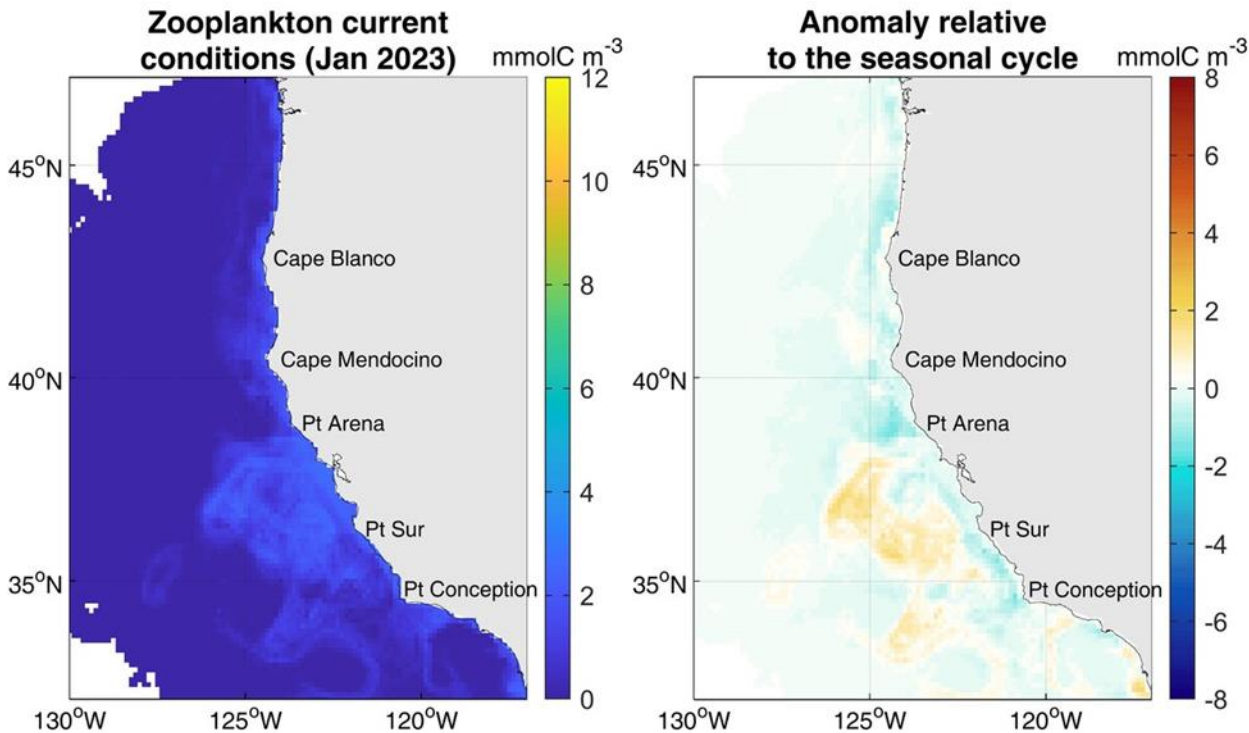


Figure 8. Latest modeled zooplankton concentrations in the California Current (left) and corresponding anomaly relative to the 1993-2018 seasonal cycle (right). Derived from the operational krill hotspot model from January 2023 accessible on the [MBARI Website](#).

The model suggests there are currently no krill hotspots and overall, krill abundance is low within the coastal domain off California. Relatively weaker anomalies offshore suggest potentially higher than average krill abundance during January 2023.

Forage Abundance Indices

Updated forage indices from the annual NMFS Rockfish Recruitment and Ecosystem Assessment survey (Figure 9) indicate that total krill (all species combined) is above average for the first time since 2019, owing to cool sea-surface coastal conditions off California last year. Anchovy abundance continues to be high and above the historical average, though has declined compared to the past few years. High concentrations of anchovy are expected to continue, especially nearshore ranging from the greater Point Reyes region through southern California, and average to potentially below average in offshore krill abundance.

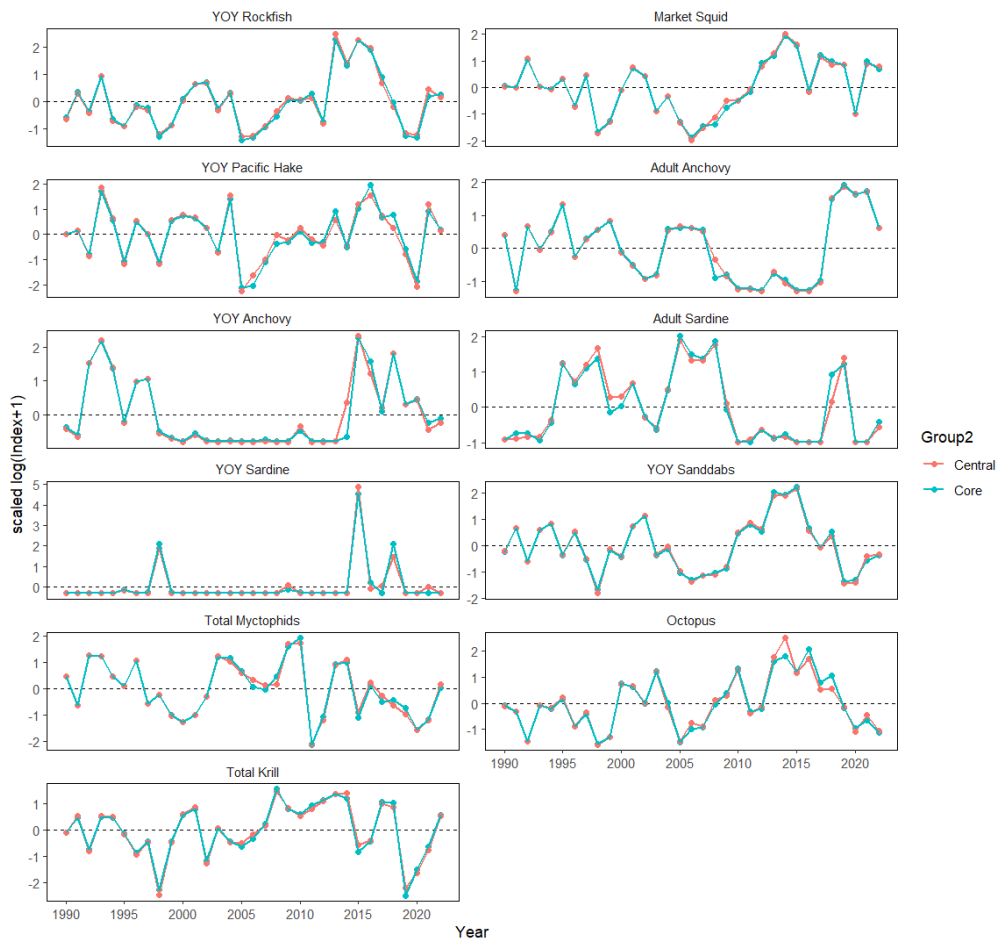


Figure 9. Updated annual time series of ecosystem indicators derived from the NOAA Rockfish Recruitment and Ecosystem Assessment Survey. YOY is 'young of the year'. Time series products are provided for the traditional 'Core' region, covering Point Reyes to Point Sur, and for the expanded 'Central' region, which corresponds to the Habitat Compression Index (HCI) Region 3 covering the central management area. Note both regional indices are essentially the same, thus providing greater context for assessment of regional variability. For more detail, please see Santora et al. 2021 Nature Communications and Santora et al. 2021 Oceanography.

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 February 9, 2023, La Niña to ENSO-neutral is expected to continue for the next couple of months. ENSO-neutral conditions are expected to prevail in the spring and early summer.

Large Marine Heatwave Tracker

As of January 20, 2023 the heatwave has receded from nearshore coastal waters, returning to normal or slightly colder-than normal temperatures (Figure 10).

Jan-20-2023

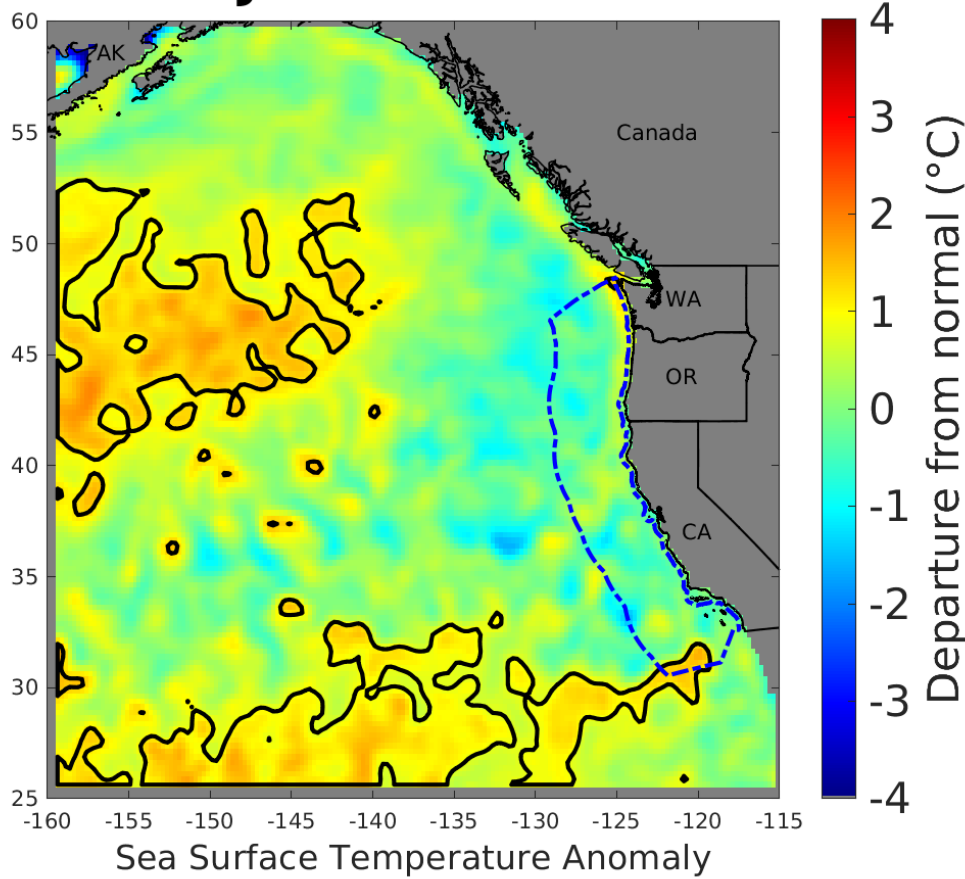


Figure 10. Science-quality (delayed 3-weeks), daily interpolated standardized sea surface temperature anomalies (SSTa) in the California Current ecosystem available for analysis of MHW presence. Dark outline shows the current extent of MHW conditions, as delineated by values of the normalized SST + 1.29 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 January 2023 when the northern region was experiencing moderate compression and the central region was experiencing high compression (Figures 11 and 12). The moderate compression in Region 2 does not currently pose concerns regarding distribution of whale populations. The high compression in Region 3 is reflected in significantly lower than average cool thermal habitat which is compressed shoreward. This is a concern for concentrating whales and their forage closer to shore, potentially within some of the known high density feeding areas observed in late 2022.

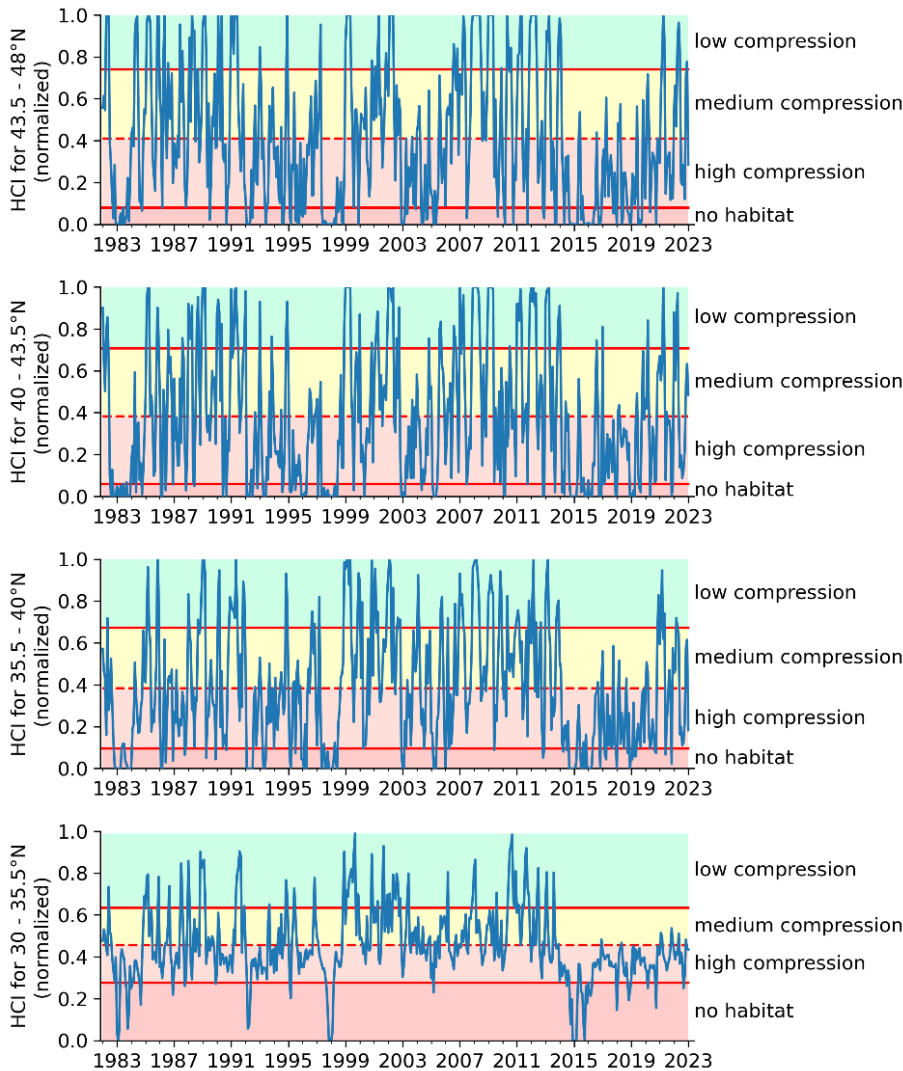


Figure 11. Monthly Habitat Compression Index (HCI), updated through January 2023. The HCI quantifies the available cool thermal habitat area and its relative shoreward compression. Dashed red line is the mean and solid red lines are +/- 1 Standard Deviations. See Figure 12 for spatial distribution of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

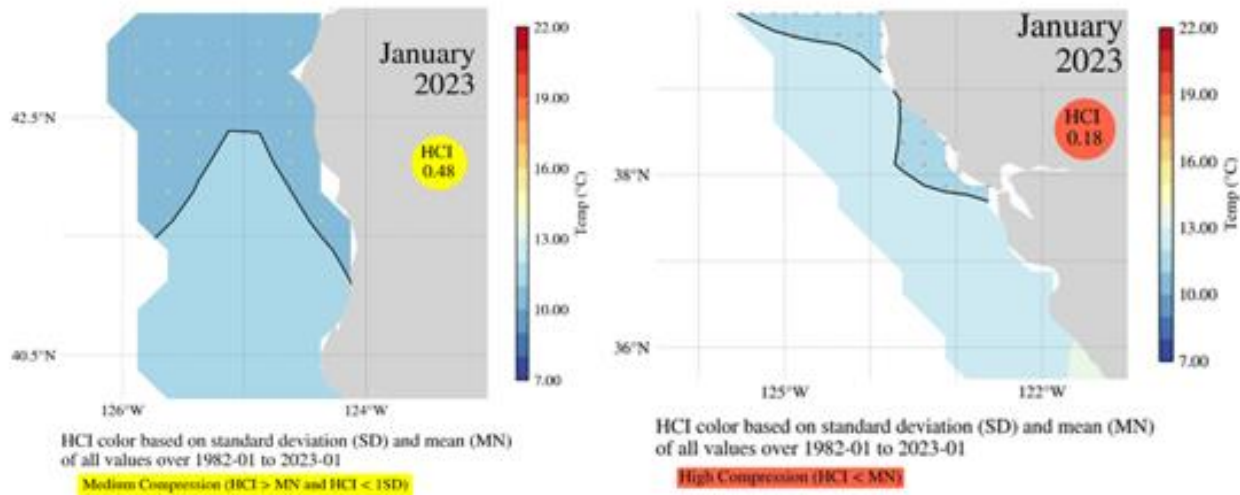


Figure 12. Spatial structure of the Habitat Compression Index for Region 2 (40 to 43.5 °N; left side) and Region 3 (35.5 – 40 °N; right side).

North Pacific High

The North Pacific High index is currently below average (Figure 13). Updated values will be available in late February.

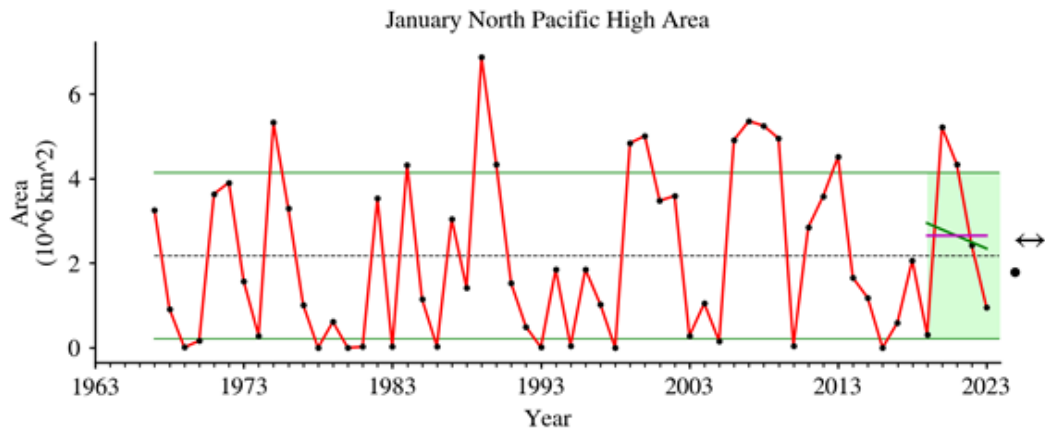


Figure 13. The North Pacific High (NPH) index monitors the area and intensity of the NPH atmospheric pressure cell off the US West Coast. The winter NPH informs potential spring ecosystem conditions within the coastal waters of California. Above average area of the NPH relates to earlier initiation and strength of upwelling and elevated krill concentrations off central California in April-May. The NPH in January currently suggests it is below average, however, the NPH must be examined through the end of February to provide greater inference about spring.

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

Pursuant to the Risk Assessment and Mitigation Program (Section 132.8, Title 14, CCR), Impact Score Calculations will be assigned beginning with the 2021 calendar year based on confirmed entanglements of Actionable Species (humpback whales, blue whales, or leatherback sea turtles) reported to CDFW by NOAA. 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.