

Assessment of Marine Life Entanglement Risk

Preliminary Assessment and Available Data for the Risk Assessment Mitigation Program

Last updated: October 23, 2023

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PRELIMINARY ASSESSMENT

This Preliminary Assessment and Management Recommendation has been developed by California Department of Fish and Wildlife (CDFW) Marine Region 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.

I. Recommended Management Actions

- **Commercial Fishery:**
 - Season Delay: Fishing Zones 3, 4, 5, and 6
 - Fishing Zones 1 and 2 will be evaluated during the next Risk Assessment, pursuant to Fish and Game Code section 8276.
- **Recreational Fishery:**
 - Fleet Advisory: Fishing Zones 1, 2, 3, 4, 5 and 6
 - Crab Trap Prohibition: Fishing Zones 3 and 4

Table 1. Fishing Zones and current management status in the California commercial and recreational Dungeness crab fishery.

Fishing Zone	Current Management Status	Proposed Management Status - Commercial	Proposed Management Status - Recreational
1	Closed	Not Assessed	Fleet Advisory
2	Closed	Not Assessed	Fleet Advisory
3	Closed	Season Delay	Crab Trap Prohibition; Fleet Advisory
4	Closed	Season Delay	Crab Trap Prohibition; Fleet Advisory
5	Closed	Season Delay	Fleet Advisory
6	Closed	Season Delay	Fleet Advisory

II. Management Recommendation Summary Rationale

- *Entanglements:* Humpback whale entanglements in California commercial Dungeness crab fishing gear and Unknown Fishing Gear bring the three-year rolling average Impact Score to 3.39, which exceeds the trigger as defined in RAMP for the commercial Dungeness crab fishery.
- *Marine Life Concentrations:* Based on recent Marine Life Concentration surveys for Fishing Zones 1-5 conducted by NMFS on October 4-6, 2023, humpback whale sightings were elevated in Zones 3 and 4, exceeding the Marine Life Concentration trigger as defined by RAMP for the recreational and commercial Dungeness crab fisheries in those Fishing Zones.

Marine Region's preliminary recommendation is for the Director to delay the commercial fishery in Fishing Zones 3-6. Marine Region also recommends the prohibition of recreational crab traps in Fishing Zones 3 and 4 and issuance of a Fleet Advisory for Fishing Zones 1-6 until the next Risk Assessment. These recommendations are based on the exceedance of Marine Life Concentration data triggers and known migration patterns for humpback whales in Fishing Zones 3 and 4. In addition, the current Impact Score for the commercial fishery is 3.39, requiring Management Action. Aerial surveys indicated concentrations of humpback whales along the 50m (~27 fathoms) depth contour in Fishing Zones 3 and 4. Off transect, NMFS aerial surveyors also observed several humpback whales in Fishing Zone 1 (roughly 8-10 nautical miles offshore). Monterey Bay Whale Watch data indicated an average number of humpback whales-per-half-day-trip during the last seven days (7 - 13 October 2023) of 16.2, with a peak of 25 whales observed during a half-day trip on 12 October. Oceanographic models for Fishing Zones 2 and 3 show high habitat compression through September 2023, further elevating entanglement risk at this time. For Fishing Zone 6, lack of available data prior to the season opener requires Management Action, pursuant to 132.8(c)(2)(A) and 29.80(c)(7)(A).

Note: A Fleet Advisory for the recreational fishery in Fishing Zones 1 - 6 is recommended based on aerial survey data and known migration patterns of humpback whales. If the Director prohibits traps, hoop nets will still be allowed, requiring increased precaution when setting gear to avoid entanglements in vertical lines.

It is anticipated that the delay and trap prohibition for the commercial and recreational fishery would be in place until at least the next Risk Assessment, expected to occur on or before November 17, 2023. That assessment will inform a potential commercial fishery opener on December 1, 2023, and/or a lifting of the trap restriction for the recreational fishery.

For additional information, see the Entanglement and Marine Life Concentration sections of this Available Data document.

III. Alternative Management Actions for the Commercial Fishery

Alternatives Considered but Rejected

- Gear Reduction - given the current exceedance of the Impact Score and elevated risk due to concentrations of humpback whales across Fishing Zones 3 and 4, this was not the recommended Management Action.
- Depth Restriction - will not sufficiently provide protections due to distribution of humpback whales across depths and may concentrate trap gear thereby increasing entanglement risk.
- Alternative Gear - can only be authorized after April 1st.

AVAILABLE DATA

IV. Triggers Requiring Management Action

I. Confirmed Entanglements: §132.8(c)(1)

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

The table below outlines the confirmed entanglements under RAMP and their associated Impact Score for the year 2023. See "[FAQ: Impact Scoring for the Risk Assessment and Mitigation Program](#)" for information about the RAMP Impact Score.

Table 2. Actionable Species Entanglements during 2023 pursuant to RAMP regulations.

Entanglement ID	Date	Species	Fishery	Impact Score
20230417Mn	04/17/23	Humpback whale	Unknown Fishing Gear	0.38
20230420Mn	04/20/23	Humpback whale	Unknown Fishing Gear	0.38
20230611Mn	06/11/23	Humpback whale	CA commercial Dungeness crab	0.75
20230719Mn	07/19/23	Humpback whale	CA commercial Dungeness crab	0.75
20230819Mn	08/19/23	Humpback whale	CA commercial Dungeness crab	0.75

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.

Actionable Species	Current Fishing Season Impact Score (2023-24)	Current Calendar Year Impact Score (2023)	3-Year Rolling Average
Humpback whales	0	3.01	3.39

As of October 23, 2023, there have been zero Confirmed Entanglements of blue whales or leatherback sea turtles during the 2023-2024 period.

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

Data provided by: California Department of Fish and Wildlife, Scott Benson and Karin Forney (NOAA SWFSC and Upwell), Monterey Bay Whale Watch (processed by Karin Forney, NOAA SWFSC)

For the period of November 1 until the Fishing Season opens statewide a RAMP Marine Life Concentration trigger has been met when:

- The number of humpback whales is greater than or equal to 20, or there is a running average of five or more animals over a one-week period within a single Fishing Zone.

- The number of blue whales is greater than or equal to three, or there is a running average of three or more animals over a one-week period within a single Fishing Zone
- A Pacific leatherback sea turtle is seen in any Fishing Zone

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	NMFS Aerial Survey	No
Zone 2	NMFS Aerial Survey, CDFW Aerial Survey (partial coverage)	No
Zone 3	NMFS Aerial Survey, CDFW Aerial Survey	Yes
Zone 4	NMFS Aerial Survey, CDFW Aerial Survey, Monterey Bay Whale Watch	Yes
Zone 5	NMFS Aerial Survey	No
Zone 6	None	Yes

A. CDFW Surveys

- On October 19, 2023, CDFW conducted an aerial survey from the coast to the 50-fathoms at an altitude of 2000ft covering Fishing Zones 3-4 with partial coverage of Fishing Zone 2. Conditions were favorable with a Beaufort state of less than 1 and limited to no cloud cover until reaching Fishing Zone 2. Fishing Zone 1 and 2 had heavy cloud cover and could not be surveyed. One humpback and one unidentified whale were seen in Fishing Zone 2, seven unidentified whales in Fishing Zone 3, and two unidentified whales in Fishing Zone 4. It should be noted that CDFW does not consider this a comprehensive survey given aircraft speed and altitude limitations.

Table 5. Counts of Actionable Species seen by CDFW aerial survey conducted on October 19, 2023.

Fishing Zone	Humpback whales	Unidentified whales
Zone 2	1	1
Zone 3	0	2
Zone 4	0	7

CDFW aerial survey data is available online with the [Arc Map Viewer](#). For assistance with using Arc Map Viewer, please see the [How to Guide](#).

B. NMFS Aerial Surveys

- Aerial surveys were conducted on October 4-6, 2023, within Fishing Zones 1-5, covering zig-zag transect lines from the coast to the 50-fathom isobath (Figure 1). The observation team consisted of three observers who searched through bubble windows and a belly port, plus a data recorder. Standardized survey methods were applied from a chartered Partenavia P-68 Observer aircraft to record whales,

turtles, dolphins/porpoises, and other ecosystem indicator species such as forage fish, sea nettles and moon jellies (leatherback prey), and ocean sunfish ('Molas', which are often found in the same habitat as leatherback turtles and also feed on jellies). Weather was sunny with light winds, providing excellent survey conditions.

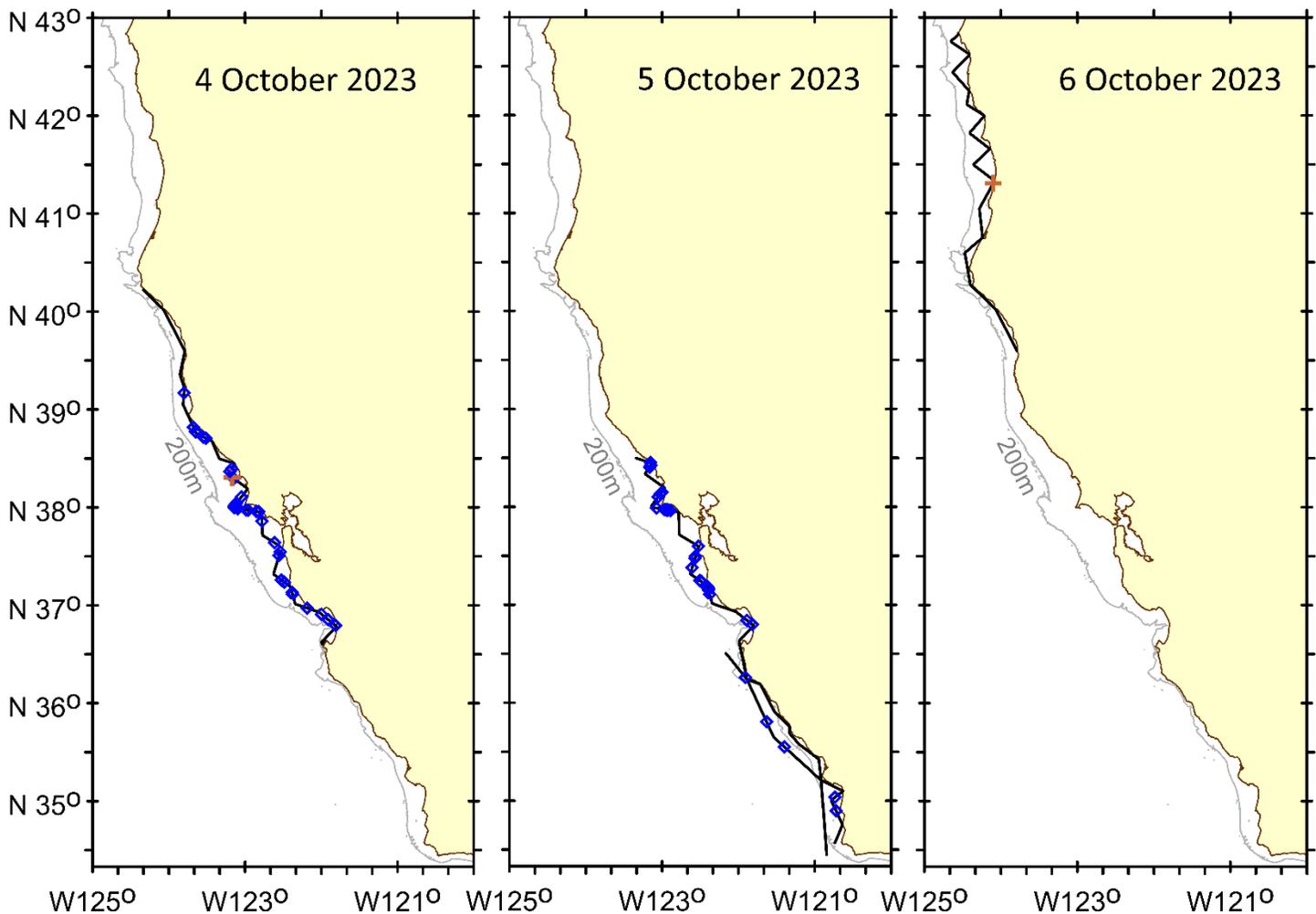
- During the three survey days (Figure 1), a total of 117 humpback whales were observed in 73 sightings. In addition, two unidentified large whales that may have been humpback whales were recorded (one in Fishing Zone 1 and one in Fishing Zone 3).
- Humpback whales were most concentrated from Monterey Bay to Pt. Arena, and they appeared to be feeding on schooling fish (based on their co-occurrence with fish-eating seabirds and California sea lions).
- Two blue whales were observed near some humpback whales just northwest of Point St. George lighthouse after the conclusion of the survey while the team was transiting back to Monterey. No leatherback turtles were observed during the survey.
- The number of humpback whales documented by Fishing Zone is as follows:

Table 6. Counts of whales seen on NOAA aerial survey conducted from October 4-6, 2023.

Fishing Zone	Number of sightings	Number of humpback whales
1	0*	0*
2	4	8
3	50	73
4	15	30
5	4	6
Total	73	117

**Several additional humpback whales were observed just northwest of Point St. George lighthouse (about 8-10 nautical miles offshore) after the conclusion of the survey while the team was transiting back to Monterey; these are not shown in the figure or included in this table.*

Aerial survey transects with sightings of humpback whales (◇) and unidentified large whales (+)



(Source: Scott Benson and Karin Forney, NOAA/SWFSC)

Figure 1. Plot for the aerial surveys conducted 4 - 6 October 2023, showing transects lines flown each day (black lines) and sighting locations of humpback whales and unidentified large whales. The depth contours shown are 50 m (~27 fathoms), 100 m (~55 fathoms), and 200 m (~110 fathoms).

C. NMFS Aerial Leatherback Surveys

- Aerial surveys in support of leatherback turtle capture and tagging operations were conducted during September 23-24 and October 2, 2023, within Fishing Zone 3. East-west transect lines spaced at 1-2 nm intervals were flown within the Gulf of the Farallones (Figure 2). The observation team consisted of three observers who searched through bubble windows and a belly port, plus a data recorder. Standardized survey methods were applied from a chartered Partenavia P-68 Observer aircraft to record whales, turtles, dolphins/porpoises, and other ecosystem indicator species such as forage fish, sea nettles and moon jellies (leatherback prey), and ocean sunfish ('Molas', which are often found in the same habitat as leatherback turtles and also feed on jellies). Weather was sunny with light winds, providing excellent survey conditions.

- No leatherback turtles were observed during the surveys, but one hard shelled sea turtle (likely a green turtle) was documented on September 24, 2023 (Figure 2).
- Moderate aggregations of jellyfish (brown sea nettles, moon jellies, and egg yolk jellies) were documented from about Half Moon Bay to San Francisco, mostly in water depths of about 20-30 fathoms where large ocean sunfish (Mola mola) were also abundant, indicating that suitable foraging habitat for leatherback turtles was present (Figure 2).
- The NOAA/Upwell team conducted aerial surveys of California, Oregon, and Washington coast nearshore waters during July-October 2023. No leatherback turtles were seen anywhere off the US West Coast throughout the survey period. Scott Benson received four reports of leatherback turtle sightings during 2023. Based on these results, we conclude that leatherback turtle abundance is low off the US West Coast.
 - 6/12/23: East of Catalina Island
 - 8/6/23: Two miles north of Santa Barbara Harbor
 - 9/6/23: Near Seal Rock, OR
 - 9/15/23: Actively foraging in the Gulf of the Farallones (west of Bolinas).

Aerial survey transects and sightings
of cetaceans, turtles, *Mola mola*, and jellyfish
23-24 September and 2 October, 2023

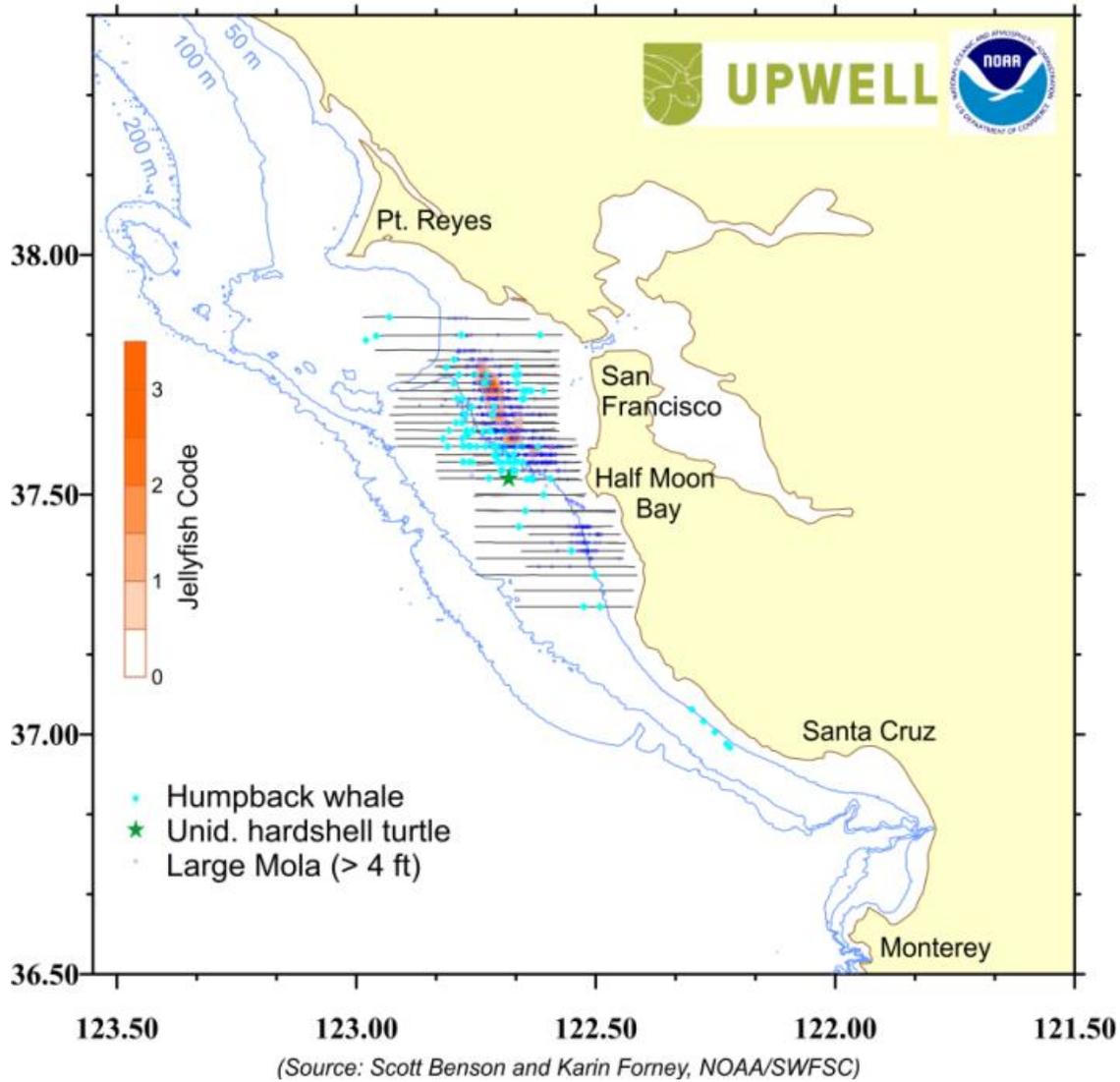


Figure 2. Plot for the aerial surveys conducted during September 23-24 and October 2 2023, showing transects lines flown (black lines) and sighting locations of large ocean sunfish (*Mola mola*), sea nettles, humpback whales, and one hard shelled sea turtle (most likely a green turtle). The depth contours shown are 50 m (~27 fathoms), 100 m (~55 fathoms), and 200 m (~110 fathoms).

D. Monterey Bay Whale Watch Surveys (Fishing Zone 4)

The average number of humpback whales-per-half-day-trip during the last seven days (October 7-13, 2023) was 16.2, with a peak of 25 whales observed during a half-day trip on October 12, 2023.

**Monterey Bay Whale Watch: Humpback whales per 1/2-day trip
(Nov 15, 2016 - October 13, 2023)**

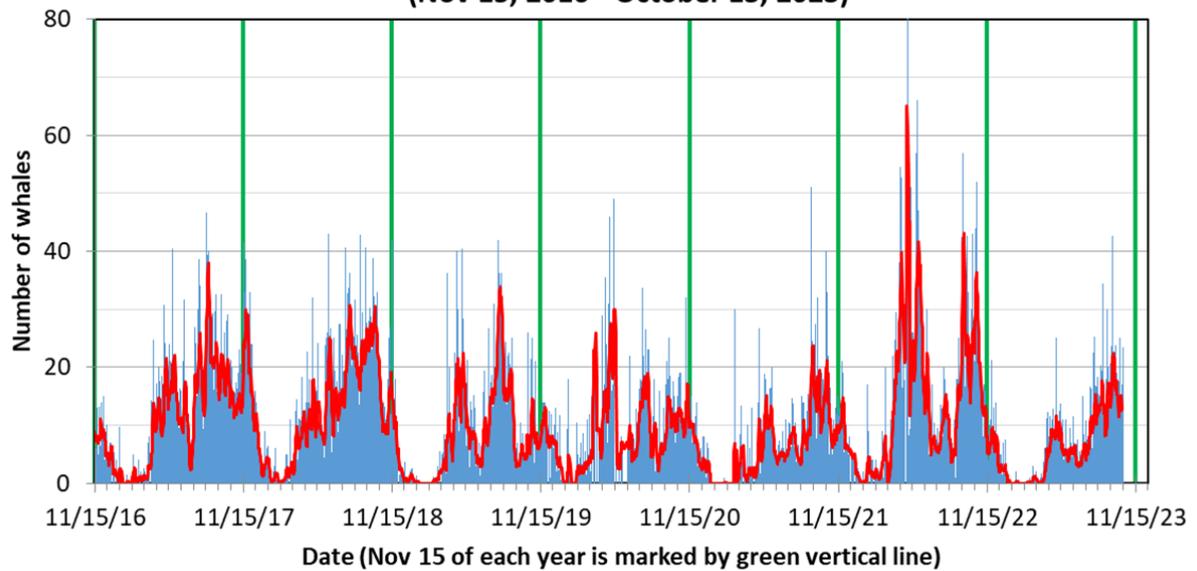


Figure 3. Standardized number of humpback whale sightings for Monterey Bay Whale Watch from 15 November 2016 – 13 October 2023. The y-axis is the number of whales per half-day trip; the thin blue bars are the average daily whale numbers, and the red line is a 7-day running average to make the patterns a bit easier to see. A vertical green line has been added at November 15 of each year for reference. Each tick mark is one month.

V. Management Considerations

I. Information from NOAA: §132.8(d)(2)

There were nine confirmed humpback whale entanglement reports in California in 2023. Three involved CA commercial Dungeness crab gear, four involved unidentified gear, one involved spot prawn gear, one involved gillnet gear. There have been zero confirmed entanglements of blue whales and leatherback sea turtles.

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

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

A. Point Blue Conservation Science (Fishing Zones 3, 4, and 6)

For current observation data please see the [Point Blue Whale Alert map](#).

Table 7. Summary of available humpback and blue whale recorded by observers and reported on via Point Blue Conservation in Fishing Zones 3, 4, and 6 during the seven-day period ending October 20, 2023

Fishing Zone	Number of humpback whales observed	Number of blue whales observed
Zone 3	118	0
Zone 4	0	0
Zone 6	48	0

B. Monterey Bay Whale Watch (Fishing Zone 4)

The semi-monthly average number of whales-per-half-day-trip in southern Monterey Bay is slightly above the historical average for this period, but lower than during 2022 (Figure 4). The seasonal pattern of whale abundance appears similar to what was observed during 2021.

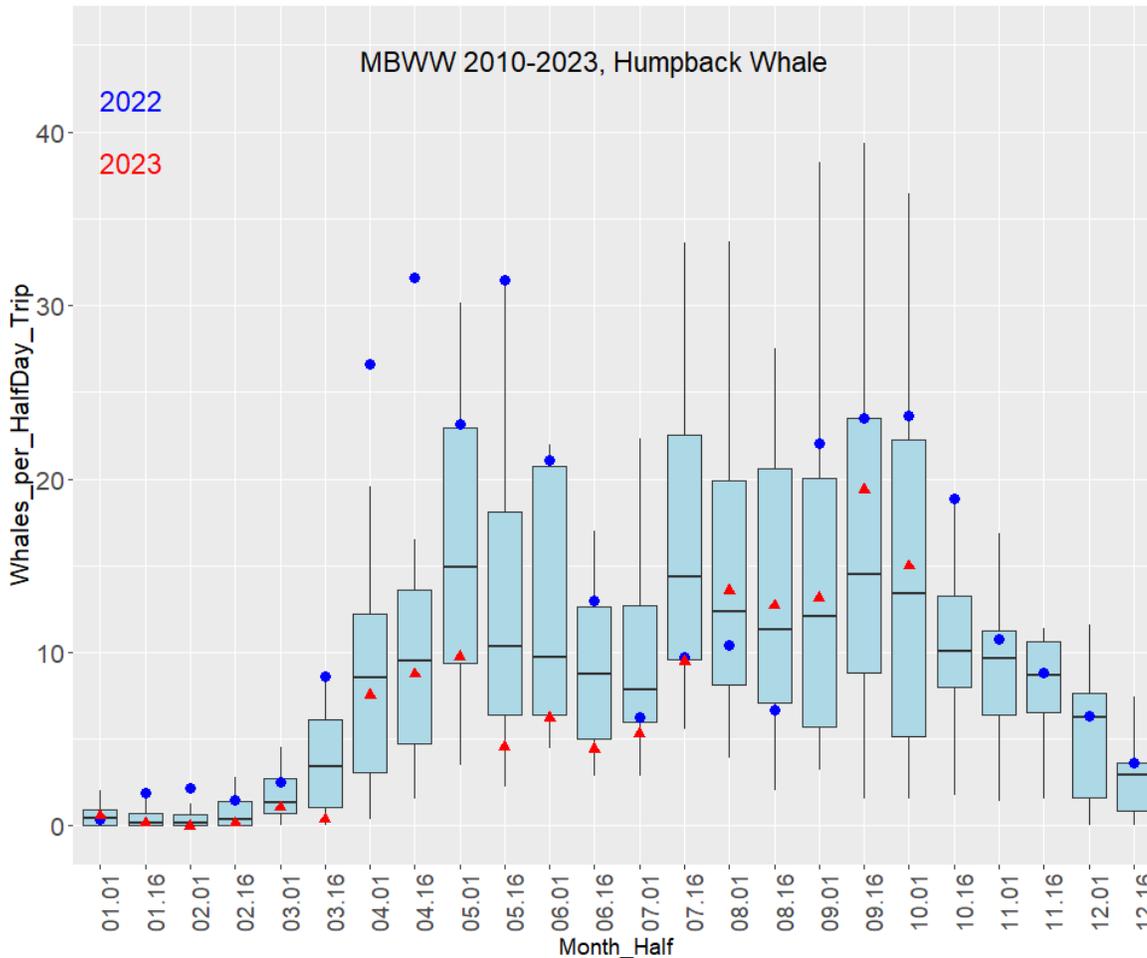


Figure 4. Historical Monterey Bay Whale Watch data for 2010-2023, summarizing the average and variation in the number of humpback whales per half-day trip on a semi-monthly basis (1st- 15th, 16th- end of month). This boxplot follows standard statistical practice in that the black horizontal line is the 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) are provided for reference, placing recent whale numbers in a historical context.

C. Whale Watch 2.0 (All Fishing Zones)

As of July 17, 2023, the most recent available data, blue whale habitat predictions show high habitat suitability in Fishing Zones 1-4, moderate habitat suitability in Fishing Zone 5 and high habitat suitability in Fishing Zone 6. For current habitat suitability check the [NOAA Coastwatch Habitat Suitability Map](#).

III. Fishing Season dynamics: §132.8(d)(7)

Data provided by: California Department of Public Health, California Department of Fish and Wildlife

A. Domoic Acid and Quality Testing

- Most samples from collection sites in Fishing Zones 1, 3 and 4 have been collected and submitted to the California Department of Public Health (CDPH) with [results through October 12, 2023](#) posted on the [CDPH domoic acid website](#). The results so far indicate that no locations require retesting at this time.

Sampling in San Luis Obispo, Mendocino and Humboldt counties is still being coordinated.

- Quality testing results are anticipated to be available as early as the week of November 6, 2023. Crab quality criteria only affects Fishing Zones 1 and 2.

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

A. MBARI Krill Model

Modeled zooplankton conditions for September 2023, indicate higher than expected concentrations off Cape Blanco, slightly below average concentrations between Cape Blanco and Pt. Arena, pockets of both above average and below average zooplankton between Pt. Arena and Pt. Sur, and slightly above average zooplankton levels south of Pt. Sur. Current data and conditions can be accessed from the [MBARI website](#).

V. Ocean conditions: §132.8(d)(9)

A. El Niño/Southern Oscillation (ENSO) Diagnostic

As of October 12, 2023, El Niño is anticipated to continue through the Northern Hemisphere spring. Please visit the [NOAA ENSO Diagnostic webpage](#) for more information.

B. Large Marine Heatwave Tracker

As of September 29, 2023, the current heatwave forecast suggests that coastal waters will continue to cool and the heatwave will remain offshore through the fall. Unlike the events in 2014-2015, the last time this system had a strong marine heatwave with an El Niño looming, the current heatwave appears to be receding rather than building in strength, making it more similar to the heatwaves tracked over the past four years. Thus, we expect to see a return to cooler coastal temperatures until El Niño brings back warmer coastal conditions in the late winter/early spring. More information can be accessed from the [NOAA Marine Heatwave Tracker webpage](#).

C. Habitat Compression Index

Data from September 2023 shows Regions 2 and 3, which include the north and central coast of California, with high habitat compression (Figure 5). Please visit the [NOAA Habitat Compression Index webpage](#) for more information.

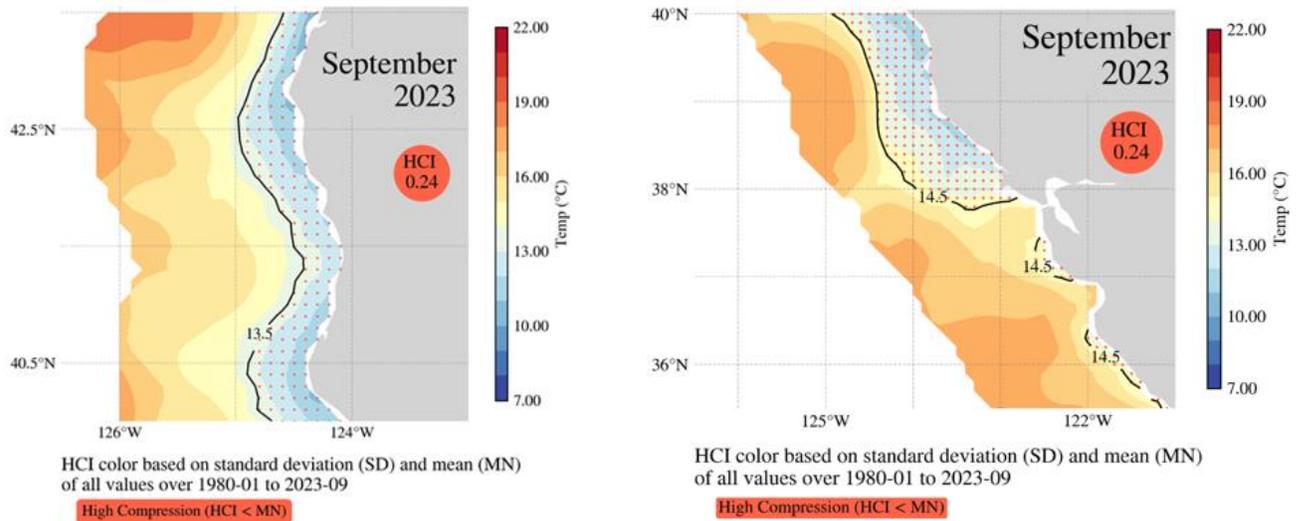


Figure 5. Spatial structure of the Habitat Compression Index for Region 2 (40 to 43.5 °N: left side) and Region 3 (35.5 – 40 °N: right side)

VI. 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) are provided above in the Initial Assessment.

VII. 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.

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

Data provided by: California Department of Fish and Wildlife

See Table 3 for the current fishing season and calendar year Impact Score. For more information about Impact scoring, please review the [Impact Score FAQ](#).