

2022-23 Risk Assessment: Available Data

Last updated: ~~April 26, 2023~~ April 28, 2023.

See updated information on Marine Life Concentrations and Habitat Compression Index.

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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 April 26, 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.

On April 17th, 2023, a confirmed humpback whale entanglement (20230417Mn) with Unknown Fishing Gear was reported in Monterey Bay. The whale was first reported on April 17th and while no gear was seen on the whale at the time it exhibited behavior that was consistent with being anchored by trap gear. On April 18th the whale was sighted again, having freed itself from the downline. Drone footage showed line wrapped around the peduncle and trailing line above and below the fluke.

On April 20th, 2023, a response team confirmed a second humpback whale entanglement (20230420Mn) in Unknown Fishing Gear in Monterey Bay. Response teams reported multiple wraps of line at the base of the peduncle and a small amount of trailing line.

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

As a result CDFW has assigned an Impact Score of 0.38 to each of the April 17, 2023 and April 20, 2023, humpback whale entanglements bringing the 2023 calendar year impact score to 0.76. CDFW considers both humpback whale entanglements (20230417Mn and 20230420Mn) in Fishing Zone 4 to be confirmed entanglements in unidentified fishing gear.

During 2022 and 2023, there were no confirmed entanglements of either blue whales or leatherback sea turtles in California commercial Dungeness crab gear (reported from any location) or Unknown Fishing Gear (reported from California). 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. 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	NA	NA
Leatherback sea turtles	0	0	NA	NA

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

Data provided by: United States Coast Guard (USCG), California Department of Fish and Wildlife (CDFW), Cascadia Research Collective, and Monterey Bay Whale Watch (processed by Karin Forney, NOAA SWFSC).

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

USCG (Fishing Zone 1)

On April 24, 2023, the US Coast Guard flew a portion of Fishing Zone 1 from Cape Mendocino to the Oregon border (Figure 1). No whales were observed.

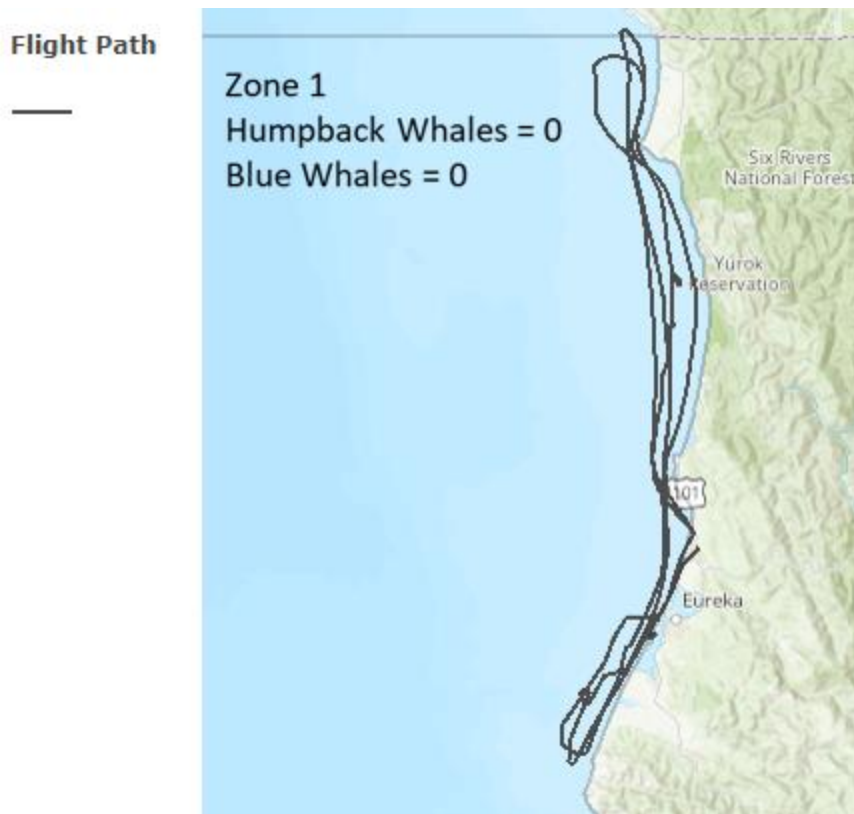


Figure 1. Map showing track lines and observations from USCG aerial survey of Fishing Zone 1 on April 24, 2022.

CDFW Aerial Survey (Fishing Zones 1, 2, 3)

CDFW staff conducted an aerial survey on April 18, 2023 between Half Moon Bay and Cape Mendocino. Weather conditions were good to Cape Mendocino, and no humpback or blue whales were observed in the areas surveyed for Fishing Zones 1, 2, or 3 (Figure 2).

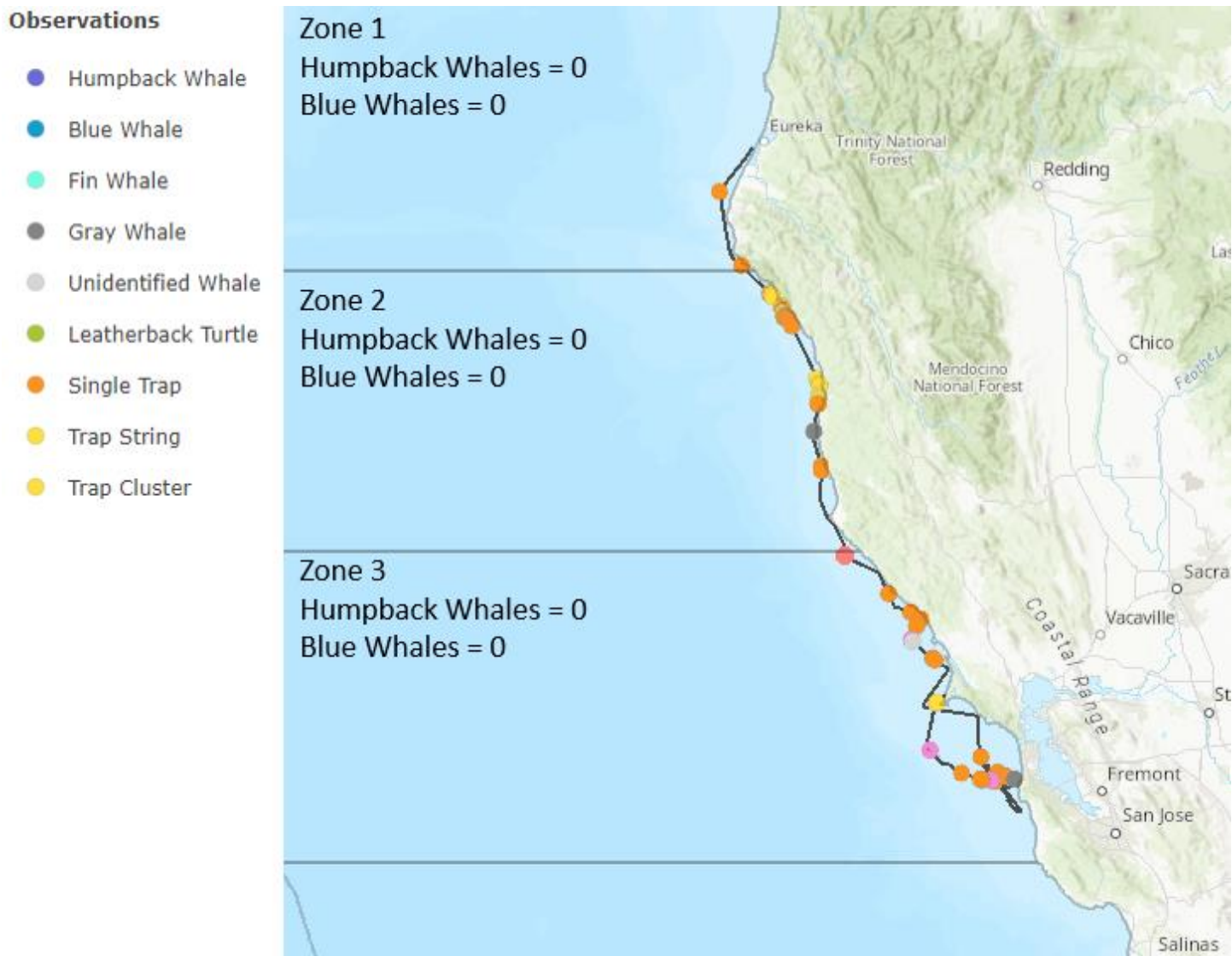


Figure 2. Map showing track lines and observations from CDFW aerial survey of Fishing Zones 1, 2, and 3 on April 18, 2023.

Cascadia Research Collective (*Fishing Zones 1,3,4 and 5*)

On March 31, 2023, Cascadia Research conducted two surveys out of Half Moon Bay. Five humpback whales were sighted on the survey of the 70-meter contour, and ten humpback whales were sighted on the survey of the 200-meter contour. The second survey was conducted out of San Francisco Bay and covered 140 nautical miles around the Southeastern Farallon Islands. Five humpback whales were sighted on the second survey, largely concentrated around the Farallon Islands.

In coordination with The Marine Mammal Center, Oregon State University, and industry partners, Cascadia Research Collective conducted vessel surveys throughout April.

Activities by Cascadia personnel included responses to three humpback whale entanglements in the Monterey Bay area. All appeared to involve smaller juvenile animals and in the single case with a good fluke identification photograph, no match was found to existing catalogs at Cascadia or in Happywhale. One of these whales is currently being tracked for a potential disentangle effort this week. These included:

1. 20230417Mn: Juvenile in Monterey Bay, response on 18 April, 2023 no ID. Originally reported as anchored.
2. 20230420Mn: Juvenile in Monterey Bay, response and survey by CRC on 20 April, 2023 initially to search for previous entangled whale. Good ID but no match.
3. 20230424Mn: Juvenile in Monterey Bay, entangled in spot prawn gear, no ID. Tracking buoy attached and whale has moved north to offshore of Bodega Bay.

Results of the surveys are summarized below in Table 5 and Figures (3-8).

Table 5. Summary of vessel surveys in April 2023 in Zones 1, 3, 4, and 5 by Cascadia Research, The Marine Mammal Center, Oregon State University and organized by the industry.

Date	Vessel	Zone	Survey Area	Number of sightings of humpback whales	Number of humpback whales observed	Comments
April 14-15	OSU Pacific Storm	1	OR Border to Cape Mendocino	18	27	Line transect survey as part of MOSAIC project.
April 26	TMMC RHIB	3	San Francisco Bay Area	NA	NA	Fog prevented coverage of other than most coastal area, only gray whales.
April 9	MUS	4	Monterey Bay and north	11	16	62 nmi, also 4 gray whales.
April 20	MUS	4	Monterey Bay area	4	12	53 nmi, including documenting entangled whale.
April 7	MUS	5	Morro Bay area	6	16	109 nmi, humpbacks were feeding on fish, also 3 gray whales seen.
April 26	Sky	5	Port San Luis and south	8	10	Industry survey by Captain and one crew member
April 27	Sky	5	Port San Luis and south	9	27	Industry survey with Cascadia observer, fog in south

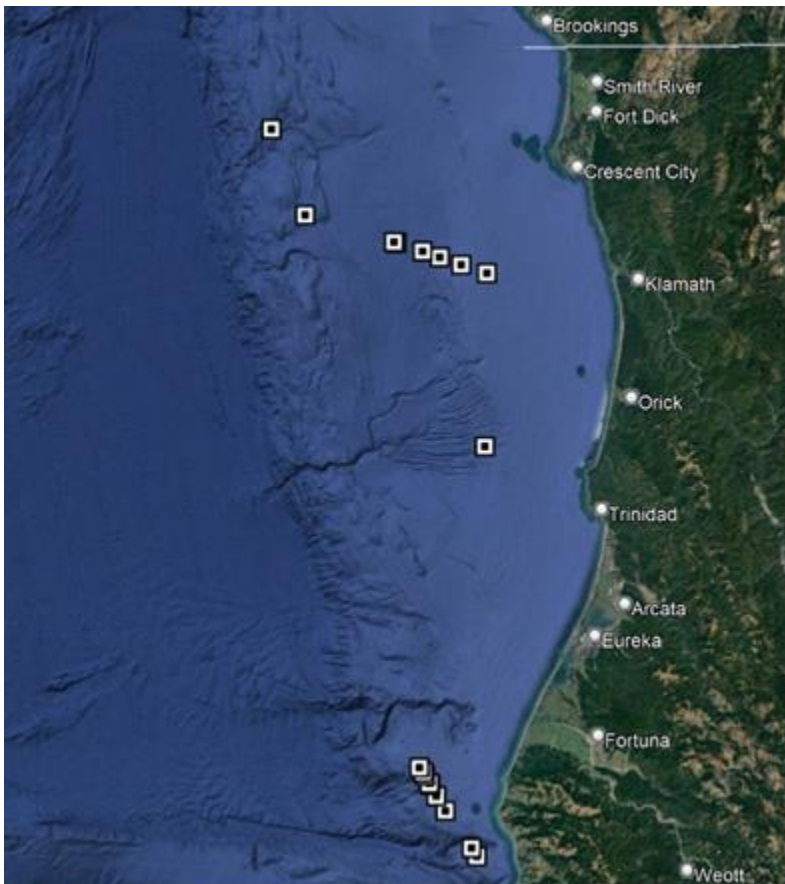


Figure 3. Locations of sightings of humpback whales in Fishing Zone 1 from Oregon State University's MOSAIC cruise conducted aboard the Pacific Storm on April 14 and 15, 2023. Sightings in Zone 1 included 18 sightings of 27 humpback whales (shown above). All sightings and effort occurred north of the Fishing Zone 2 border.

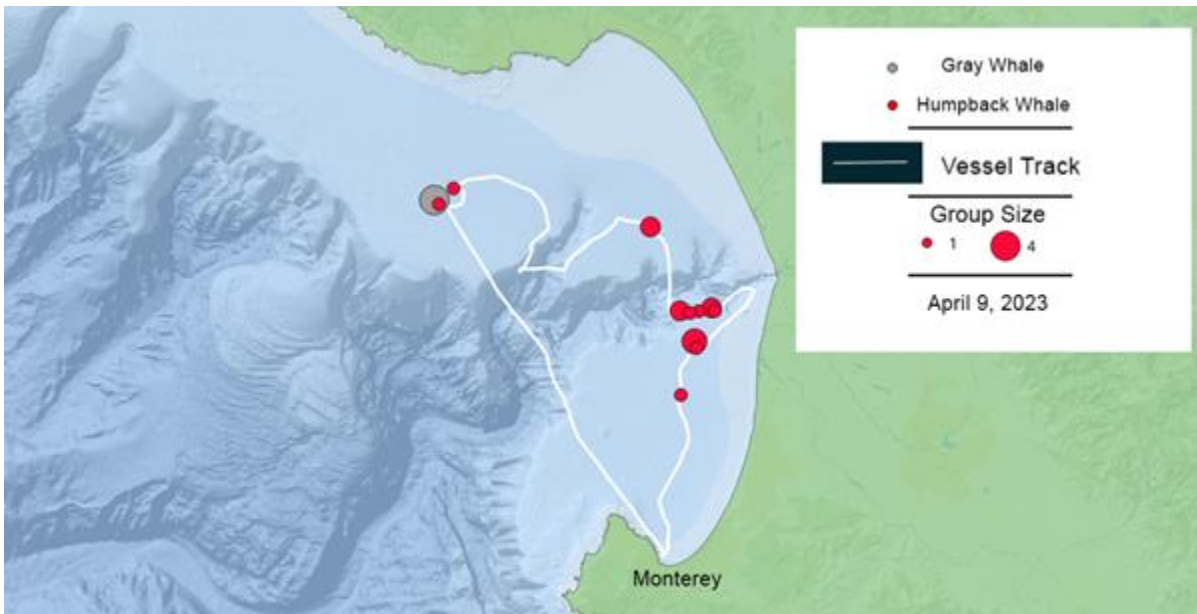


Figure 4. Track and sightings from survey by Cascadia Research vessel MUS in Monterey Bay (Fishing Zone 4) on April 9, 2023.

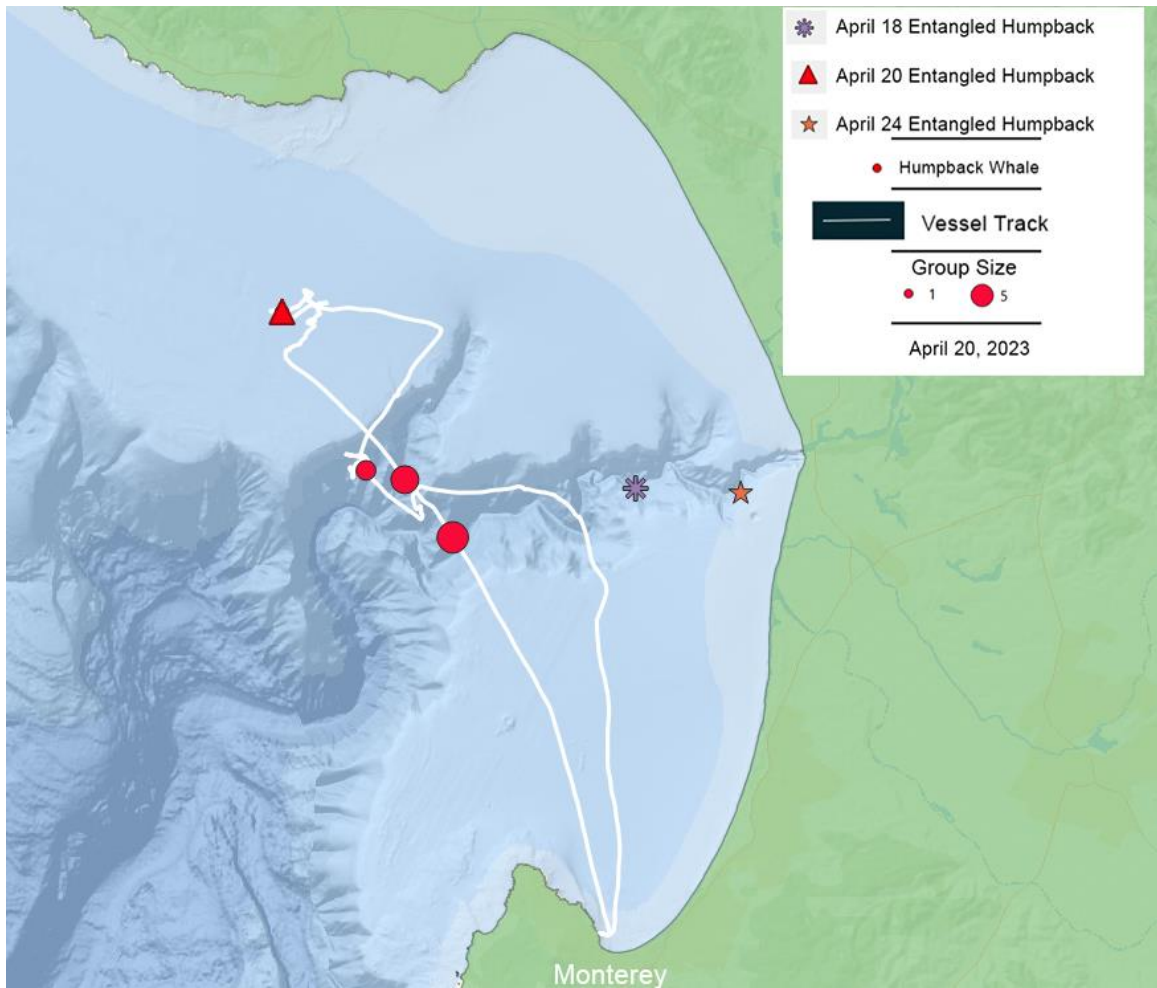


Figure 5. Track and sighting from survey by Cascadia Research vessel MUS and locations of entangled whales in Monterey Bay (Fishing Zone 4) on April 20, 2023.

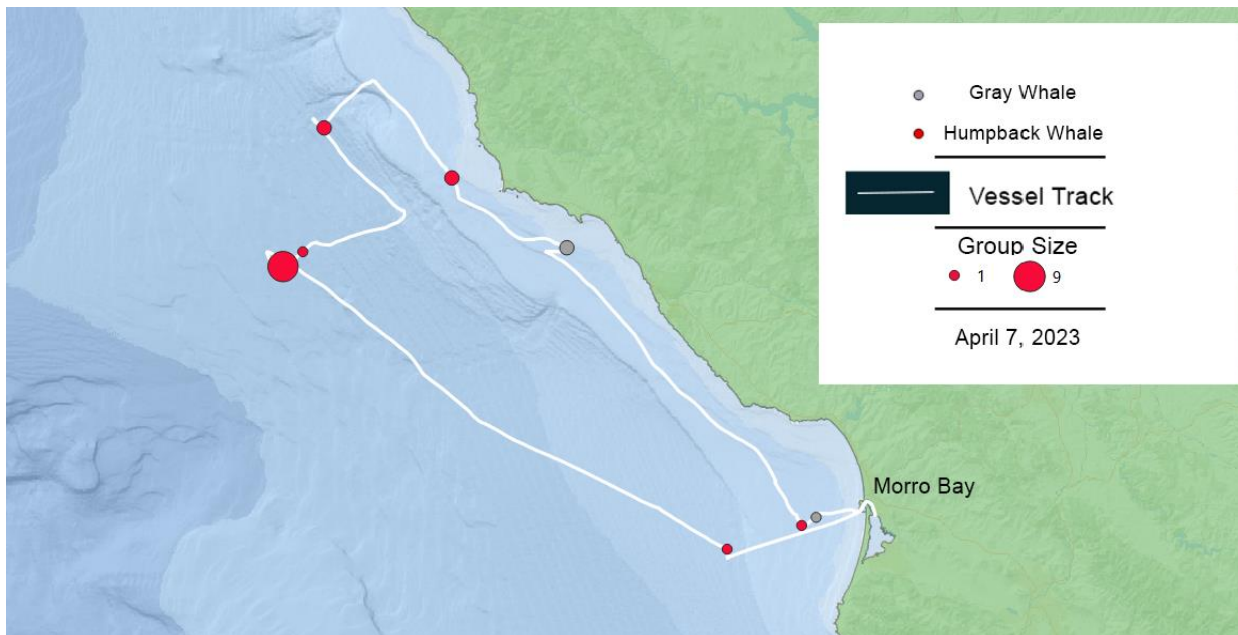


Figure 6. Track and sightings from survey in Cascadia Research vessel MUS in the Morro Bay Area (Fishing Zone 5) on April 7, 2023.

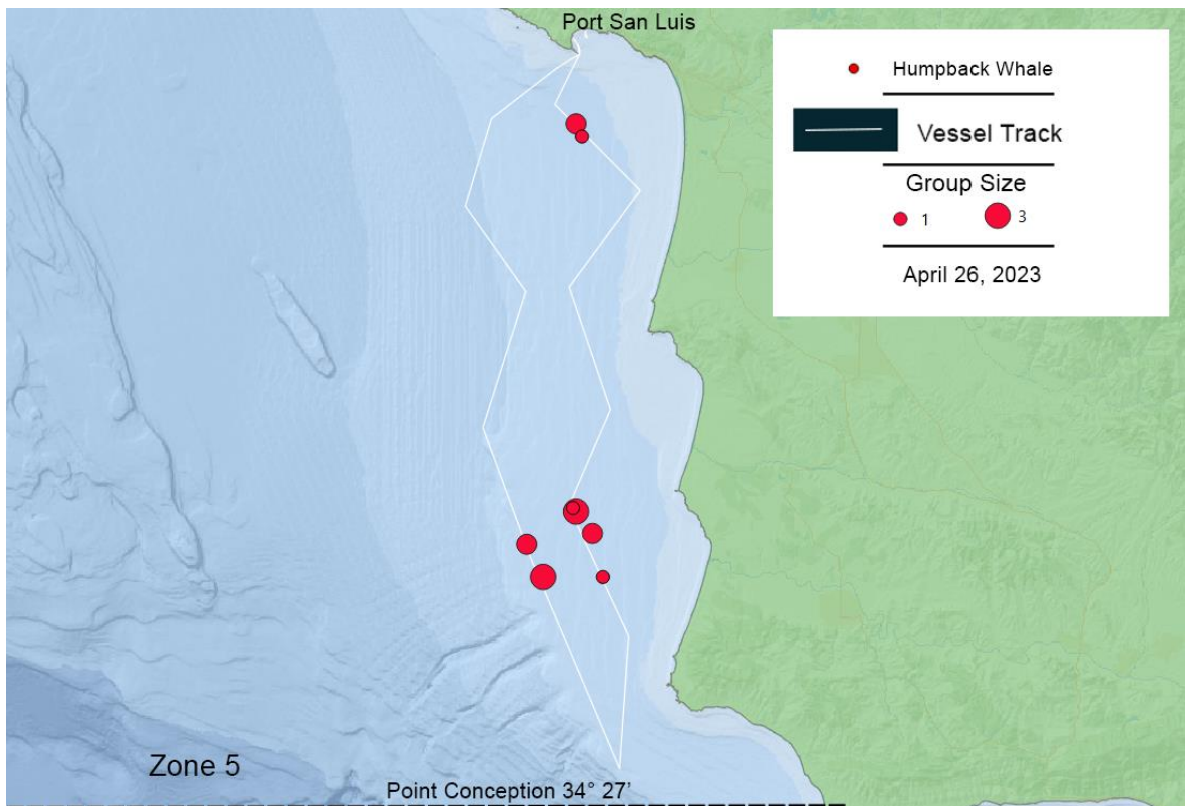


Figure 7. Track and sightings from Cascadia Research survey aboard Industry F/V Sky in Port San Luis area on April 26, 2023.

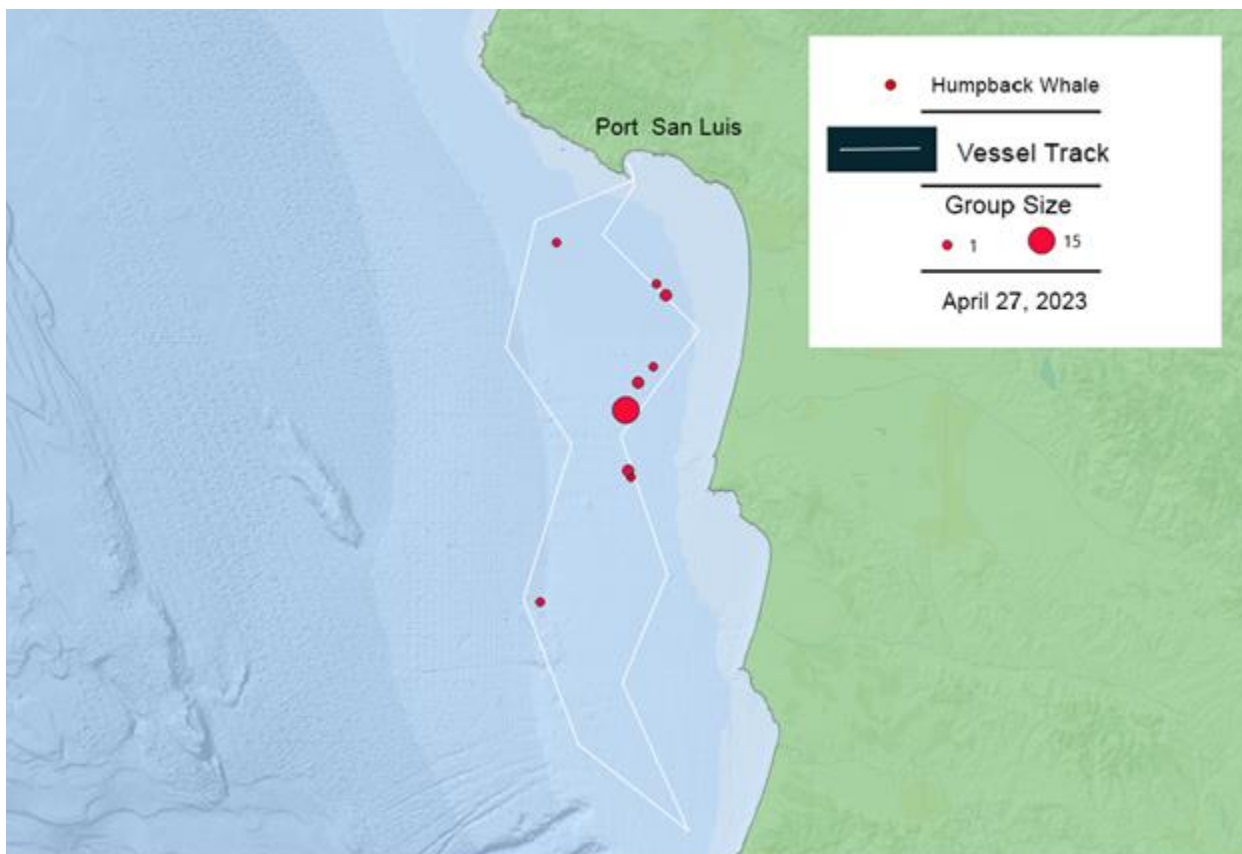


Figure 8. Track and sightings from Cascadia Research survey aboard Industry F/V Sky in Port San Luis area on April 27, 2023.

Monterey Bay Whale Watch (Fishing Zone 4)

- Monterey Bay Whale Watch conducted whale-watching trips in southern Monterey Bay on all seven days during the week of April 15-21, 2023.
- The average number of humpback whales per half-day trip during the week of April 15-21, 2023, was 9.2, with a peak of 25 humpback whales observed during an all-day trip on April 16, 2023.
- Two blue whales were observed during an all-day trip on April 21, 2023.

MANAGEMENT CONSIDERATIONS

Information from NOAA: §132.8(d)(2)*

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

Two humpback whale entanglements in Unknown Fishing Gear were reported on April 17, 2023 (20230417Mn) and April 20, 2023 (20230420Mn) in Monterey Bay (Fishing Zone 4).

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 April 26, 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 April 26, 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 Data Portal, and Cascadia Research Collective

Monterey Bay Whale Watch (Fishing Zone 4)

For humpback whales, the semi-monthly average of whales per half-day trip has continued to increase and is now close to the average historical value of about 10 whales at this time of year (Figure 9). Based on historical patterns, the number of humpback whales will likely continue to increase during the next few weeks and remain elevated through at least November (Figures 9 and 10).

Two blue whales were observed on April 21, 2023. This is the first 2023 observation of blue whales by MBWW, consistent with historical data showing the seasonal presence of blue whales near Monterey Bay from about April through November (Figure 11).

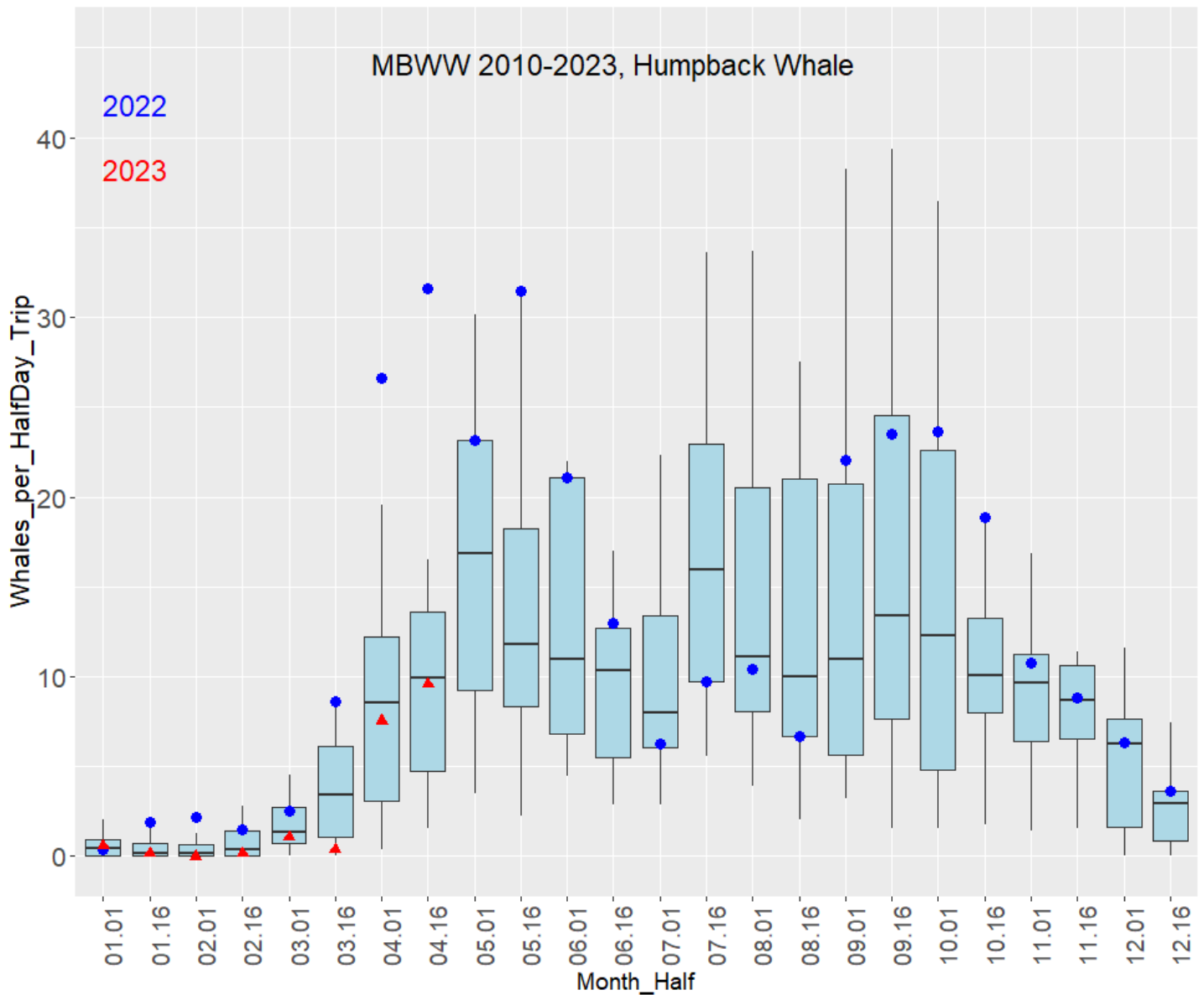


Figure 9. Historical Monterey Bay Whale Watch data for 2010-2023, summarizing the average and variation in the number of humpback whales per half-day trip on a semi-monthly basis (1st- 15th, 16th- end of month). This boxplot follows standard statistical practice in that the black horizontal line is the 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.

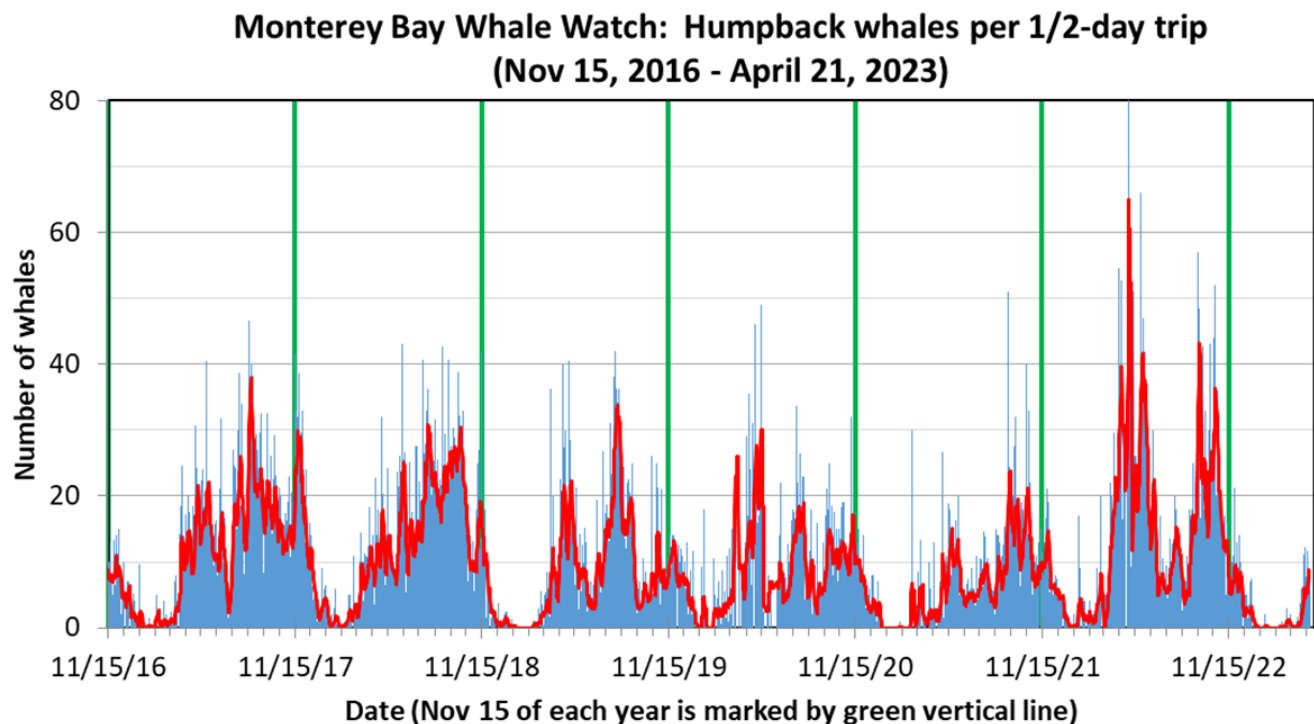


Figure 10. Standardized number of humpback whale sightings for Monterey Bay Whale Watch from 15 November 2016 – 21 April 2023. The y-axis is the number of whales per half-day trip; the thin blue bars are the average daily whale numbers, and the red line is a 7-day running average to make the patterns 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.

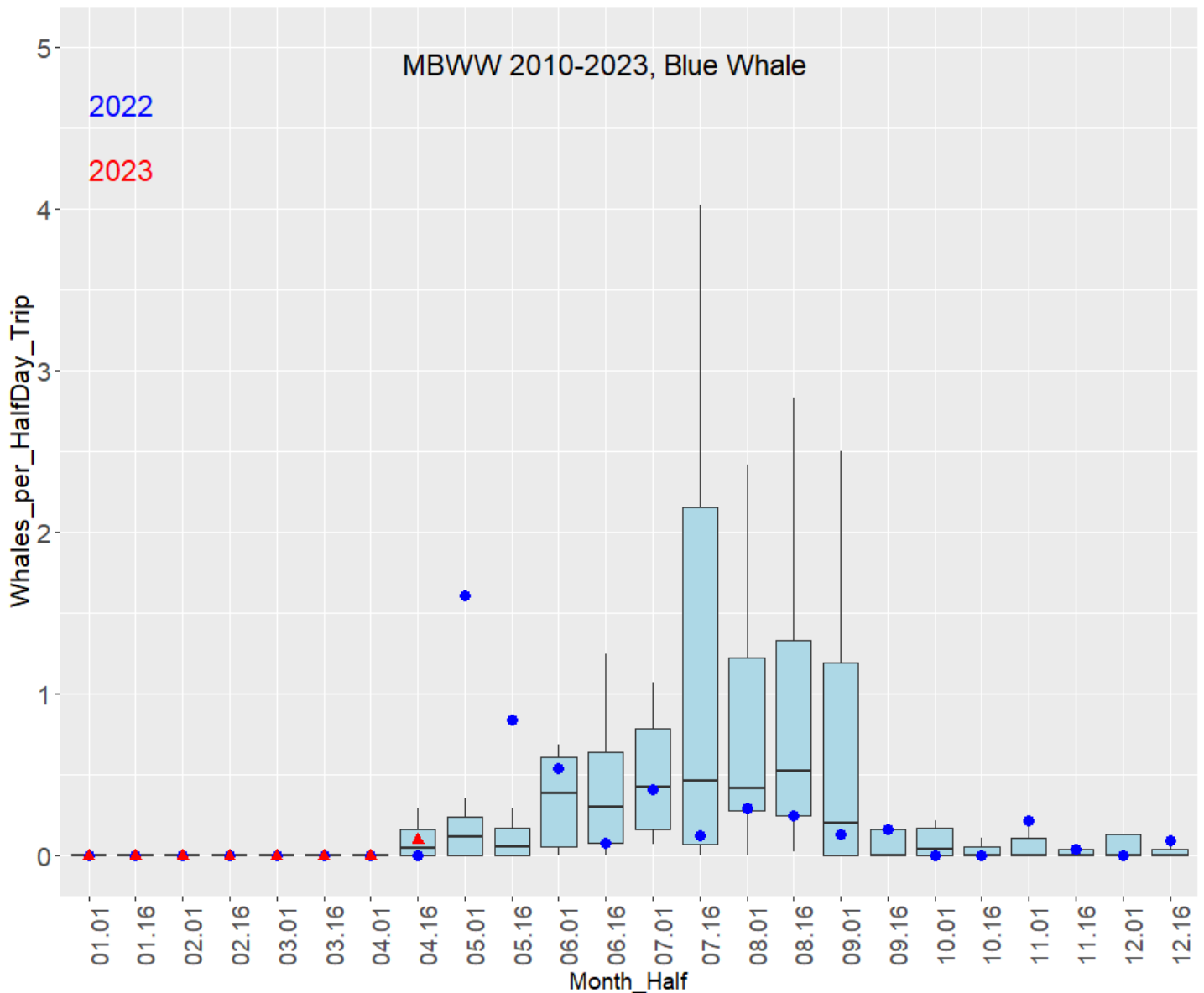


Figure 11. Historical Monterey Bay Whale Watch data for 2010-2023, summarizing the average and variation in the number of blue whales per half-day trip on a semi-monthly basis (1st- 15th, 16th- end of month). This boxplot follows standard statistical practice in that the black horizontal line is the 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 Zone 6*)

During the seven-day period ending April 25, 2023, trained naturalists from the Channel Islands National Marine Sanctuary and National Park Service reported 86 humpback whales in Fishing Zone 6 (Figure 12). No blue whales were observed in any Fishing Zone during this period.

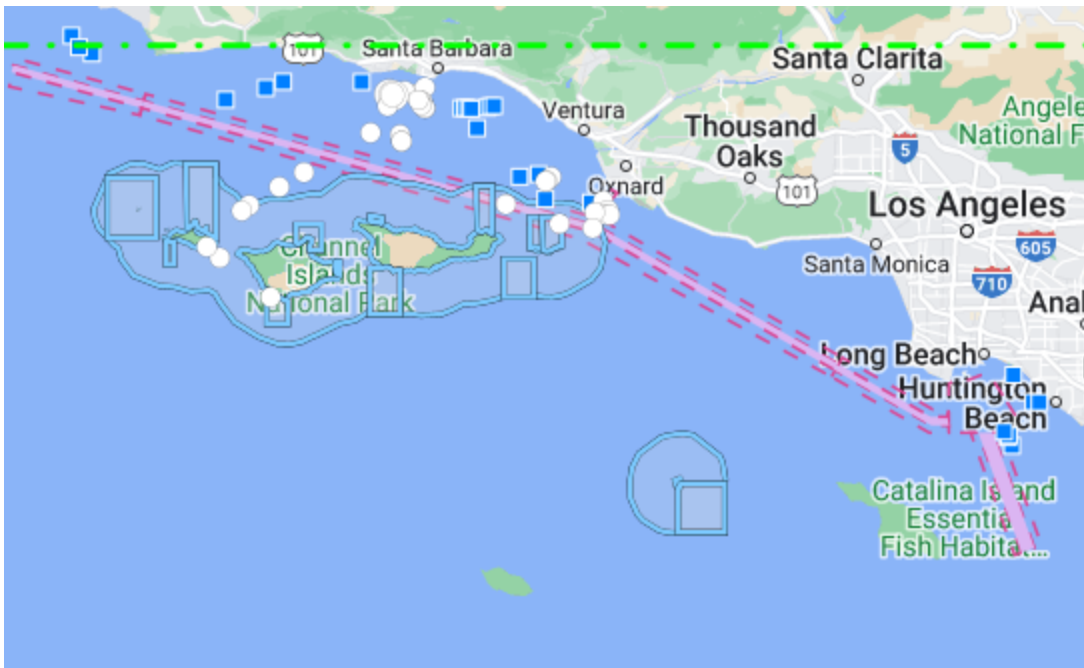


Figure 12. Locations of humpback whale sightings within Fishing Zone 6. Reporting locations are reported by white circles. A given report may or may not represent multiple individuals. Fishing Zone boundaries are represented by dashed lines.

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)

Fishing Zones 1 and 2 are open as of April 25, 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 13). So far, 74% of the total volume harvested for this season has been from Fishing Zone 1, with 19% 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 14). 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 (Figures 15). Overall, 47% of the total volume harvested for this season has been landed into Crescent City, 22% landed in Eureka, seven percent landed into Bodega Bay, six percent landed in 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 16). Vessels have

also made landings into Fort Bragg (25), Trinidad (14), Monterey (13), and Morro Bay (withheld due to confidentiality; Figure 16). However, vessel activity by Fishing Zone has significantly decreased since the beginning of April with most Fishing Zones showing less than half of their highest active vessels count active over the last few weeks.

Table 5. Summary of fleet dynamics information, as of April 25, 2023.

Metric	Value	Additional Info
Season status	Partial Closure	Fishing Zones 1 and 2 Open
Number of daily landings	5,851	NA
Total volume (pounds)	20,298,491	NA
Total Ex-Vessel Value	\$50,598,255	NA
Average unit price	\$2.76	NA
Total number of active vessels	371	NA
Maximum potential traps (based on active permits)	120,525	Estimates are also provided in the Bi-Weekly Fishing Activity Reports subsection

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

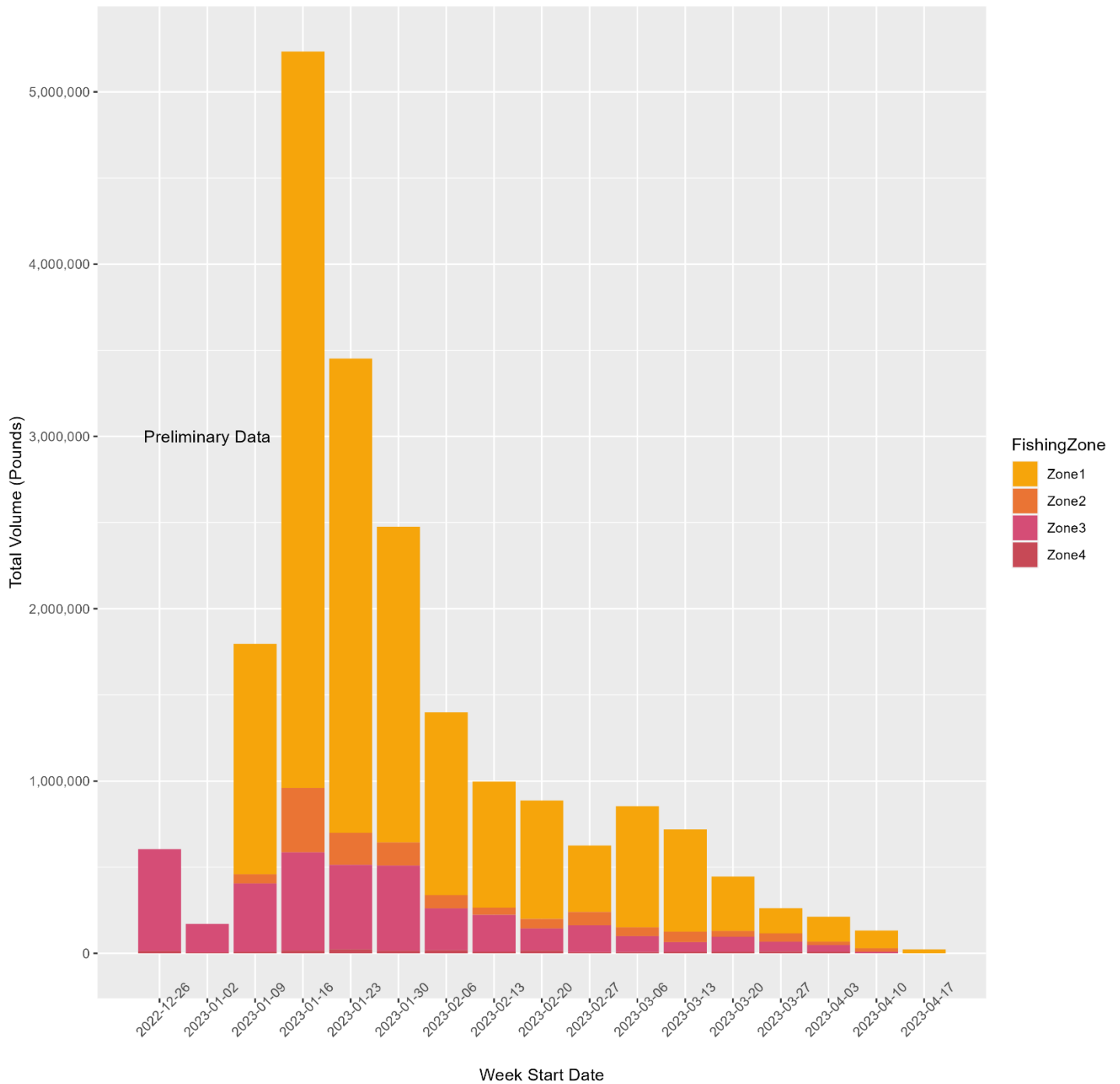


Figure 13. Cumulative volume (pounds) harvest by week and Fishing Zone. Week 1 starts with the first day the commercial Dungeness crab fishery was open in any area, December 31, 2022. All data are preliminary and subject to change.

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

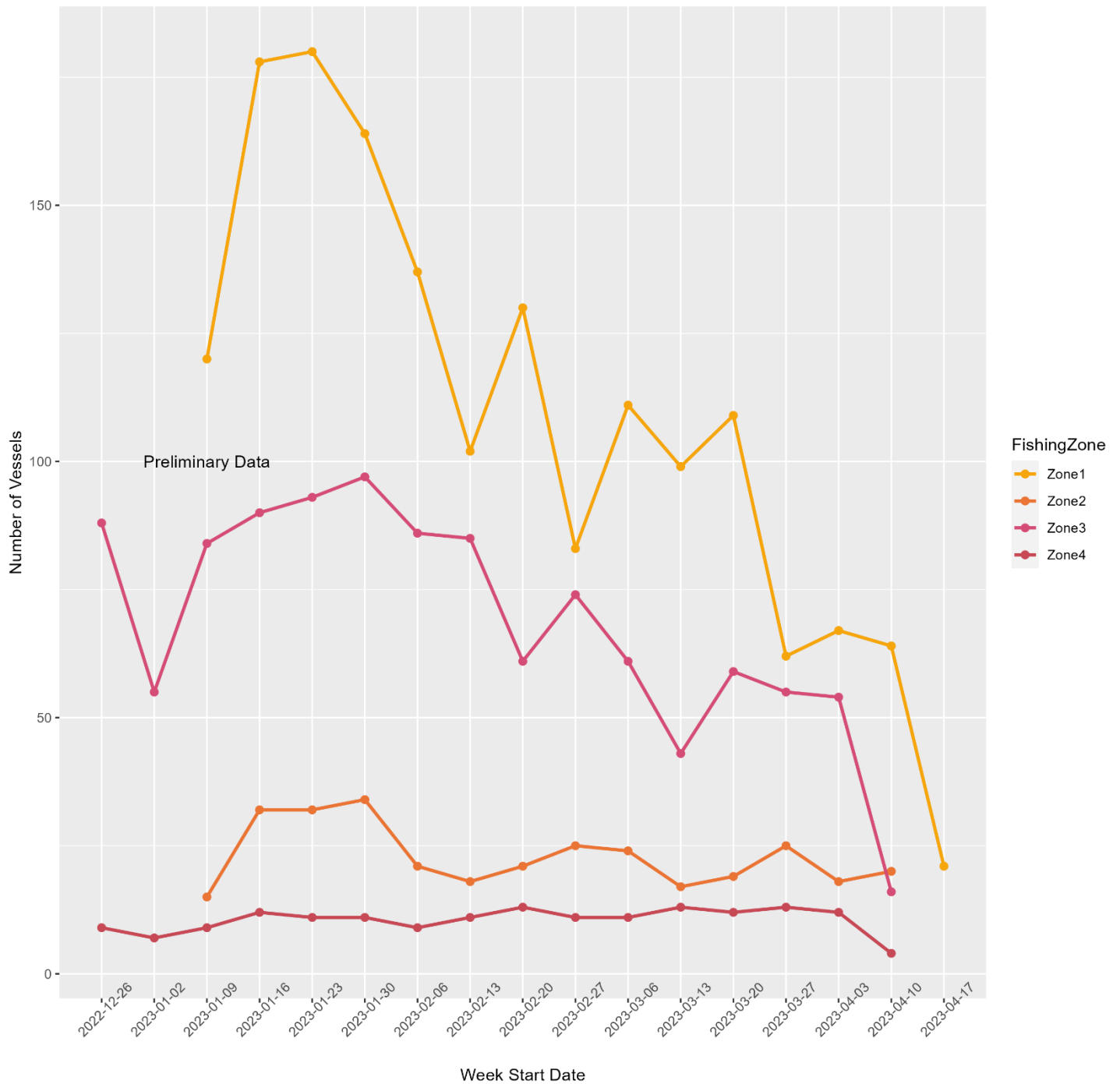


Figure 14. Number of active vessels by week and Fishing Zone. Week 1 starts with the first day the commercial Dungeness crab fishery was open in any area, December 31, 2022. All data are preliminary and subject to change. Some week*port complex combinations are withheld due to confidentiality constraints.

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

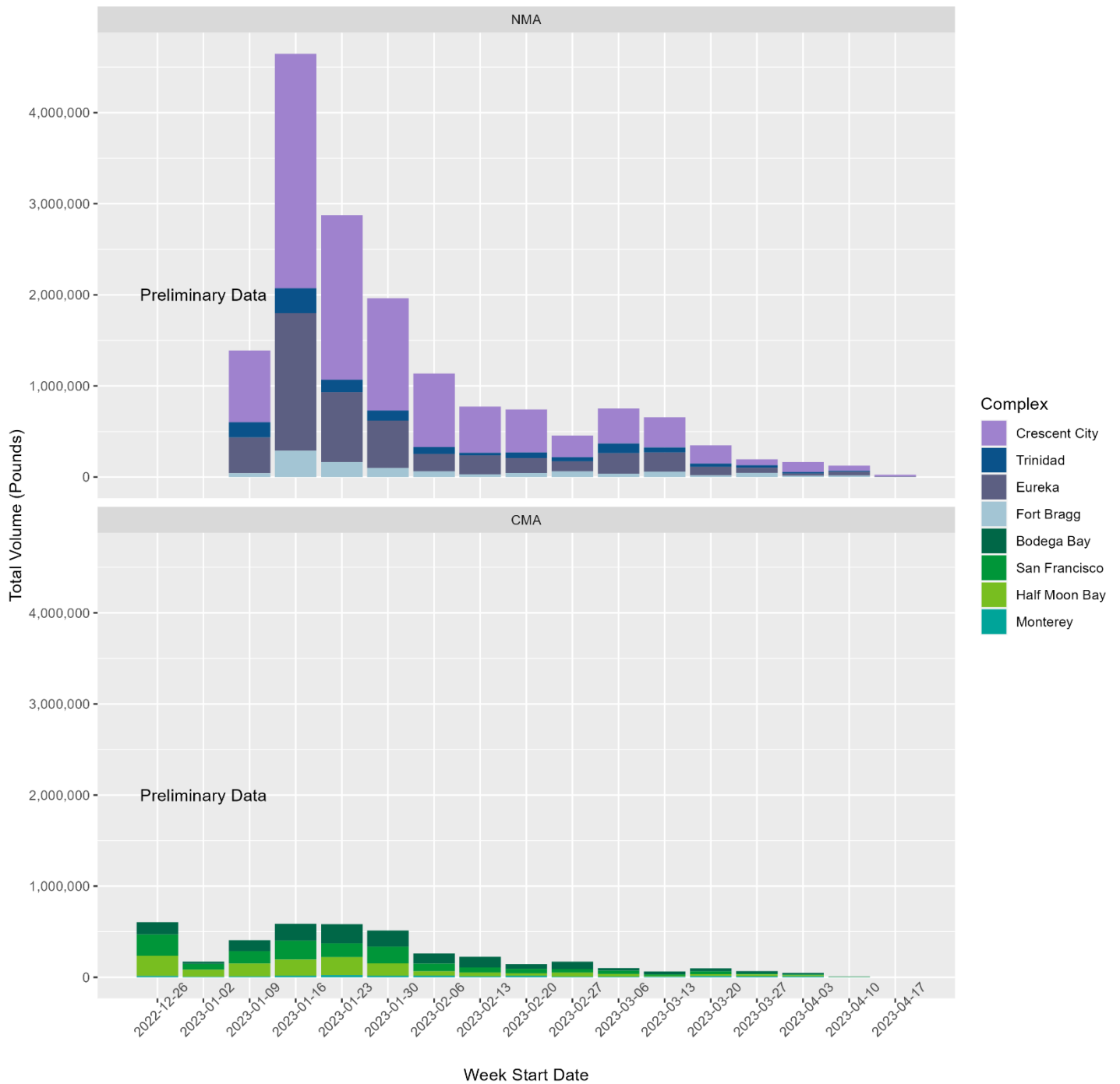


Figure 15. Cumulative volume (pounds) landed by week and port complex. Week 1 starts with the first day the commercial Dungeness crab fishery was open in any area, December 31, 2022. All data are preliminary and subject to change. Certain week*port complex combinations are withheld due to confidentiality constraints.

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

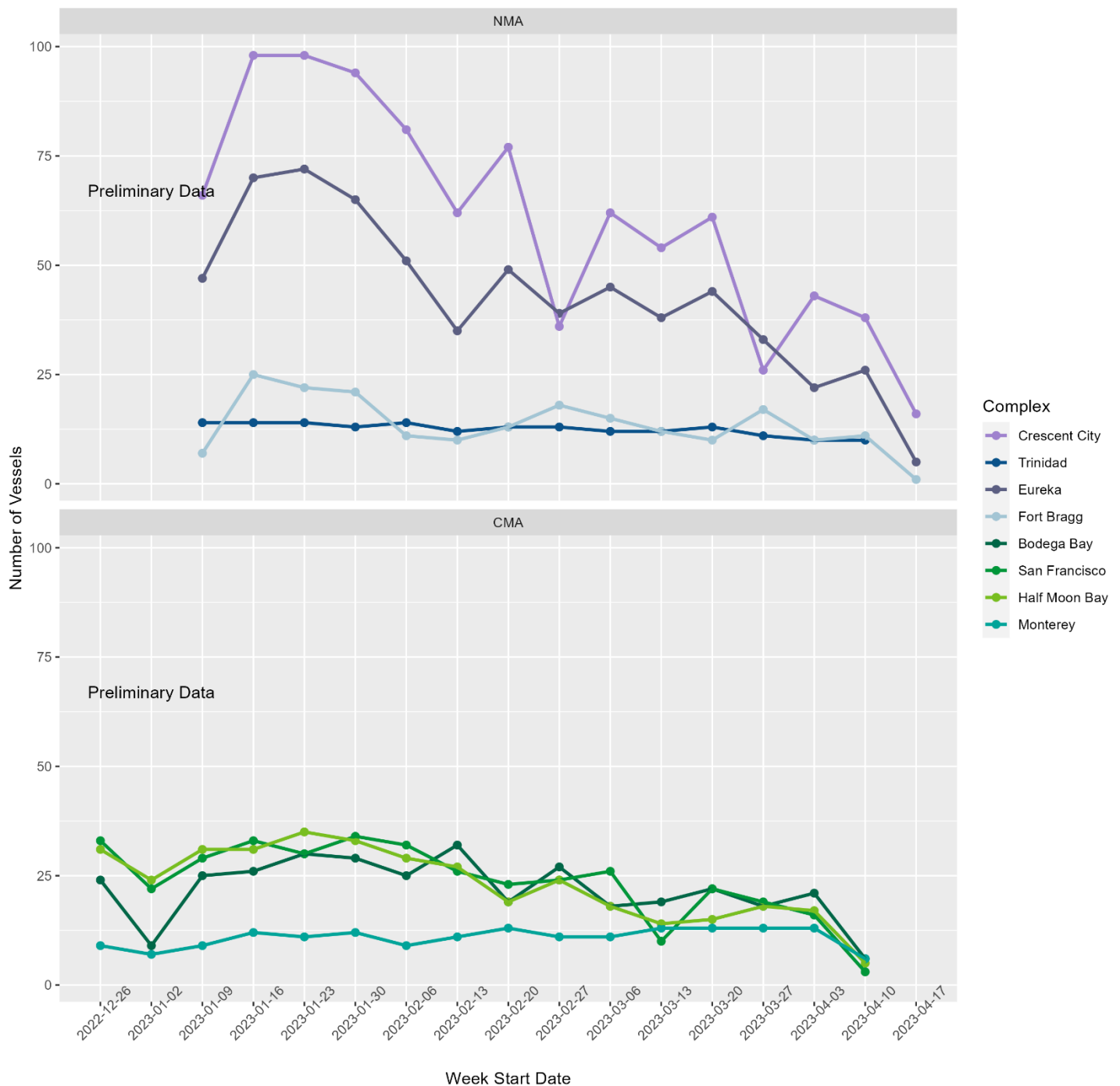


Figure 16. Number of active vessels by week and port complex. Week 1 starts with the first day the commercial Dungeness crab fishery was open in any area, December 31, 2022. All data are preliminary and subject to change. Some week*port complex combinations are withheld due to confidentiality concerns.

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 April 16, 2023. A summary of reports received for April 1, 2023, is provided in Table 7 and those received for April 16, 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 reported totals, total traps in Zone 1 have consistently been between 60% and 65% of total traps deployed each period until Available Data, April-26-2023

the most recent period that covers when the season closed in Zones 3, 4, 5, and 6, number of traps in Zone 1 are over 70% of total.

Table 7. Summary of information provided for the April 1, 2023 bi-weekly reporting period by Fishing Zone (1-6). Accessed from CDFW's Bi-Weekly Reporting database on April 25, 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	97	332	31,511	12	28	53	9	56
Zone 2	20	243	4,852	14	27	60	0	
Zone 3	65	217	13,191	19	33	80	14	229
Zone 4	15	167	2,493	20	36	60	2	29
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	197		52,047				25	314

Table 8. Summary of information provided for the April 16, 2023 bi-weekly reporting period by Fishing Zone (1-6). Accessed from CDFW's Bi-Weekly Reporting database on April 25, 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	80	328	24,255	12	27	53	13	139
Zone 2	16	213	3,394	14	30	85	0	
Zone 3	38	188	5,075	20	35	80	36	301
Zone 4	10	105	735	17	37	60	9	166
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	144		33,459				58	606

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	Feb 16 - Total Traps	Mar 1 - Total Traps	Mar 16 - Total Traps	Apr 1 - Total Traps	Apr 16 - Total Traps
Zone 1	56,936	50,263	43,063	31,511	24,255
Zone 2	6,068	5,624	5,740	4,852	3,394
Zone 3	24,345	23,136	20,281	13,191	5,075
Zone 4	2,055	2,209	2,395	2,493	735
Zone 5	NR-C	NR-C	NR-C	NR-C	NR-C
Zone 6	NA	NA	NA	NA	NA
Totals	89,404	81,232	71,479	52,047	33,459

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 Point Arena, higher than expected concentrations from Point Arena to Point Sur, and below average expected conditions from Point Sur south to the Mexico/California border (Figure 17).

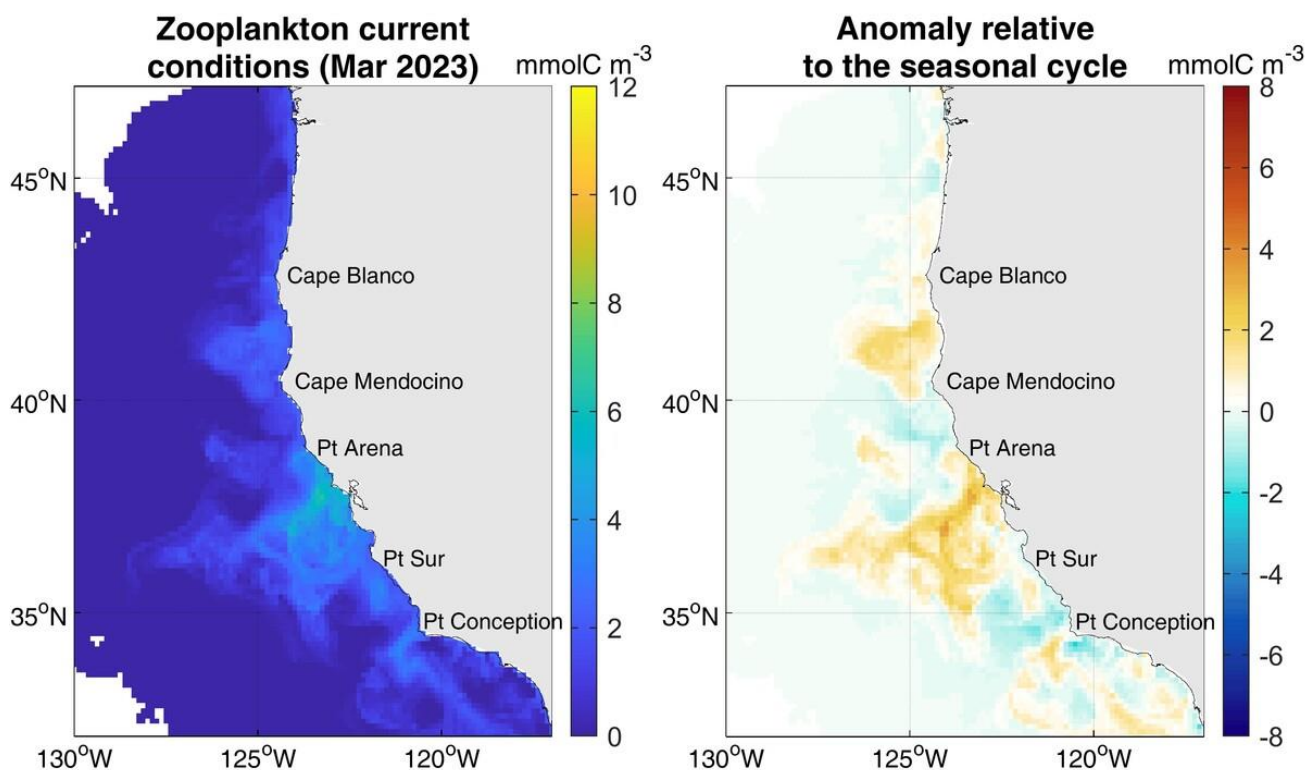


Figure 17. Latest modeled zooplankton concentrations in the California Current (left) and the corresponding anomaly relative to the 1993-2018 seasonal cycle (right), Derived from the operational krill hotspot model from February 2023 accessible on the [MBARI website](#).

Ocean conditions: §132.8(d)(9)*

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

Habitat Compression Index

The most recent Habitat Compression Index values are for March 2023 (Figure 18). Compression was high in March from 2014-2017, moderate to high from 2018-2020, and low from 2021-2023. Additionally, waters are cold and likely fueling a surge in the spring krill population.

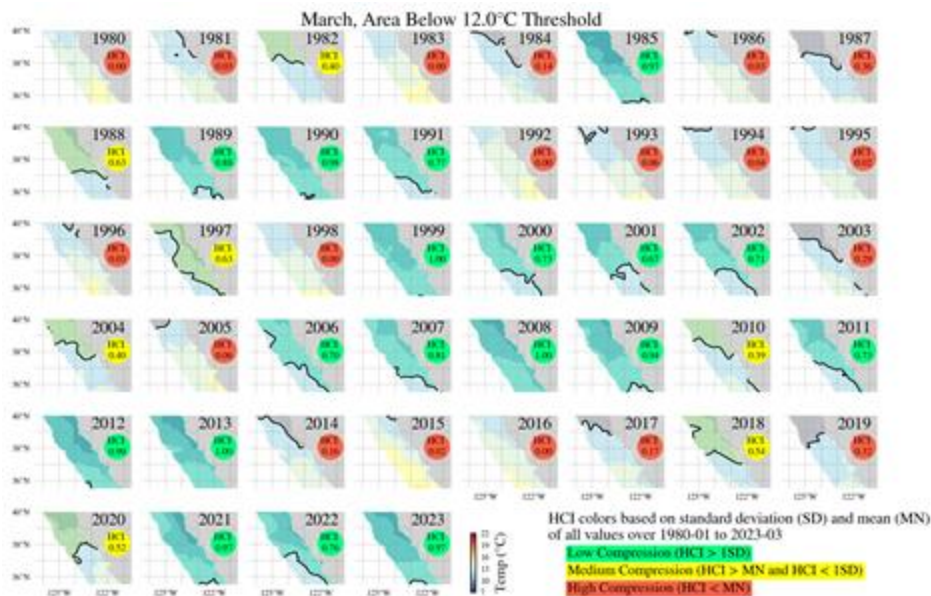


Figure 18. Maps of historical March sea surface temperature and location of the Habitat Compression Index Boundary (thin black line) between 1980 and 2023.

El Niño/Southern Oscillation (ENSO) Diagnostic

As of April 13, 2023, La Niña conditions have ended, and ENSO-neutral conditions are present. ENSO-neutral conditions are likely to continue until May-July when there is a strong chance of a transition to El Niño conditions.

Large Marine Heatwave Tracker

As of March 7, 2023, there are no new Large Marine Heatwaves (LMHs), and nearshore coastal waters are slightly colder-than the average temperatures (Figure 19). The heatwave that developed in January 2022, receded, and shrank from nearshore coastal waters in November of 2022.

Apr-07-2023

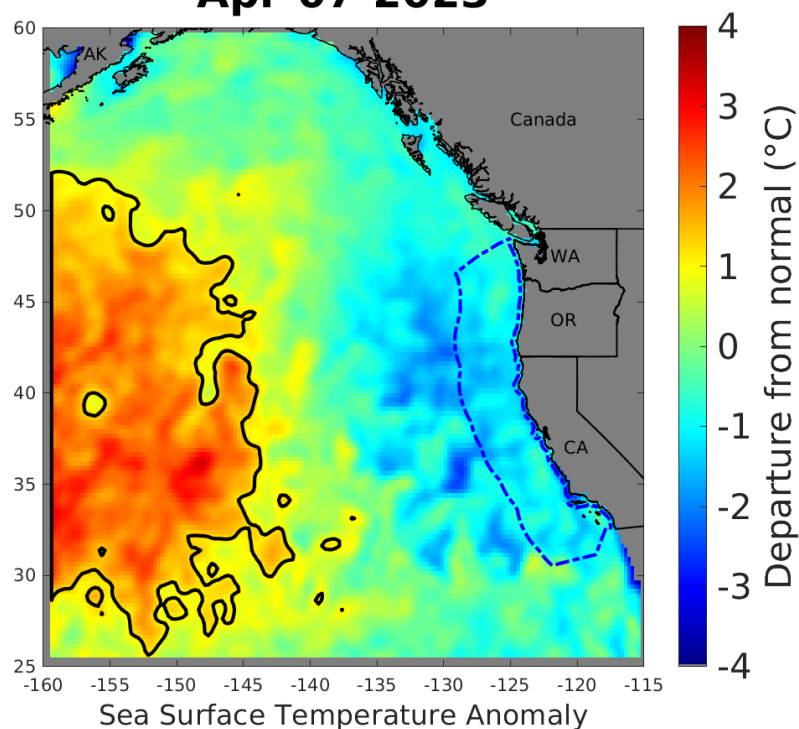


Figure 19. Science-quality (delayed 3-weeks), daily interpolated standardized sea surface temperature anomalies (SSTa) in the California Current ecosystem available for analysis of MHW presence. Dark outline shows the current extent of MHW conditions, as delineated by values of the normalized SST + 1.29 SD from normal. Blue dashed line represents the US West Coast EEZ. SST data from [NOAA's Optimum interpolation Sea Surface Temperature analysis \(OISST\)](#), with the SST anomaly calculated using climatology from NOAA's AVHRR-only OISST dataset.

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.