

## 2019-20 Risk Assessments: Available Data

Last updated: April 7, 2020

### FACTOR: ENTANGLEMENTS

*Data provided by: Lauren Saez and Dan Lawson (NMFS)*

- There have been no confirmed entanglements with California commercial Dungeness crab gear during the 2019-20 fishing season.
- There have been no confirmed entanglement reports since the last meeting.
- 2020 entanglements to-date are as follows:
  - Humpback whales: 2 confirmed entanglements
    - February 14: entangled with gillnet, reported off San Diego
    - February 28: entangled with unidentified gear (dark colored line), reported off Monterey
  - Blue whales: 0 reported entanglements
  - Leatherback sea turtles: 0 reported entanglements
  - Gray whales: 2 confirmed, 1 unconfirmed
    - January 20: 1 confirmed entanglement with gillnet reported off San Diego
    - January 12: 1 confirmed entanglement with unidentified gear reported off Oxnard
    - March 19: 1 unconfirmed entanglement with unidentified gear, reported as buoys
  - Unidentified whale: 1 unconfirmed entanglement (March 3)
- A summary of spring and early summer entanglements (March – June) for 2013-2019 is provided in Appendix 1.

### FACTOR: MARINE LIFE CONCENTRATIONS

*Data provided by: Monterey Bay Whale Watch (compiled by Karin Forney, NOAA SWFSC), Scott Benson (NOAA SWFSC), Jaime Jahncke (Point Blue Conservation Science)*

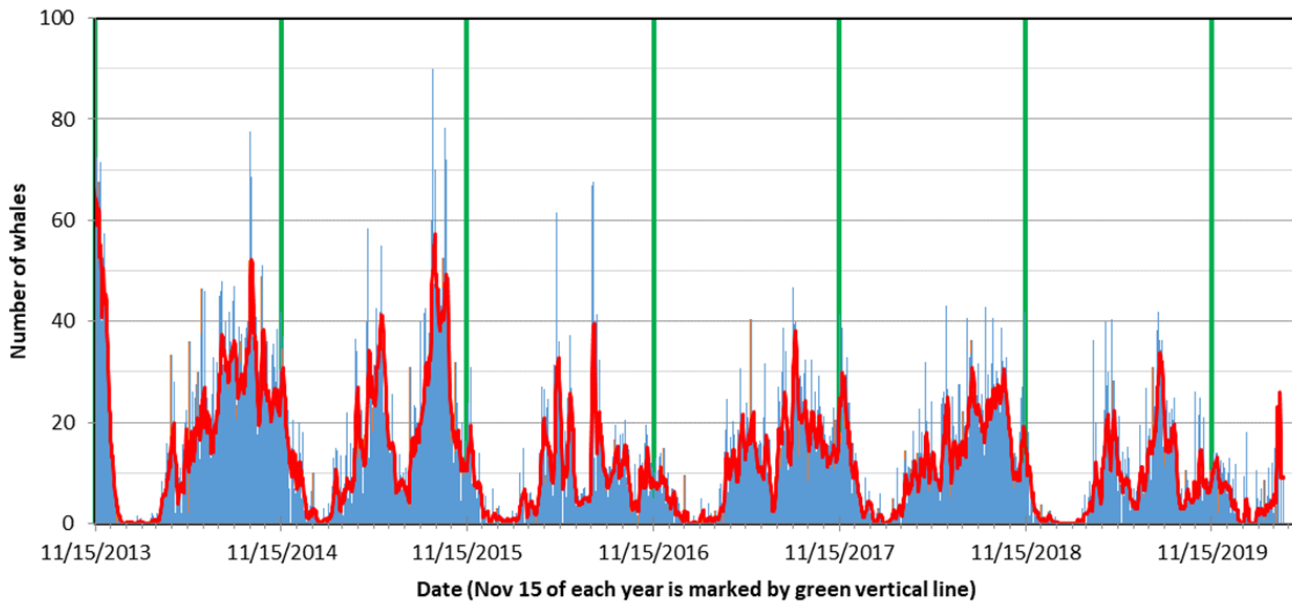
#### Monterey Bay Whale Watch

- Although commercial MBWW whale-watching trips have been suspended because of COVID-19, Nancy Black has conducted four research-only trips (on 3/21, 3/24, 3/31, and

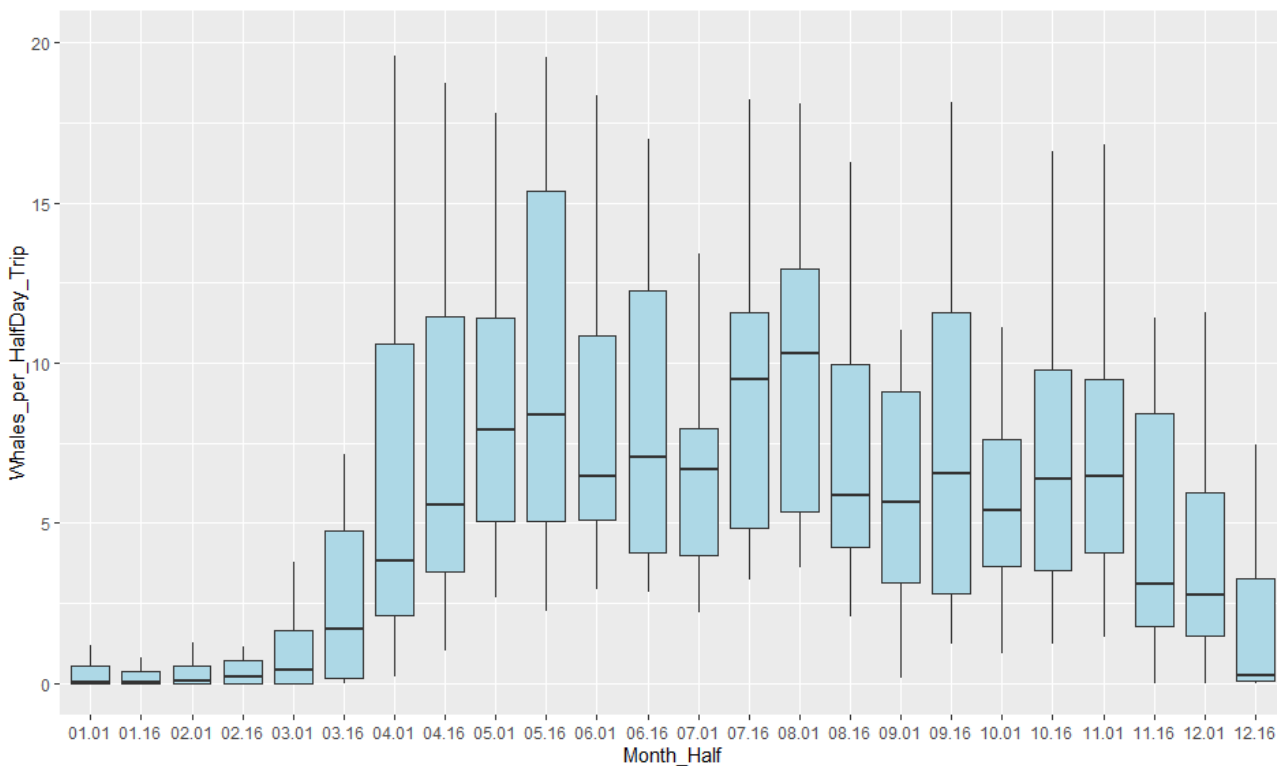
4/4), which Karin Forney standardized to the same half-day-trip unit used in previous summaries.

- The average number of humpback whales per half-day-trip during these four research trips was 16.12 whales (daily range 9-20, Figure 1), compared to the previous two bi-weekly 14-day averages of 2.5 and 4.1 whales per half day trip.
- Based on historical patterns that show humpback whales arriving during March/April (Figure 2), this continued doubling of the weekly average whale numbers suggests that whales are now arriving in larger numbers, and the expected number of humpback whales will continue to increase during the coming weeks.
- Following their spring arrival, individual humpback whales tend to return to their preferred feeding areas along the California coast, moving between these feeding areas in search of good foraging opportunities. Known biologically important feeding areas (BIAs), where humpback whales can be expected to concentrate for foraging, are shown in Figure 3.
- No blue whales have been observed since mid-December 2019, consistent with their southward winter migration (Figure 4).
- Blue whales are expected to start arriving off California during late May/June (Figure 5), and their distribution will depend on the availability of krill.
- The average number of gray whales per half-day-trip during these four research trips was 2.625 whales (daily range 0-5.5, Figure 6), compared to the previous two bi-weekly 14-day averages of 5.9 and 7.9 whales per half day trip.
- This suggests that gray whales have nearly completed their northbound migration (from their breeding grounds in Mexico to their feeding areas in Alaska), consistent with historical patterns (Figure 7).

**Monterey Bay Whale Watch: Humpback whales per 1/2-day trip  
(Nov 15, 2013 - Apr 4, 2020)**



**Figure 1. Standardized number of humpback whale sightings from 15 November 2013 – 4 April 2020 for Monterey Bay Whale Watch. The y-axis is the number of whales; 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. Note: After 3/17/2020 only four research trips were conducted because commercial whale-watching operations were suspended in response to COVID-19.**



**Figure 2. Historical Monterey Bay Whale Watch data for 2003-2020, 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). 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); and the vertical lines show the full range of whale numbers.**

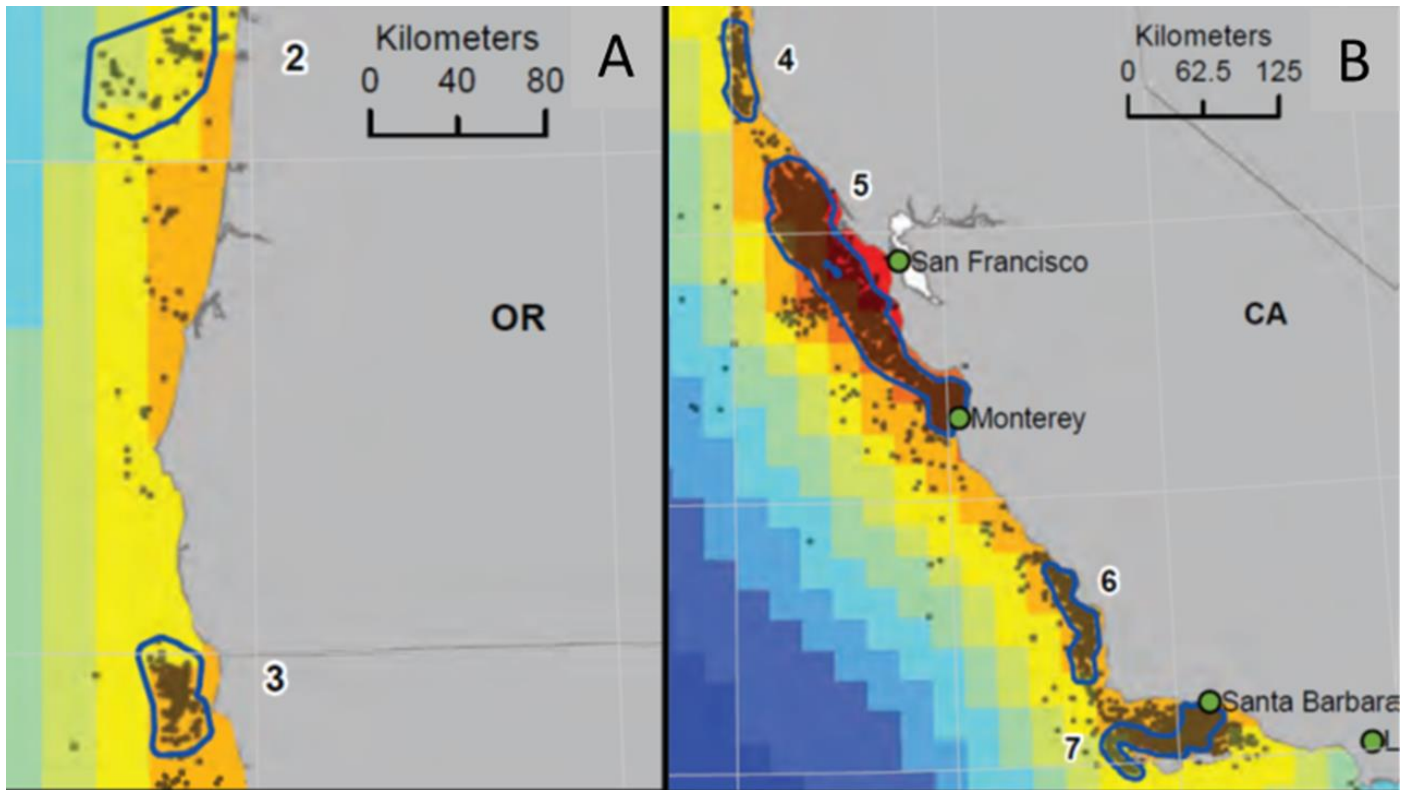


Figure 3. Biologically Important Areas (BIAs) for feeding humpback whales off California and southern Oregon. California areas include (from north to south, with indicated numbers): (3) Point St. George; (4) Fort Bragg to Point Arena; (5) Gulf of the Farallones–Monterey Bay; (6) Morro Bay to Point Sal; and (7) Santa Barbara Channel–San Miguel. [Source: Calambokidis et al. 2015, *Aquatic Mammals* 41(1), 39-53, DOI 10.1578/AM.41.1.2015.39]

Monterey Bay Whale Watch: Blue whales per 1/2-day trip  
(Nov 15, 2013 - Apr 4, 2020)

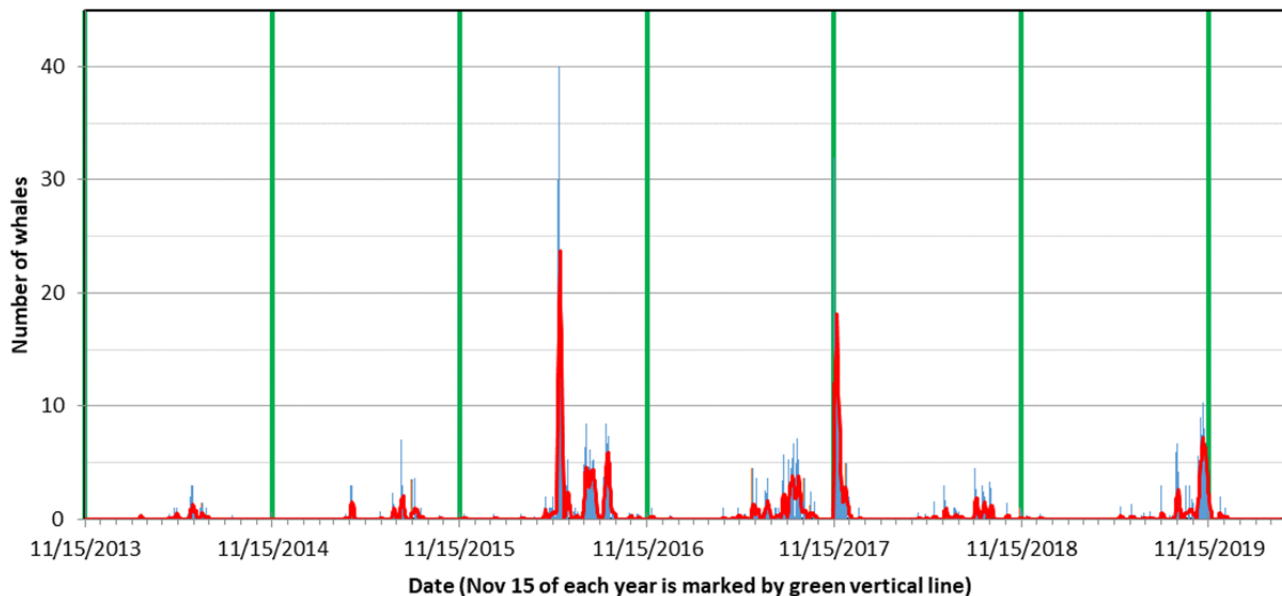


Figure 4. Number of blue whale sightings from 15 November 2013 – 4 Apr 2020 for Monterey Bay Whale Watch. The y-axis is the number of whales; the thin blue bars are the average daily whale numbers, and the red line is a 7-day running average to make the patterns a bit easier to see. A vertical green line has been added at November 15 of each year for reference. Each tick mark is one month.

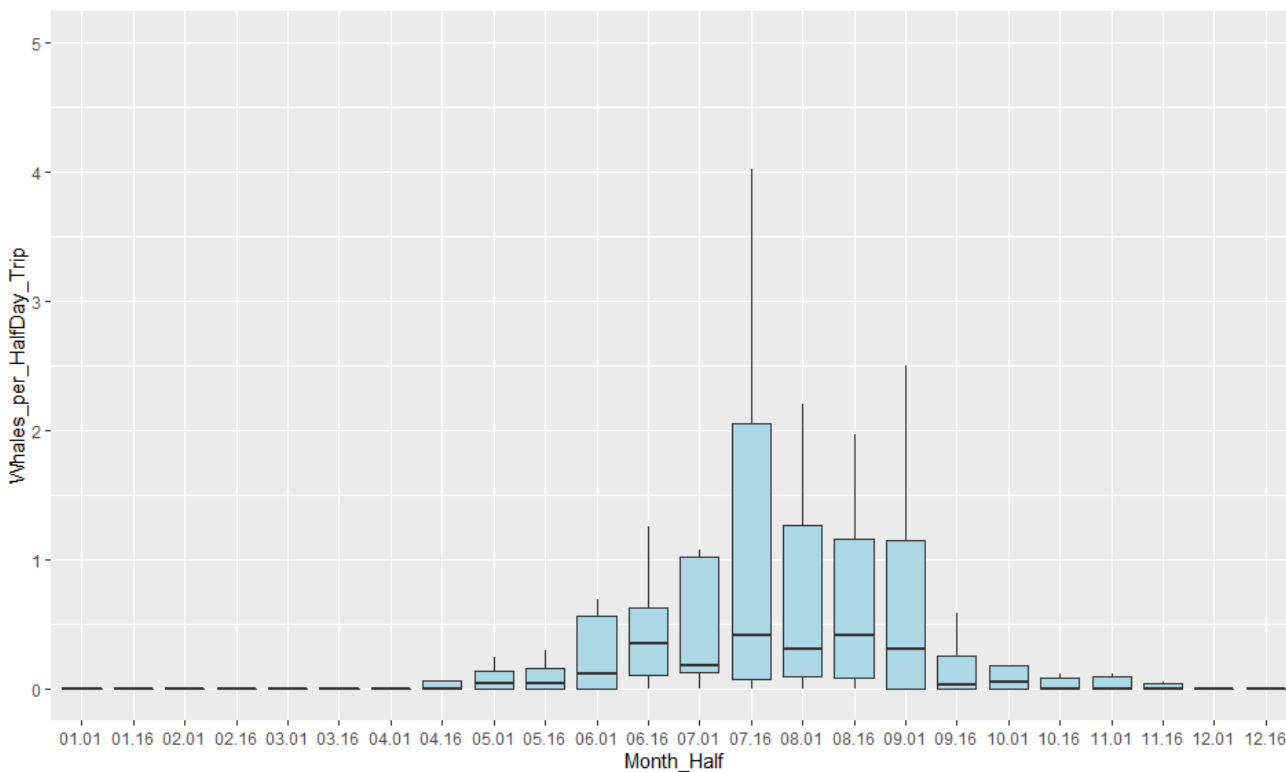


Figure 5. Historical Monterey Bay Whale Watch data for 2003-2020, summarizing the average and variation in the number of blue whales per half-day trip on a semi-monthly basis (1st- 15th, 16th- end of month). The black horizontal line is the average number of whales; the blue box shows the 25th -75th percentiles (i.e., half of all past whale numbers are within the blue box); and the vertical lines show the full range of whale numbers.

Monterey Bay Whale Watch: Gray whales per 1/2-day trip  
(Nov 15, 2013 - Apr 4, 2020)

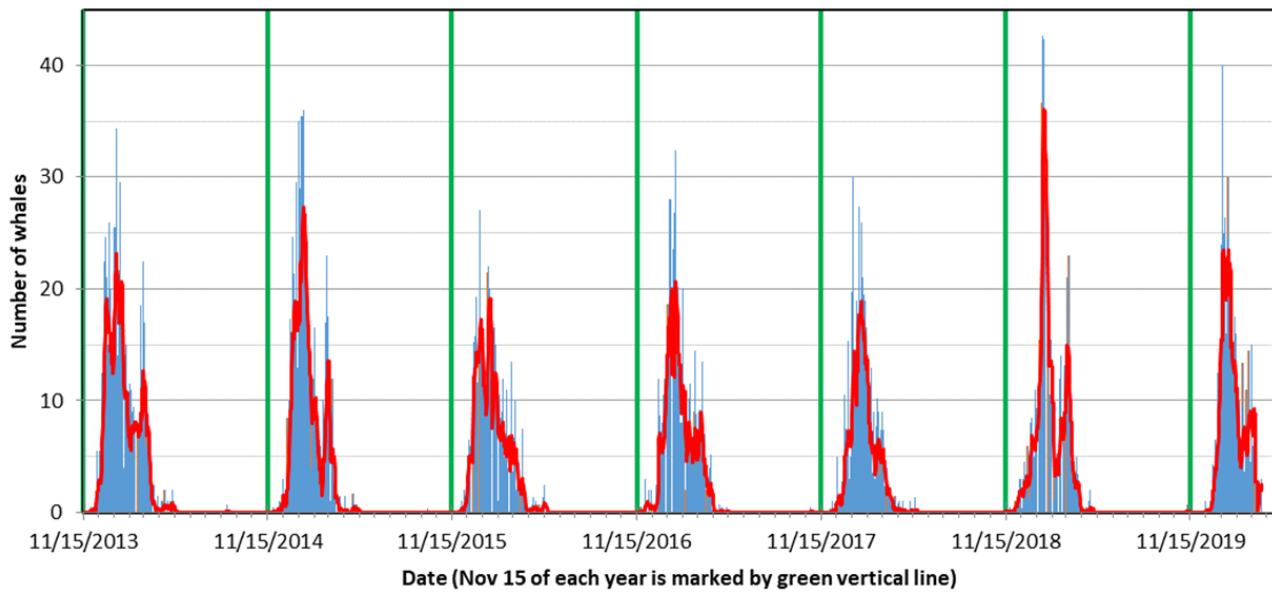


Figure 6. Number of gray whale sightings from 15 November 2013 – 4 Apr 2020 for Monterey Bay Whale Watch. The y-axis is the number of whales; the thin blue bars are the average daily whale numbers, and the red line is a 7-day running average to make the patterns a bit easier to see. A vertical green line has been added at November 15 of each year for reference. Each tick mark is one month.

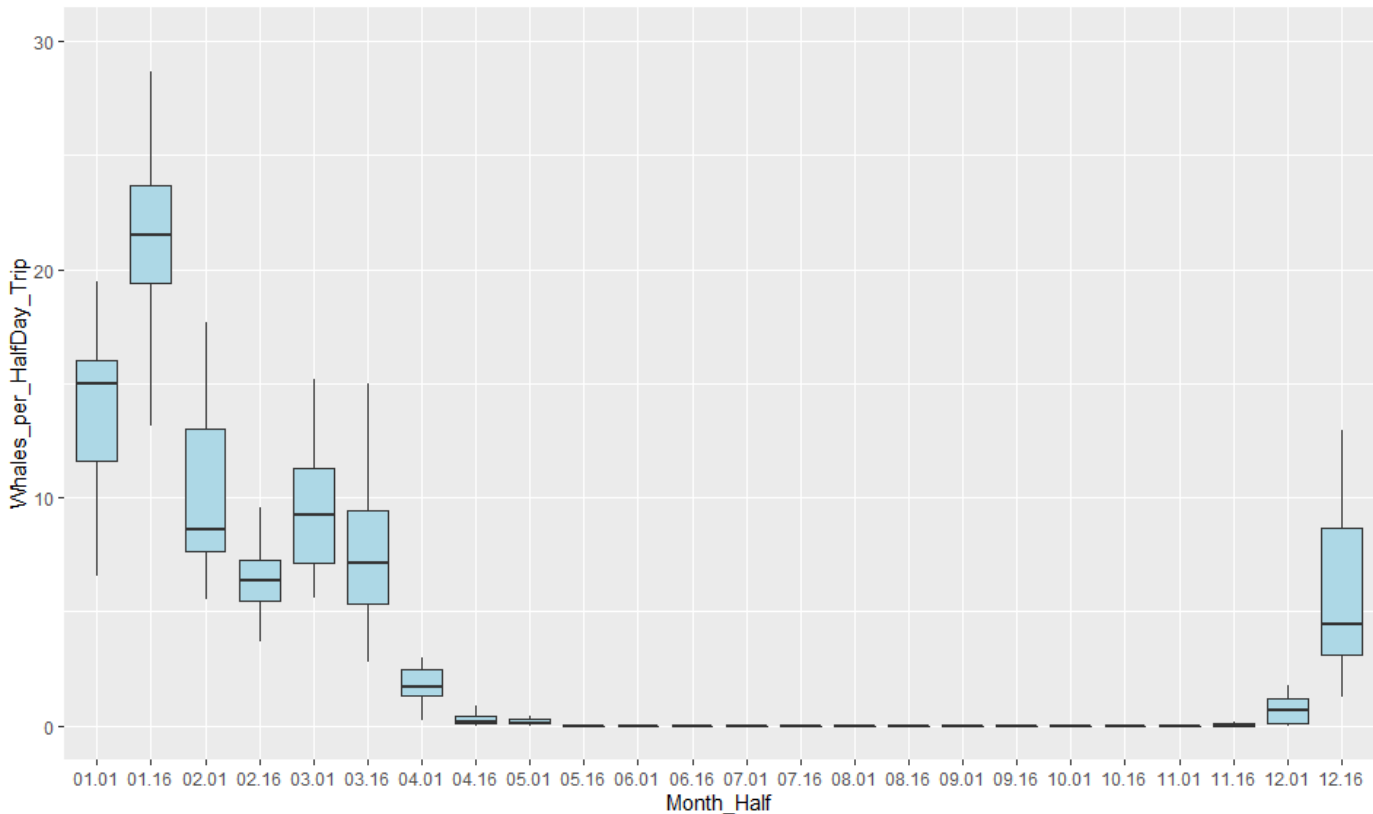


Figure 7. Historical Monterey Bay Whale Watch data for 2003-2020, summarizing the average and variation in the number of gray whales per half-day trip on a semi-monthly basis (1st- 15th, 16th- end of month). The black horizontal line is the average number of whales; the blue box shows the 25th -75th percentiles (i.e., half of all past whale numbers are within the blue box); and the vertical lines show the full range of whale numbers.

## Leatherback Sea Turtle Tagging Data

Three of six transmitters that were attached to leatherback turtles during September/October 2019 remain active. The three turtles remain outside of the California Current at present. One leatherback has reversed direction of movement and has begun to move eastward toward the California Current, however, this individual has not yet moved north of tropical latitudes.

## Point Blue Conservation Science

- Observations by trained biologists at the Farallon Islands show large numbers of gray whales over the last 30 days (March 6, 2020 to April 6, 2020), with 1 humpback whale observed from the Farallon Island light house on March 25, 2020 (Figure 8). No blue whales were reported.
- Observations within Monterey Bay included 25 Humpback Whales reported through the WhaleAlert app on April 7, 2020 (Figure 9).
- Observations by trained naturalists from Channel Islands National Marine Sanctuary and the National Park Service during weekend trips to the Channel Islands over the last 30 days included 34 gray whales and 14 humpback whales in the Santa Barbara Channel (Figure 10). No blue whales were reported.

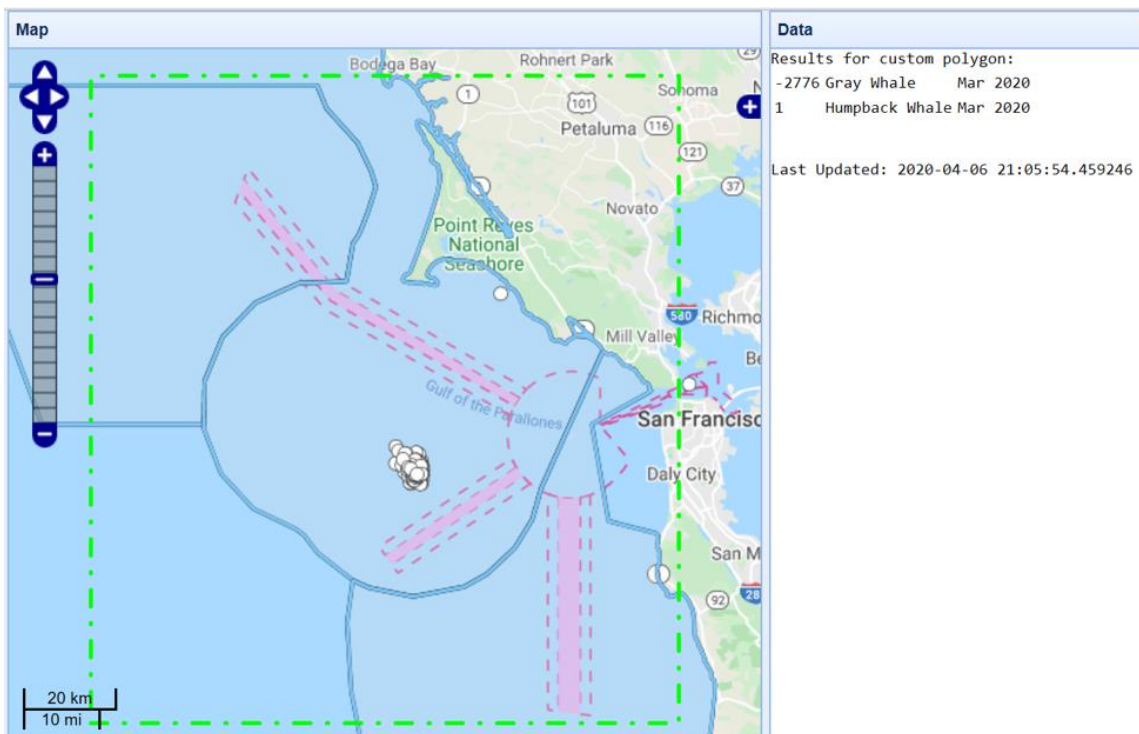


Figure 8. Observations of Whales and Dolphins in the Greater Farallones from March 6 to April 6, 2020. Dashed green line shows area under consideration. Reporting locations are represented by white circles. A given report may represent multiple individuals, and the same individual may be included in multiple reports. Right hand panel shows total counts by species within the dashed green line.



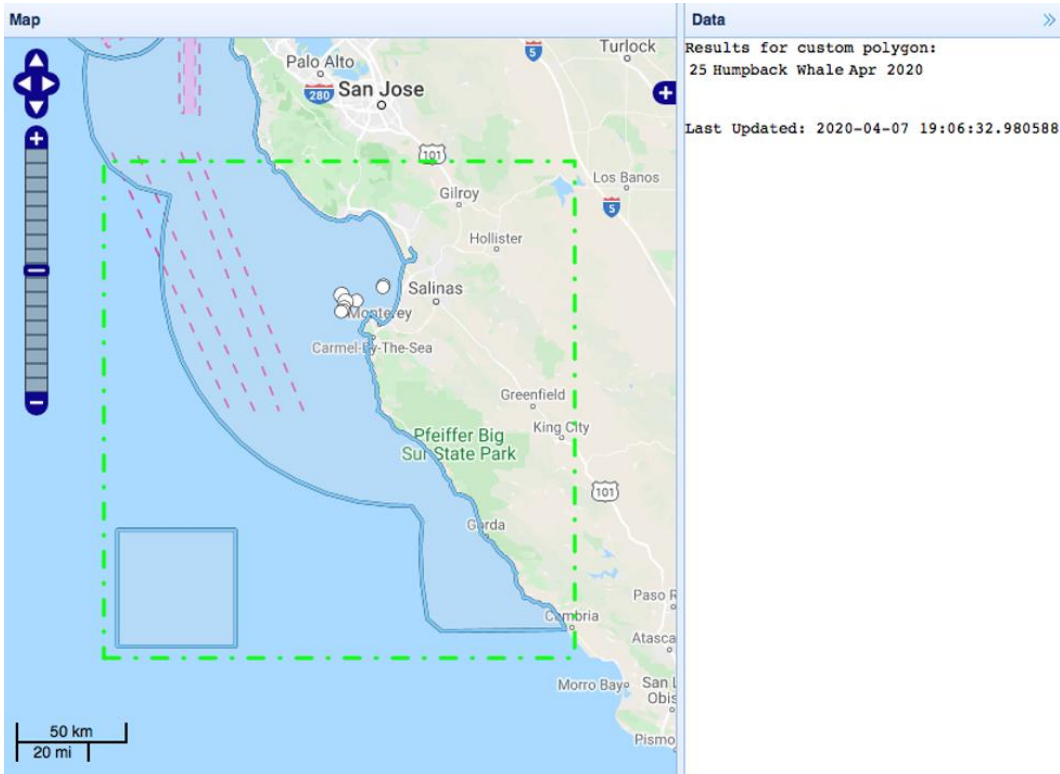


Figure 9. Observations in the Monterey Bay area. Dashed green line shows area under consideration. Reporting locations are represented by white circles. A given report may represent multiple individuals, and the same individual may be included in multiple reports. Right hand panel shows total counts by species within the dashed green line.

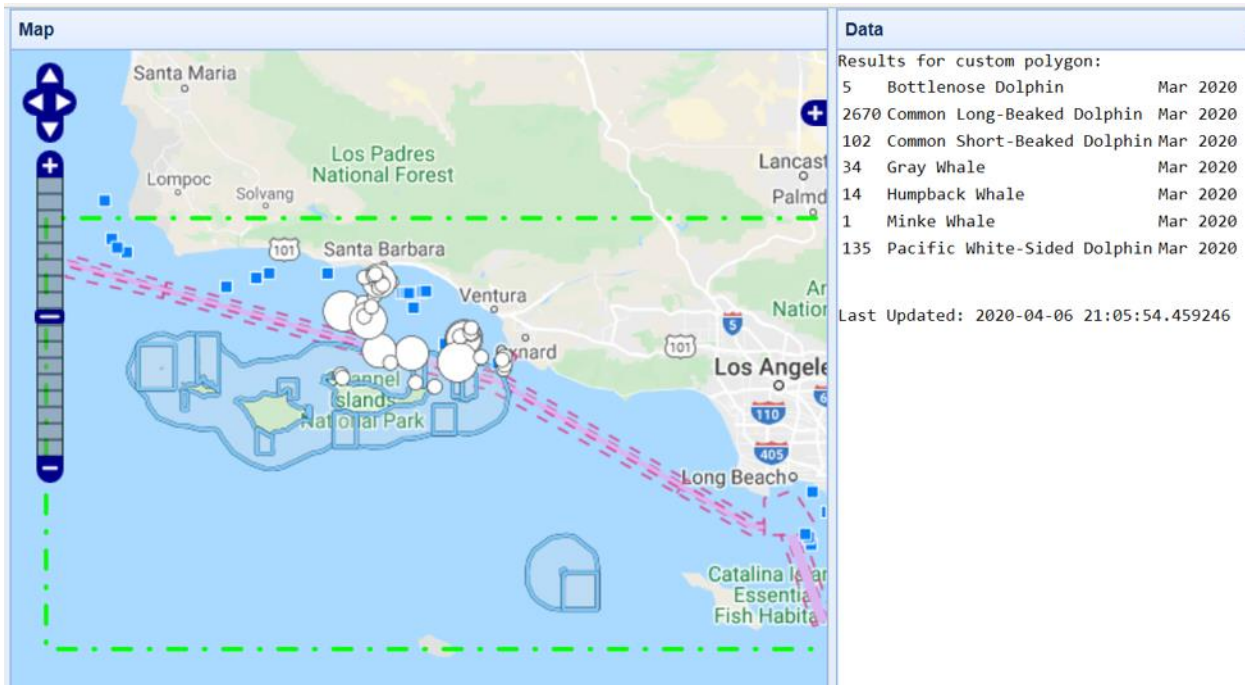


Figure 10. Observations of Whales and Dolphins in the Santa Barbara area from March 6 to April 6, 2020. Dashed green line shows area under consideration. Reporting locations are represented by white circles. A given report may represent multiple individuals, and the same individual may be included in multiple reports. Right hand panel shows total counts by species within the dashed green line.



## CDFW Aerial Surveys

In progress at the time this document was developed. Available information will be shared during the 4/9 WG call.

## FACTOR: FISHING DYNAMICS

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

### Marine Landings Data System and Automated License Data System

- All analyses were conducted with landing receipt data available as of April 6, 2020. Submission requirements through the E-Tix platform and subsequent availability in the Marine Landings Data System means data are relatively complete through late March; only landings through March 28, 2020 (Week 15) were included in the totals and figures below.
- During the 2019-20 season, there have been 6,048 landings of Dungeness crab (12,935,175 pounds and \$43,581,764 in Ex-Vessel Value) by 452 vessels.
- CDFW MacroBlocks (aggregated CDFW Fishing Blocks used to report catch location) are shown in Figure 11.
- Landings of Dungeness crab have continued to decline in all port complexes, with the highest volume coming into Crescent City, Trinidad and Bodega Bay (Figure 12) and the majority of harvest from MacroBlocks 1038, 1041 and 1042 (Figure 13).
- Vessel activity has continued to decline in most Northern Management Area ports and all Central Management Area ports, with a slight increase in Trinidad (Figure 14).
- Number of deployed traps (referred to as “maximum potential traps” in previous available data compilations and Working Group recommendations) is estimated by summing the number of allotted traps (i.e. trap tier) for each permitted vessel making a landing during the specified time period. Overestimation may occur if a vessel does not utilize their full trap allocation. Underestimation may occur if a vessel has traps deployed but does not make a landing during that time period or if a vessel number was incorrectly reported on a landing receipt (preventing assignment of the vessel’s trap allocation). Incorrectly reported catch locations (blocks) will also generate discrepancies. Within these constraints, the estimated number of deployed traps during the week of March 22 are highest for MacroBlock 1042, followed by MacroBlock 1041 and 1038 (Table 1). Summed across all MacroBlocks, the estimated number of deployed traps during this week is approximately 35% of those deployed during the first week when both management areas were open.

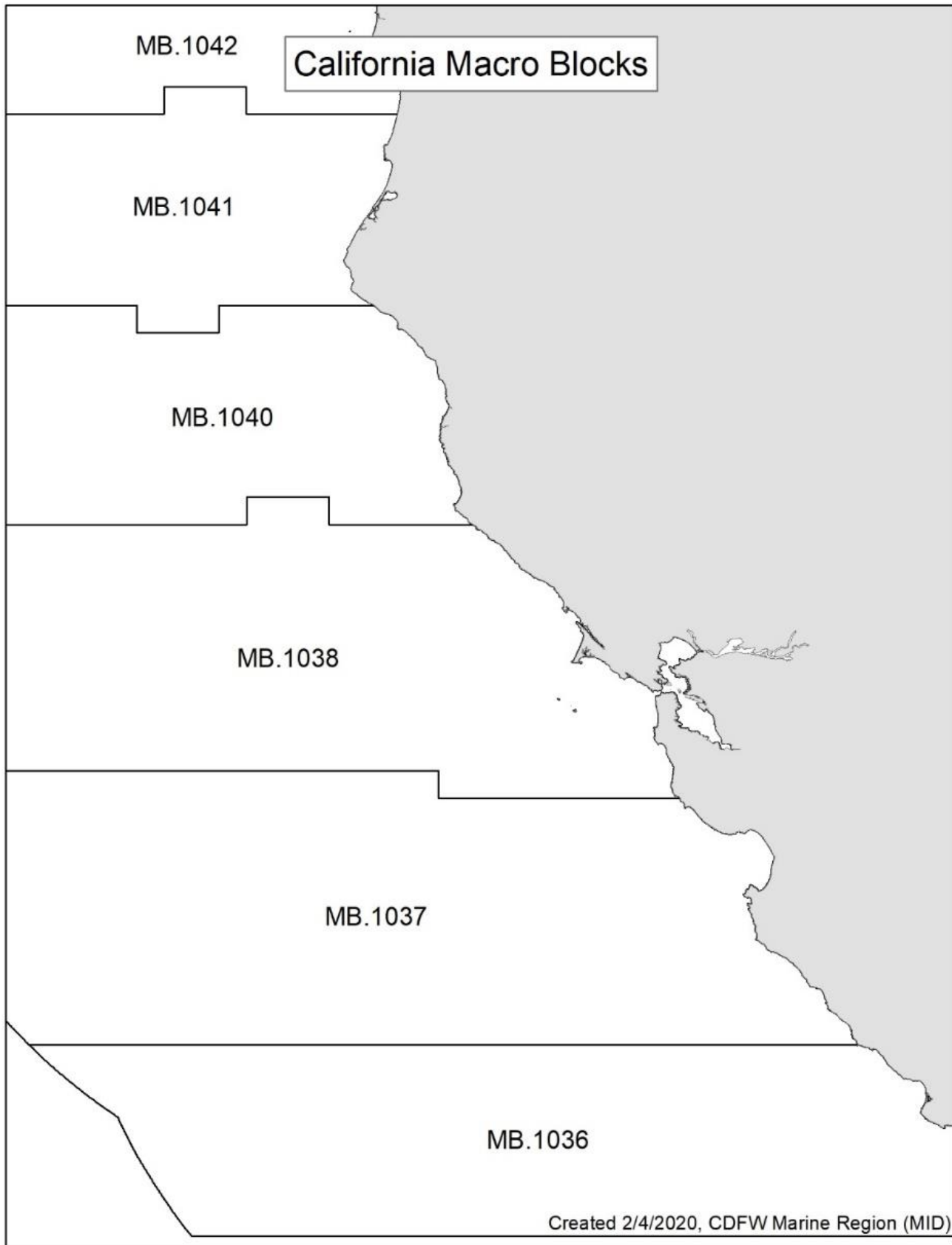


Figure 11. Map showing spatial extent of MacroBlocks used for summarizing landings analysis.

Volume of Landings (Pounds), by Week and Port Complex, 2019-20 Season

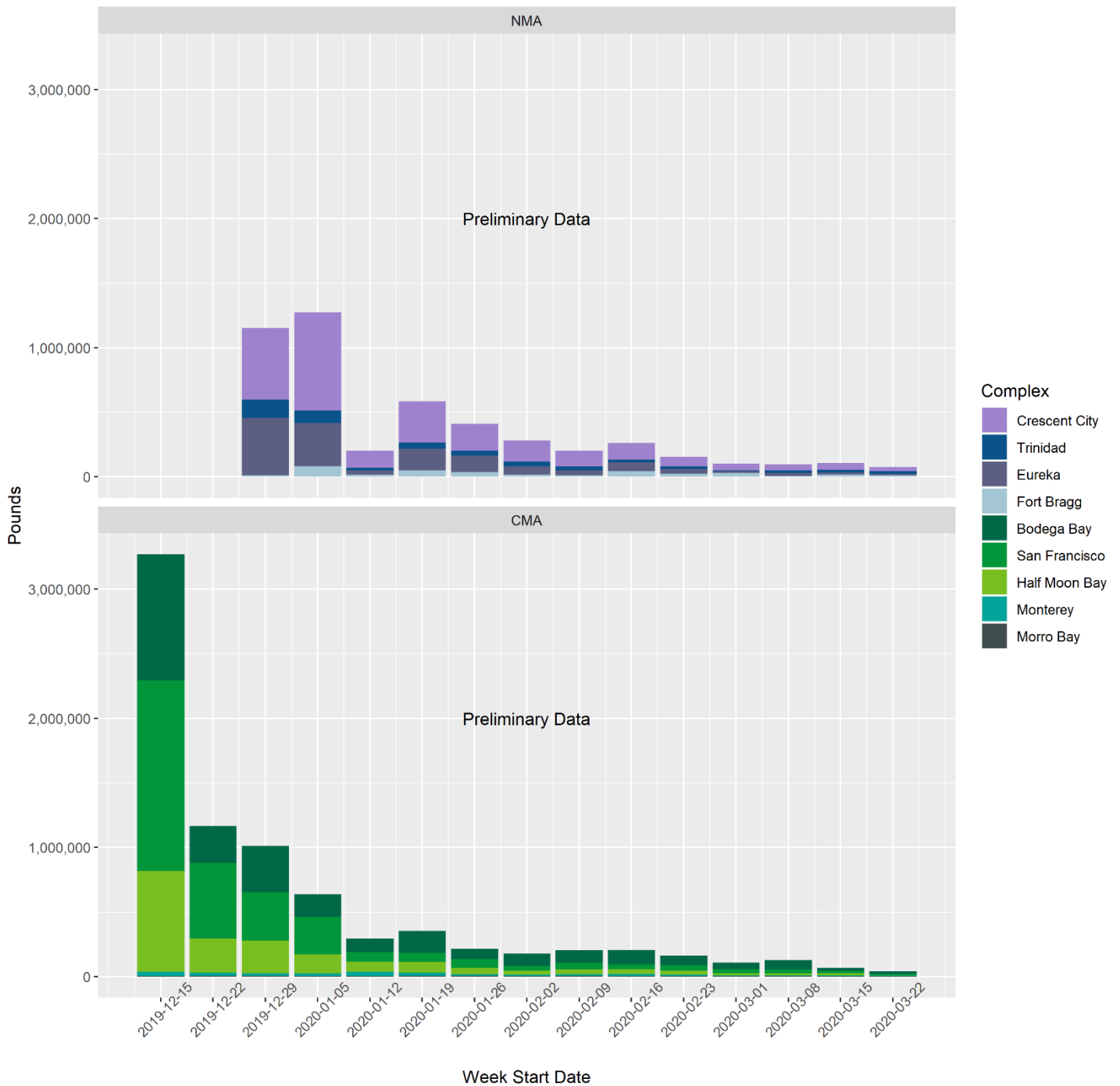


Figure 12. Dungeness crab landings (pounds) by week and port complex. Accessed from CDFW's Marine Landings Data System on April 6, 2020. All data is preliminary and subject to change.

Volume of Landings (Pounds), by Week and MacroBlock, 2019-20 Season

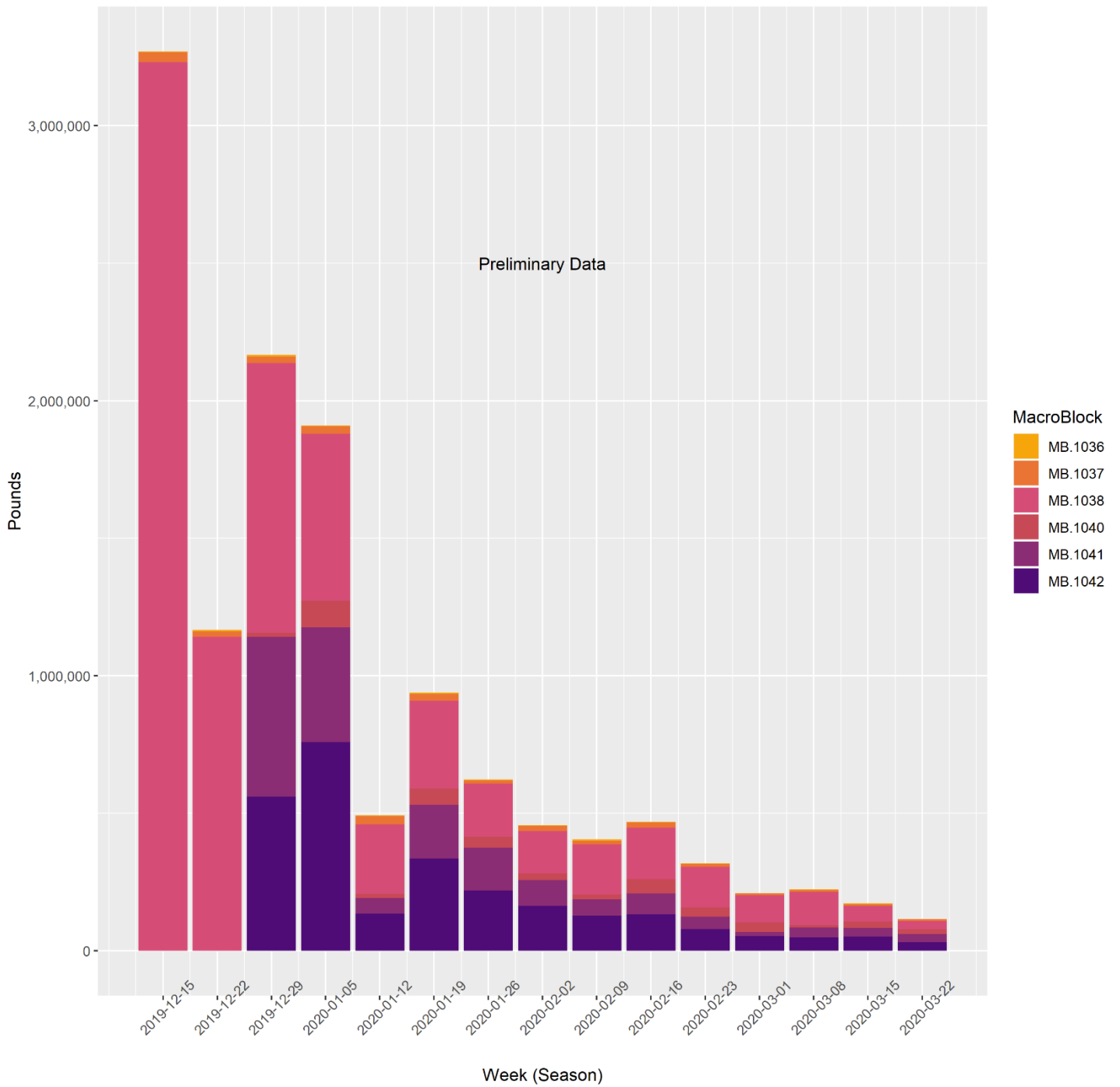


Figure 13. Dungeness crab landings (pounds) by week and MacroBlock. Accessed from CDFW's Marine Landings Data System on April 6, 2020. All data is preliminary and subject to change.

Number of Active Vessels, by Week and Port Complex, 2019-20 Season

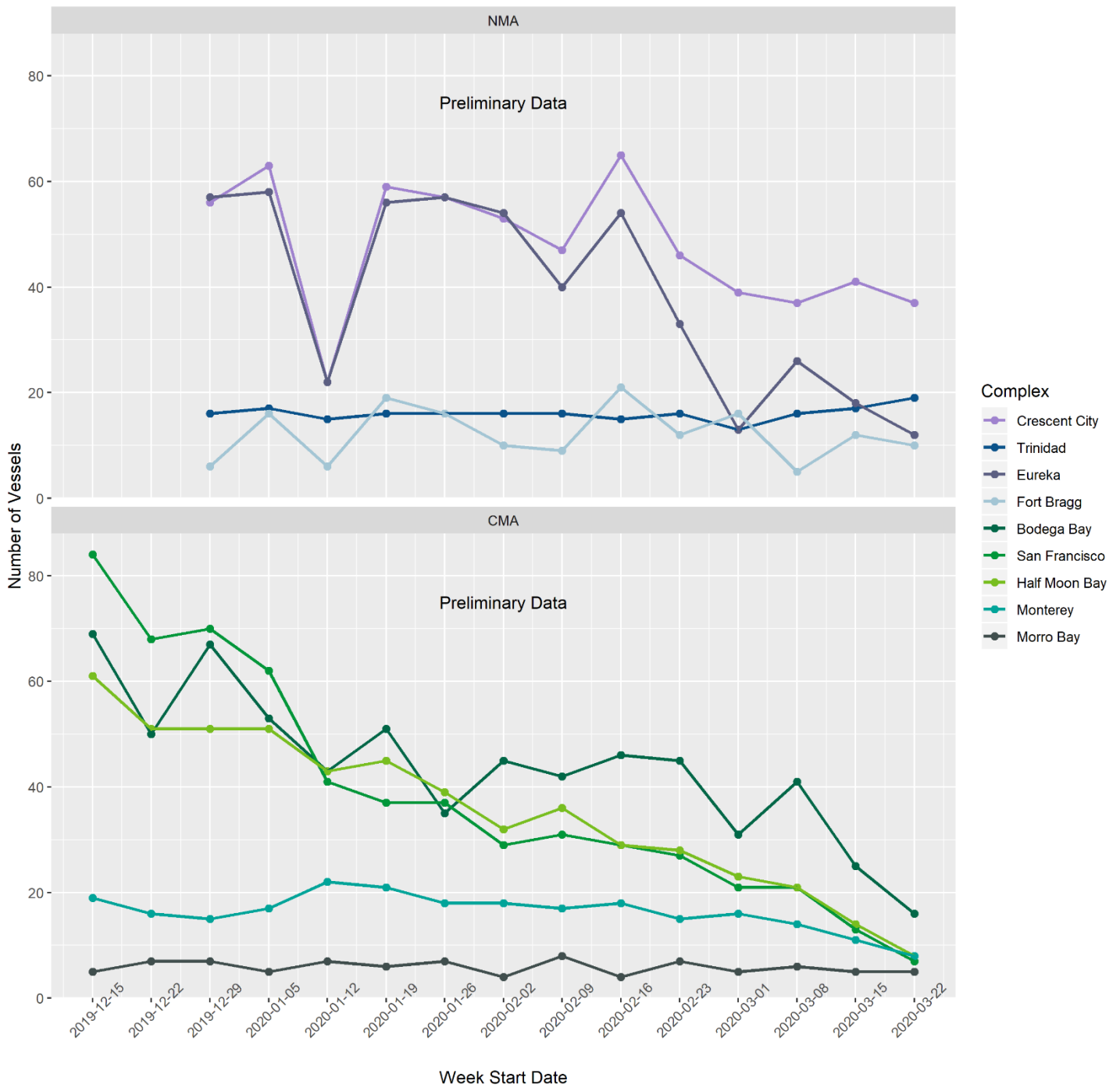


Figure 14. Number of vessels making Dungeness crab landings by week and port complex. Accessed from CDFW's Marine Landings Data System on April 6, 2020. All data is preliminary and subject to change.

**Table 1. Estimated number of Dungeness crab traps deployed in each MacroBlock based on trap allotments of vessels making landings each week. Accessed from CDFW's Marine Landings Data System on April 6, 2020 and CDFW's Automated License Data System on March 19, 2020. All data is preliminary and subject to change.**

Week of	MB.1036	MB.1037	MB.1038	MB.1040	MB.1041	MB.1042
12/15/2019	1,100	5,425	65,900	*season not open	*season not open	*season not open
12/22/2019	1,725	4,350	53,700	*season not open	*season not open	*season not open
12/29/2019	1,725	4,400	60,325	2,175	24,225	20,875
1/5/2020	1,300	5,100	52,075	5,175	23,875	24,175
1/12/2020	1,300	5,000	37,600	1,600	14,350	9,550
1/19/2020	1,550	5,300	39,900	5,425	22,600	23,400
1/26/2020	1,725	4,175	33,700	5,125	24,250	20,075
2/2/2020	1,050	5,150	31,875	3,675	22,300	19,325
2/9/2020	1,725	4,575	32,100	2,975	18,600	19,325
2/16/2020	1,050	5,400	31,600	6,075	22,350	23,500
2/23/2020	1,625	3,975	28,825	4,150	14,100	17,750
3/1/2020	1,475	3,850	21,550	4,500	8,400	14,775
3/8/2020	1,550	3,950	25,725	2,225	11,250	13,800
3/15/2020	1,375	2,625	14,300	3,800	10,700	15,650
3/22/2020	1,125	2,175	8,975	3,575	10,025	13,125

## FACTOR: OCEAN AND FORAGE CONDITIONS

*Jarrod Santora and Isaac Schroeder (NOAA Fisheries SWFSC and University of California Santa Cruz)*

- The Oceanic Niño Index (ONI) is based on a 3-month running mean and data are currently available through January 2020. The ONI January 2020 value is slightly positive (Figure 15), but the latest prediction is for ONI conditions to be neutral in Spring (65% chance) and Summer (55% chance).
- North Pacific sea-surface temperature is cooling down compared to the past 5 years. The monthly Pacific Decadal Oscillation (PDO) series indicates a switch to negative values in January and February, with February lower than January (Figure 15). This negative PDO value favors productive cool upwelling conditions in spring, related to increase likelihood of krill concentrations offshore (especially along the outer shelf break).
- February upwelling indices (Coastal Upwelling Transport Index; CUTI) were strong at 39°N, which is an important upwelling center; the February 2020 value was the largest on record (Figure 16). The area of the North Pacific High continued to be strong in March and the January-March mean is one of the largest on record (Figure 16). These above average

positive values favor productive cool upwelling conditions in spring, and are related to an increase of krill concentrations offshore (especially along the outer shelf break).

- The Habitat Compression Index (HCI) in March 2020 has similar spatial structure to February 2020 and is above the long-term mean (Figure 17). The above average positive winter values of the seasonal HCI (January-March averages), show an improvement in the amount of cool water compared to the previous 4 years. The maps of sea surface temperature indicate expansion of cooler waters to the north, but temperatures are still warmer in the south. If the strong latitudinal pattern of the HCI continues over the coming month, higher concentrations of anchovies and foraging whales are expected to the south (below the HCI boundary), similar to patterns during May and June 2019.
- Collectively, these conditions (neutral ONI, negative PDO, above average upwelling, sustained and increased area of the winter NPH, and above average and expanding HCI), strongly indicate above average ocean conditions and development of a cool and productive spring upwelling ecosystem. Based on historical observations and analyses, the thresholds and trends in these ocean variables continue to favor the expansion of cool habitat and increased concentration of krill abundance offshore through April 2020. The winter ocean climate observations are comparatively much improved over previous winters and indicate an overall lower risk of whale entanglement due to the likelihood of increased krill concentration offshore. However, anchovy abundance continues to remain high and patchy throughout the central California Current Ecosystem and aggregations of feeding whales associated with anchovy both to the south of Point Reyes and nearshore should be anticipated.



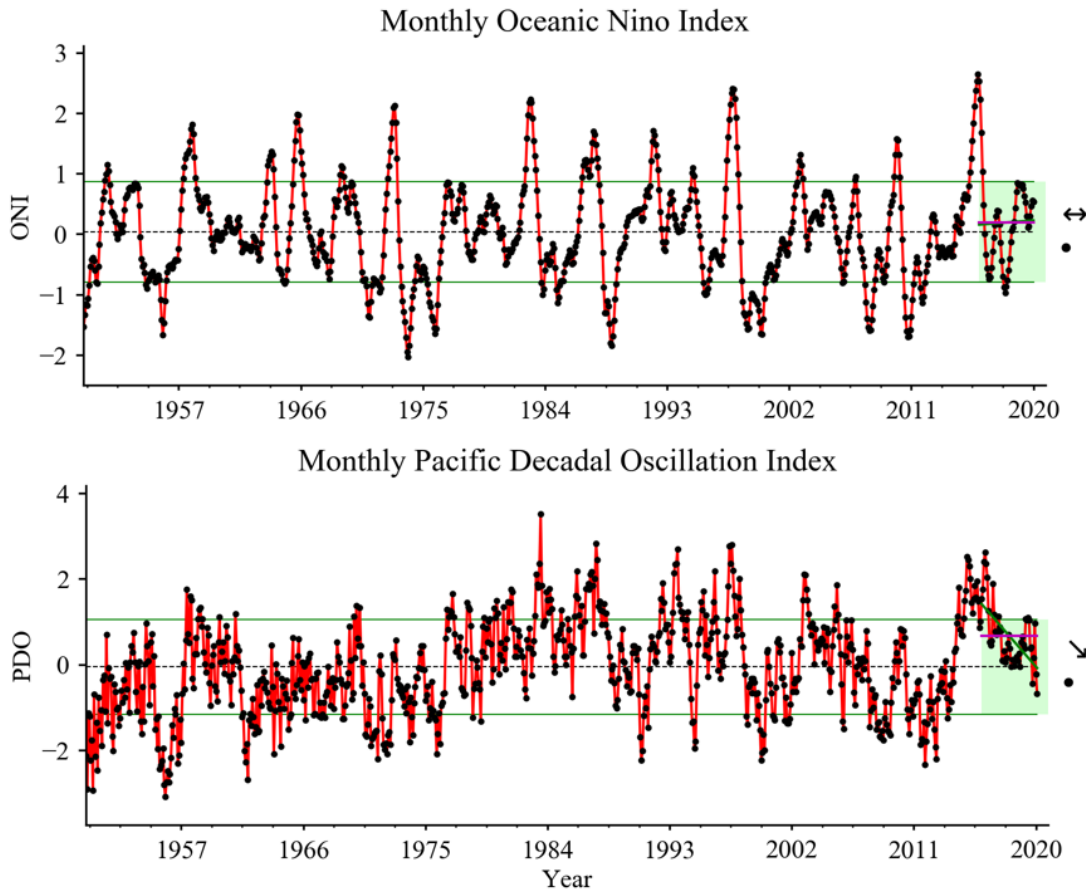


Figure 15. (top) Monthly Oceanic Niño Index (ONI). The ONI indicates continuation of neutral conditions in spring and summer 2020 (bottom) monthly Pacific Decadal Oscillation (PDO) Index. The PDO is climate state indicator and provides information on whether the ocean is likely to remain in a cool or warm state. The recent switch to negative values represents a trend towards cooler condition in the North Pacific Ocean. The dashed line is the long-term mean, green lines are +/- Standard Deviation, and arrows indicate presence of increasing, decreasing or no trend over past 5 years.

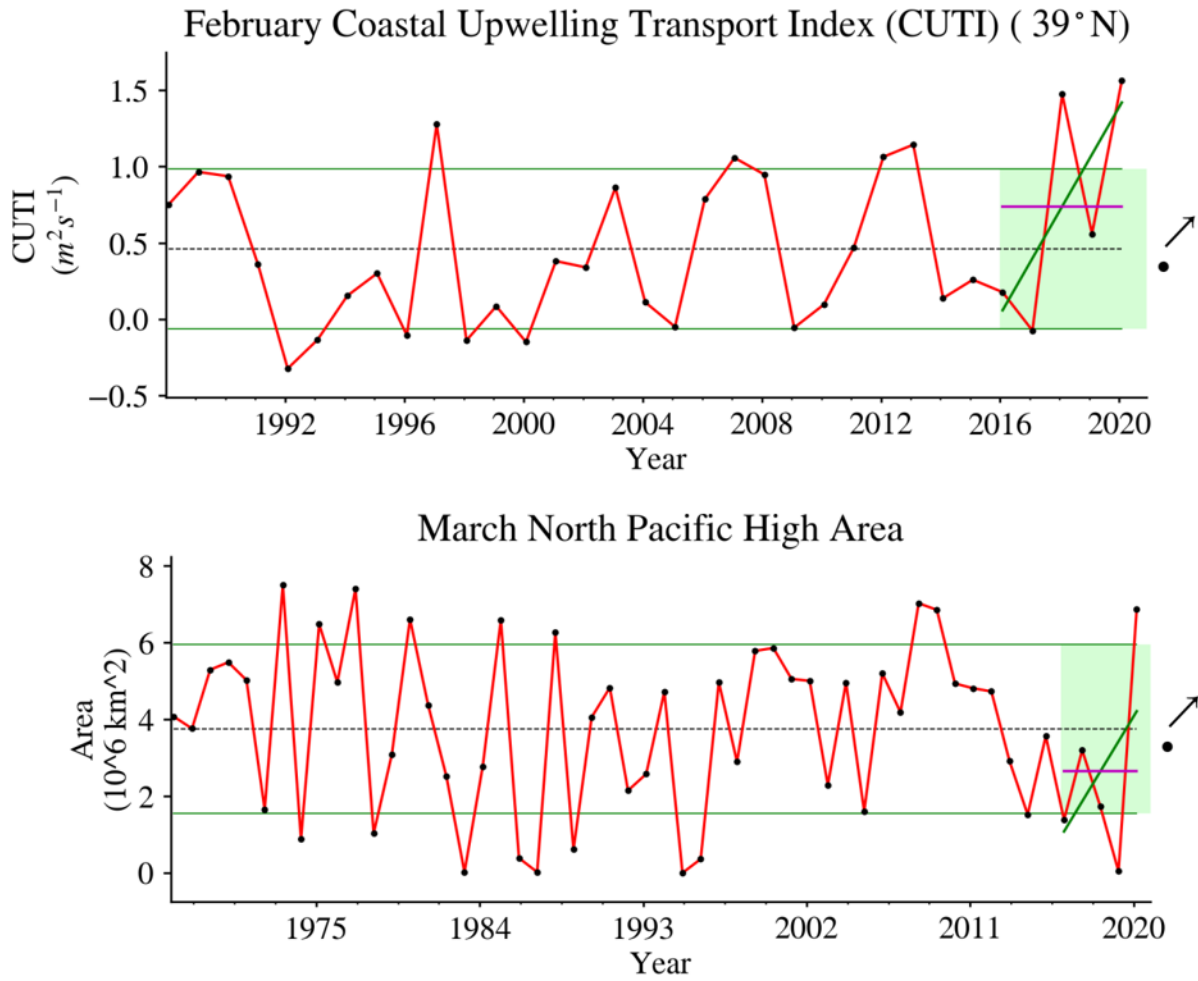


Figure 16. (top) February Coastal Upwelling Transport Index (CUTI; measurement of vertical velocity) at 39°N, and (bottom) area of the North Pacific High during March. The dashed line is the long-term mean, green lines are +/- Standard Deviation, and arrows indicate presence of increasing, decreasing or no trend over past 5 years.

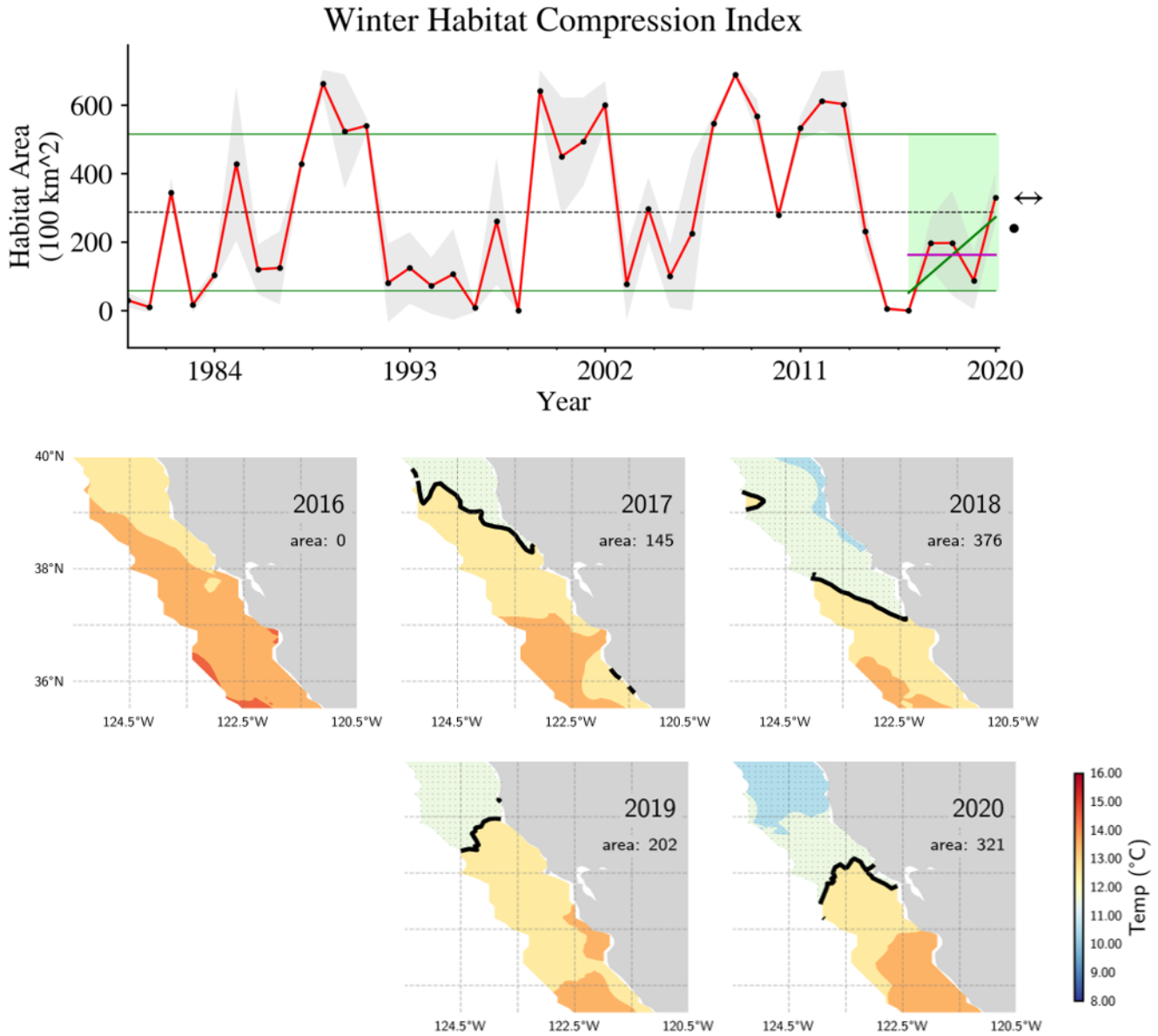


Figure 17. (top) Winter Habitat Compression Index (HCI) averaged here for December-March), and (bottom) maps of March sea surface temperature and location of HCI boundary (black thin line) indicate the relative amount of cooler surface water during the past 5 years.

## Appendix

### Summary of Historic CA Whale Entanglements Reported - March through June 2013-2019

*Provided by Dan Lawson and Lauren Saez (NMFS) on April 6, 2020*

Table 1 summarizes confirmed whale entanglement reports in California and/or known to have involved California gear from March-June each year since 2013. The data shows that it is common to see one or more confirmed humpback whale entanglement reported during that time period each year that may include CA Dungeness crab (Dcrab) gear. More often than not (4 out of 7 years), there have been multiple entanglements reported with CA Dcrab gear. Notable exceptions with no entanglements include 2013 and 2019 (following the early closure of the CA Dcrab season). 2016 was an exceptional year in terms of the total number of entanglements reported and those known to have involved CA Dcrab gear, generally understood to be associated with factors of delayed Dungeness crab opening, compressed forage habitat, etc. June is the first time of the year when blue whale entanglements with CA Dcrab gear have been reported. It is also common to see multiple gray whale entanglements during this time when gray whales travel closer to shore during their northern migration, potentially increasing entanglement risks and making entanglements more likely to be detected.

Importantly – these dates below indicate the timing of report. There are few instances where the date of entanglement can be discerned with high confidence.

**Table 1. Confirmed whale entanglements from California and/or known to involve gear from California fisheries during March – June from 2013-2019. Entanglements are grouped by month of the report, which may or may not be the same as the month during which the entanglement occurred.**

<b>Year</b>	<b>Month</b>	<b>Reported Entanglements: Humpback Whales</b>	<b>Reported Entanglements: Other Species</b>
2013	March	0	1 gray whale with unidentified gear
2013	April	0	1 gray whale with CA commercial Dcrab gear, 1 gray whale with unidentified gear
2013	May	0	0
2013	June	0	3 gray whales; 1 CA commercial Dcrab (reported in Oregon), 1 gillnet, 1 unidentified
2014	March	0	0

<b>Year</b>	<b>Month</b>	<b>Reported Entanglements: Humpback Whales</b>	<b>Reported Entanglements: Other Species</b>
2014	April	1 CA commercial Dcrab gear	0
2014	May	1 with unidentified gear	0
2014	June	2 total; 1 CA commercial Dcrab, 1 Spot prawn	0
2015	March	1 CA commercial Dcrab gear (report from MX) and 1 with unidentified gear	1 unidentified whale with unidentified gear; 3 gray whales, 1 with CA commercial Dcrab and 2 with unidentified gear
2015	April	0	1 killer whale with CA commercial Dcrab gear
2015	May	3 total; 2 CA commercial Dcrab, 1 salmon troll	3 unidentified whales; 1 with gillnet and 2 with unidentified
2015	June	3 total; 2 CA commercial Dcrab, 1 unidentified	0
2016	March	1 spot prawn gear	0
2016	April	6 total; 3 CA commercial Dcrab, 1 Sablefish, and 2 unidentified	1 killer whale with CA commercial Dcrab gear; 2 gray whales with unidentified gear
2016	May	6 total; 4 CA commercial Dcrab, 2 unidentified	0
2016	June	8 total; 4 CA commercial Dcrab (1 reported from Canada), 1 gillnet, 3 unidentified	1 blue whale with CA commercial Dcrab
2017	March	0	3 gray whales; 2 with gillnet and 1 with unidentified
2017	April	1 CA commercial Dcrab gear	5 gray whales; 1 with gillnet and 4 with unidentified
2017	May	0	0
2017	June	3 total; 1 CA commercial Dcrab, 2 unidentified	1 blue whale with CA commercial Dcrab
2018	March	0	1 gray whale with gillnet

Year	Month	Reported Entanglements: Humpback Whales	Reported Entanglements: Other Species
2018	April	0	2 gray whales with gillnet
2018	May	5 total; 1 CA commercial Dcrab, 1 commercial Dcrab state unknown, 3 unidentified	1 gray whale with unidentified, 1 fin whale with unidentified
2018	June	1 with unidentified	0
2019	March	1 with unidentified	0
2019	April	0	2 gray whales with gillnet
2019	May	1 with unidentified	1 gray with unidentified
2019	June	0	0

**HUMPBACK WHALE ENTANGLEMENT SUMMARY BY MONTH** – excluding 2016 and 2019 as unrepresentative of the “normal” spring fishery.

April – 2 entanglements reported total:

- 1 CA Dcrab in 2014, 2017 (40% of years at least 1 CA Dcrab entanglement reported);
- 100% of confirmed entanglements in April are known have involved CA Dcrab.

May – 9 entanglements reported total:

- 2 CA Dcrab in 2015, 1 CA Dcrab in 2018 (40% of years at least 1 CA Dcrab entanglement reported; 20% of years at least 2 CA Dcrab entanglements reported);
- 1 Dcrab of unknown state in 2018;
- 1 unk in 2014, 2 unk in 2015, 3 unk in 2018 (60% of years at least 1 unk entanglement reported; 40% of years at least 2 unk);
- 33% of confirmed entanglements in May are known to have involve CA Dcrab.

June – 9 entanglements reported total:

- 1 CA Dcrab in 2014, 2 CA Dcrab in 2015, 1 CA Dcrab in 2017 (60% of years at least 1 CA Dcrab entanglement reported; 20% of years at least 2 CA Dcrab entanglements reported);
- 1 unk in 2015, 2 unk in 2017, 1 unk in 2018 (60% of years at least 1 unk entanglement reported; 20% of years at least 2 unk entanglements reported);
- 1 in other gear (20% of years at least 1 in other gear);
- 44% of confirmed entanglements involve CA Dcrab.