

2021-22 Greater Farallones & Cordell Bank  
National Marine Sanctuaries Advisory Councils  
Joint Ship Strike Working Group

**Final Report**

For Review by the Greater Farallones and Cordell Bank National Marine Sanctuaries Advisory Councils

*Prepared by the Joint Ship Strike Working Group Co-Chairs and Members*



Photo credit: Adam Ernster/Condor Express

*This working group is a subunit of the Advisory Councils of the Greater Farallones and Cordell Bank National Marine Sanctuaries. The opinions and findings of this publication do not necessarily reflect the position of the Advisory Councils, the Office of National Marine Sanctuaries, and the National Oceanic and Atmospheric Administration.*

## Table of Contents

List Of Acronyms.....	2
Working Group Membership.....	3
Executive Summary.....	4
Introduction And Characterization Of Area.....	5
Past Ship Strike Reduction Efforts.....	8
Working Group Objectives, Process, and Feedback.....	14
Recommendations to the Sanctuary Advisory Councils.....	18
Appendices.....	21

## **List of Acronyms**

AIS - Automatic Identification System  
ATBA - Areas To Be Avoided  
BAAQMD - Bay Area Air Quality Management District  
CBNMS - Cordell Bank National Marine Sanctuary  
CINMS - Channel Islands National Marine Sanctuary  
ESA - Endangered Species Act  
GFNMS - Greater Farallones National Marine Sanctuary  
GT - Gross Tons  
IMO - International Maritime Organization  
LNM - Local Notice to Mariners  
MBNMS - Monterey Bay National Marine Sanctuary  
MMPA - Marine Mammal Protection Act  
NOAA - National Oceanic and Atmospheric Administration  
NMFS - National Marine Fisheries Service  
NMSA - National Marine Sanctuaries Act  
ONMS - Office of National Marine Sanctuaries  
PBR - Potential Biological Removal  
SSWG - Ship Strike Working Group  
TSS - Traffic Separation Scheme  
USCG - United States Coast Guard  
VSR - Vessel Speed Reduction

## **Joint Working Group Membership**

### Co-Chairs:

Jeff Dorman - Farallon Institute (Research), CBNMS Advisory Council

Julian Rose - Marathon Petroleum (Maritime), GFNMS Advisory Council

### Members:

Sarah Bates - F/V Bounty (Commercial Fishing), GFNMS Advisory Council

John Berge - Pacific Merchants Shipping Association (Maritime), GFNMS Advisory Council

Kathi George - The Marine Mammal Center (Conservation), GFNMS Advisory Council

Jaime Jahncke - Point Blue Conservation Research (Research), GFNMS Advisory Council

Kai Martin - Pasha Group (Maritime), CBNMS Advisory Council

Jessica Morten - Greater Farallones Association (Conservation)

Dick Ogg - F/V Karen Jeanne (Commercial Fishing), CBNMS Advisory Council

### Technical advisors and support staff:

Trisha Bergman, NOAA NMFS

Nicholas Buch, USCG District 11

Michael Carver, NOAA GFNMS/CBNMS

Alayne Chappell, NOAA GFNMS/CBNMS

Tyrone Connor, USCG District 11

Caroline Good, NOAA NMFS

Jordan Gorostiza, NOAA GFNMS/CBNMS

Alexandra Miller, USCG District 11

Rebecca Reese, NOAA NMFS

### Sanctuary Superintendent:

Maria Brown, NOAA GFNMS/CBNMS

## Executive Summary

Threatened and endangered blue, fin, and humpback whales are known to transit and feed in Greater Farallones National Marine Sanctuary (GFNMS), Cordell Bank National Marine Sanctuary (CBNMS), and the northern portion of Monterey Bay National Marine Sanctuary (MBNMS). Large vessels utilize an internationally approved traffic separation scheme (TSS) when they transit these sanctuaries, heading to and from ports in San Francisco Bay. The co-occurrence of whales and ships in space and time creates an elevated risk of fatal vessel strikes on endangered whales. In addition, high densities of vessel traffic also expose marine mammals to chronic underwater engine and propeller noise.

Protecting endangered species and sanctuary resources is a priority issue for the National Oceanic and Atmospheric Administration (NOAA) and the Office of National Marine Sanctuaries (ONMS). To address this issue, the Greater Farallones and Cordell Bank Sanctuary Advisory Councils formed a Joint Ship Strike Working Group (SSWG) to evaluate potential management options and provide feedback to the Advisory Councils on actions to reduce risk. The working group representatives include members from conservation and research groups, the shipping industry, and the commercial fishing industry. Additional technical expertise was provided by staff from government agencies and subject matter experts, who were not formal members of the SSWG but contributed to the process.

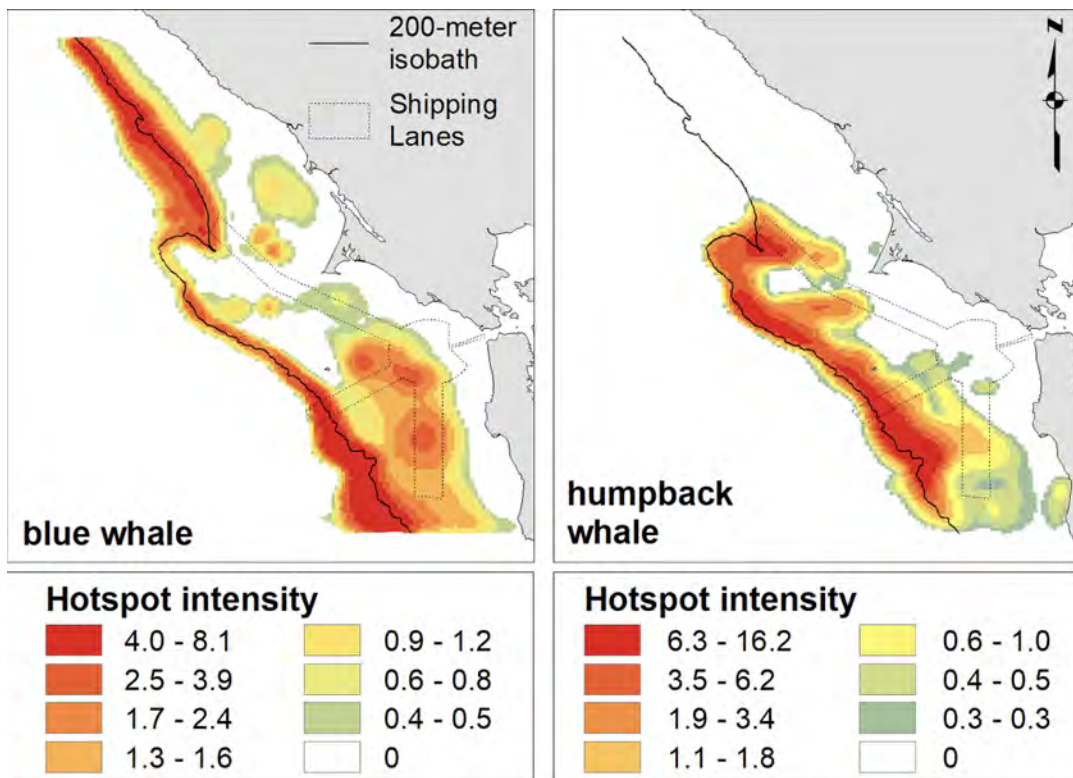
In support of a GFNMS and CBNMS goal of reducing ship strike risk by 50% within sanctuary jurisdictions, the purpose of the SSWG is to provide input on three conceptual designs to reduce the risk of ship strikes in the seaward approach to the San Francisco Bay region and within GFNMS, CBNMS, and the northern portion of MBNMS. This report contains recommendations to the CBNMS and GFNMS Advisory Councils for changes to policy and management, education and outreach, and research and monitoring within the region. The majority of the actions - which are discussed in greater detail in the report - would be implemented through partnerships between NOAA and the U.S. Coast Guard (USCG).

## Introduction and Characterization of Area

Ship strikes are a threat to whales globally. California’s coastal waters provide habitat and seasonal feeding grounds for a number of large whales, including blue whales (*Balaenoptera musculus*), fin whales (*B. physalus*), humpback whales (*Megaptera novaeangliae*), gray whales (*Eschrichtius robustus*), and minke whales (*B. acutorostrata*). Blue, fin, and humpback whales — all federally listed threatened and endangered species<sup>1</sup> — are known to concentrate off the west coast of the United States in the spring, summer, and fall to feed, where they are provided legal protection, including the prohibition of take (incidental or otherwise), under the Marine Mammal Protection Act (MMPA, 1972), the Endangered Species Act (ESA, 1973), and the National Marine Sanctuary Act (NMSA, 1972).

Whales share California’s coastal waters with many large vessels, the majority of which travel through the region as they transit to and from the ports of Los Angeles, Long Beach, and

Figure 1: Blue and humpback whale hotspot intensity in the San Francisco region<sup>2</sup>



<sup>1</sup> NOAA NMFS, 2022: <https://www.fisheries.noaa.gov/whales#by-species>

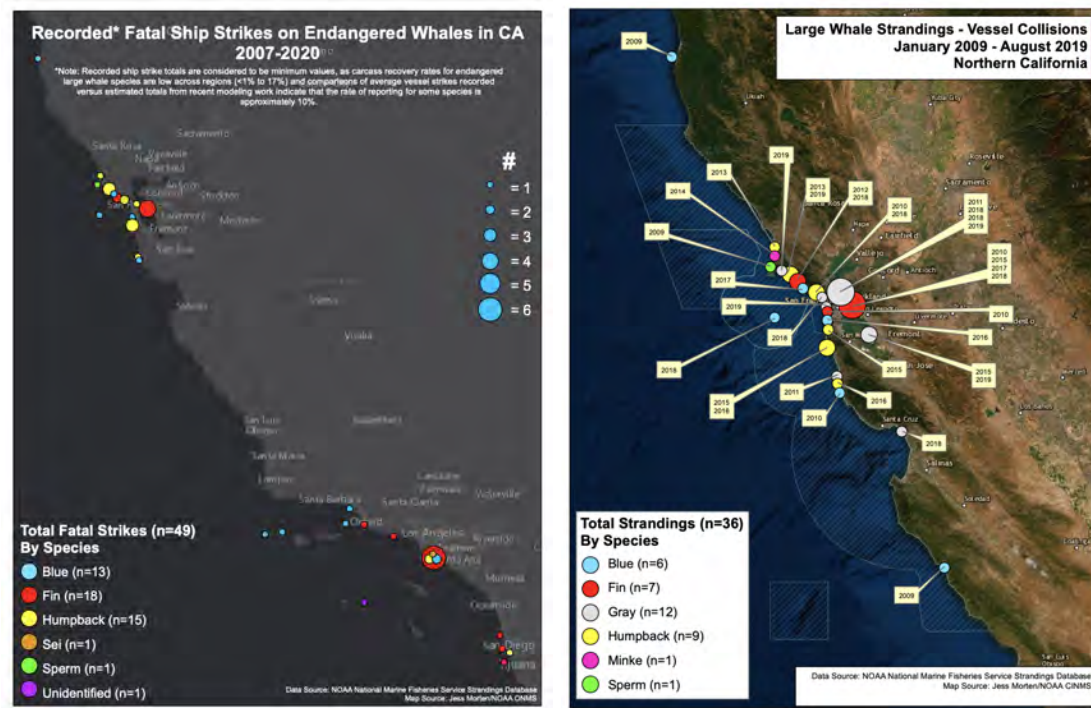
<sup>2</sup> Rockwood RC, Elliott ML, Saenz B, Nur N, Jahneke J (2020) Modeling predator and prey hotspots: Management implications of baleen whale co-occurrence with krill in Central California. PLoS ONE 15(7): e0235603. <https://doi.org/10.1371/journal.pone.0235603>



Oakland, which together were responsible for roughly 35% of the nation’s market share of imports in 2020.<sup>3</sup> In northern California, there are three approaches into San Francisco Bay (northern, western, and southern) designated by the International Maritime Organization (IMO). These heavily trafficked areas overlap with seasonal habitat and important feeding habitat for large whales, increasing the risk of vessel strikes (Figure 1).

There were 70 recorded incidents of ship strikes on large whales (including grays and minkes) and 49 on threatened and endangered species of large whales in California from 2007–2020<sup>4</sup> (Figure 2). Researchers estimate that these observed and reported incidents represent a small percentage of the total number of ship strikes occurring since most incidents with large vessels go unnoticed and most whales sink after death.<sup>5,6</sup>

*Figure 2: Recorded fatal ship strikes on endangered whales in CA from 2007–2020 (left) and recorded fatal ship strikes on all large whales in northern California from 2009–2019 (right)*



<sup>3</sup> Journal of Commerce, 2020: [https://www.joc.com/port-news/us-ports/joc-rankings-largest-north-american-ports-gained-market-share-2020\\_20210618.html](https://www.joc.com/port-news/us-ports/joc-rankings-largest-north-american-ports-gained-market-share-2020_20210618.html)

<sup>4</sup> NOAA NMFS Strandings Database

<sup>5</sup> Reisdorf AG, Bux R, Wyler D, Benecke M, Klug C, et al. (2012) Float, explode or sink: Postmortem fate of lung-breathing marine vertebrates. *Palaeobiodiversity and Palaeoenvironments* 92: 67±81. <https://doi.org/10.1007/s12549-011-0067-z>

<sup>6</sup> Pace, R. M., Williams, R., Kraus, S. D., Knowlton, A. R., and Pettis, H. M. (2021). Cryptic mortality of north atlantic right whales. *Conserv. Sci. Pract.* 3, 1–8. doi: 10.1111/csp2.346

Modeling studies estimate that 83 blue, fin, and humpback whales are killed along the U.S. west coast between May and September each year.<sup>7</sup> This amount of annual mortality exceeds the blue and humpback Potential Biological Removal (PBR) values, defined under the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population. In the San Francisco Bay region alone, models estimate that 2.7 blue and 7.0 humpback whales are killed every year by vessel strikes during the four months of May through July and September (Table 1).<sup>8</sup> Thus, the number of blue whales estimated to be killed by ship strikes in the San Francisco Bay Region exceeds the PBR for the entire population of the U.S. West Coast (Table 1).

*Table 1: Total mean predicted mortality and Potential Biological Removal (PBR) values for blue and humpback whales in the San Francisco region<sup>9</sup>*

Species	PBR (deaths yr <sup>-1</sup> )	Total mean predicted mortality (deaths in 4 mo)	
		Rockwood et al. (2017)	This study
Blue whale	2.3	1.4	2.7
Humpback whale	16.7	5.1	7.0

<sup>7</sup> Rockwood C, Calambokidis J, and Jahnce J. (2017). High mortality of blue, humpback and fin whales from modeling of vessel collisions on the U.S. West Coast suggests population impacts and insufficient protection. PLoS ONE 12(8): e0183052. <https://doi.org/10.1371/journal.pone.0183052>

<sup>8</sup> Rockwood, R. & Adams, Jeffrey & Silber, Gregory & Jahnce, Jaime. (2020). Estimating effectiveness of speed reduction measures for decreasing whale strike mortality in a high-risk region. Endangered Species Research. 43. 10.3354/esr01056.

<sup>9</sup> Rockwood, R. & Adams, Jeffrey & Silber, Gregory & Jahnce, Jaime. (2020). Estimating effectiveness of speed reduction measures for decreasing whale strike mortality in a high-risk region. Endangered Species Research. 43. 10.3354/esr01056.



## Past Ship Strike Reduction Efforts

Protecting endangered species and sanctuary resources is a priority issue for the National Oceanic and Atmospheric Administration (NOAA) and the Office of National Marine Sanctuaries (ONMS).

To address this issue locally, in 2011, GFNMS and CBNMS formed a Joint Working Group on Vessel Strikes and Acoustic Impacts to recommend sanctuary actions to reduce ship strike and ocean noise impacts in the two sanctuaries. The Joint Working Group, which included representatives from conservation groups, the shipping industry, and the scientific community, authored a report<sup>10</sup> that contained specific recommendations for policy and management, education and outreach, and research and monitoring within the sanctuaries, including:

- NOAA and USCG should pursue modification of the San Francisco TSS to avoid areas of whale concentration, such as extending the western approach beyond the continental shelf.
- Sanctuaries and NMFS should explore establishing dynamic management areas (dynamic VSR zones) at the entrance to San Francisco Bay.
- Sanctuaries and NMFS should implement real-time whale sighting and monitoring networks, with participation from the commercial shipping community, to inform the dynamic management areas.
- Sanctuaries should work with the port authorities in San Francisco Bay to establish port-based incentives for the reduction of underwater shipping noise.

Since 2011, a number of these recommendations were implemented by GFNMS and CBNMS:

### 1) Modification of Shipping Lanes

In 2013, internationally designated shipping lanes were relocated and redefined to reduce risk of navigational safety (the primary concern of the USCG) and also to reduce whale/vessel co-occurrence by the IMO, an agency of the United Nations charged with developing a consistent international code of operations for maritime shipping.

These spatial measures resulted in an estimated reduction in risk of vessel strikes.<sup>11</sup> However, in the areas offshore of the San Francisco Bay region and in other regions globally,

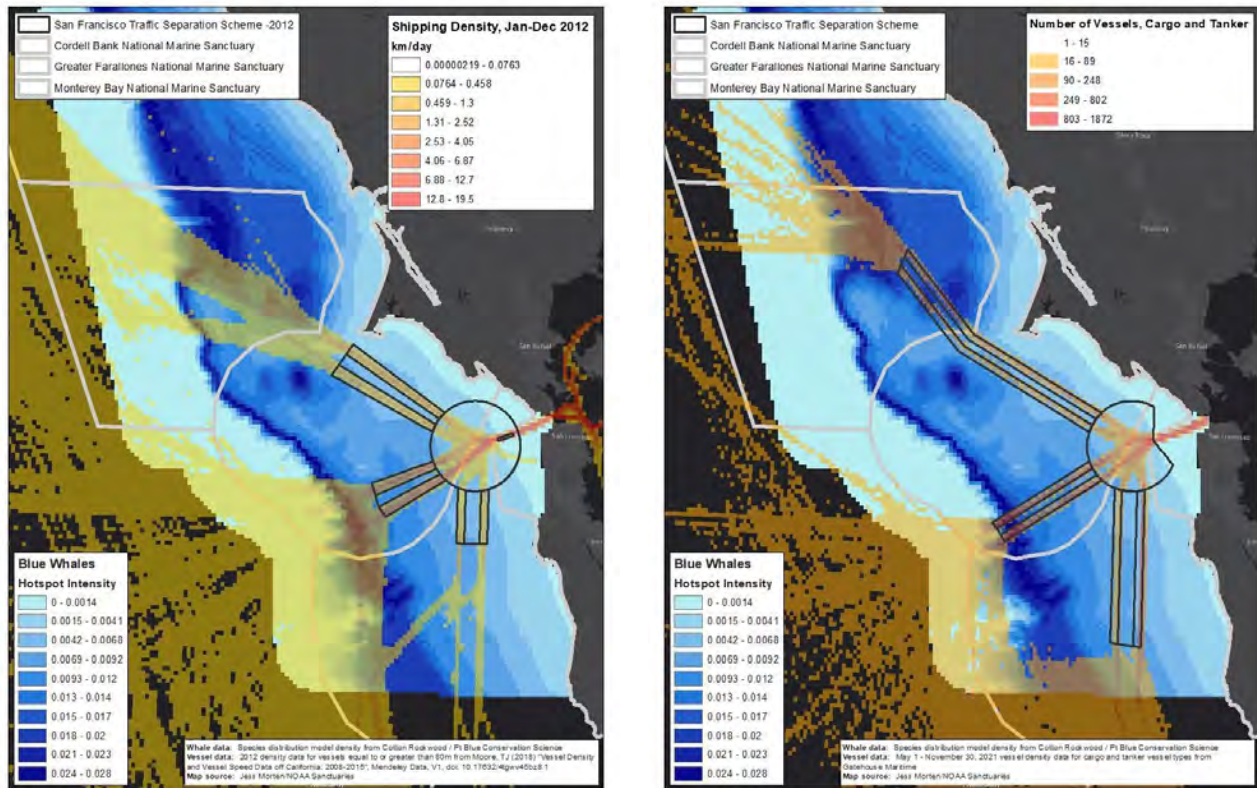
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<sup>10</sup> Vessel Strikes and Acoustic Impacts. (2012). Vessel Strikes and Acoustic Impacts. Sanctuary Advisory Council Report to the Farallones and Cordell Bank National Marine Sanctuaries. San Francisco, CA. 43 pp.

<sup>11</sup> Dransfield, A., Hines, E., McGowan, J., Holzman, B., Nur, N., Elliott, M., et al. (2014). Where the whales are: using habitat modeling to support changes in shipping regulations within National Marine Sanctuaries in Central California. *Endanger. Species Res.* 26, 39–57. doi: 10.3354/esr00627

altering shipping routes impacts individual whale populations differently — sometimes reducing mortality risk for one species while increasing it for another<sup>12</sup> — and the distribution of the species of concern continues to shift based on shifting ocean conditions, so changes to the shipping lanes require adjustments to achieve conservation success. In addition, spatial conflicts exist between various human uses of these marine regions, which in northern California include important fishing and recreation areas. Spatial measures like adjustments to the shipping lanes also require review, agreement, and adoption by the IMO and USCG, and take years to codify and implement.

*Figure 3: Vessel density data for 2012 (left) — before the 2013 IMO-approved shipping lane amendments — and 2021 (right) with 2020 blue whale hotspot intensity data from Cotton Rockwood/Point Blue Conservation Science*



## 2) Vessel Speed Reduction

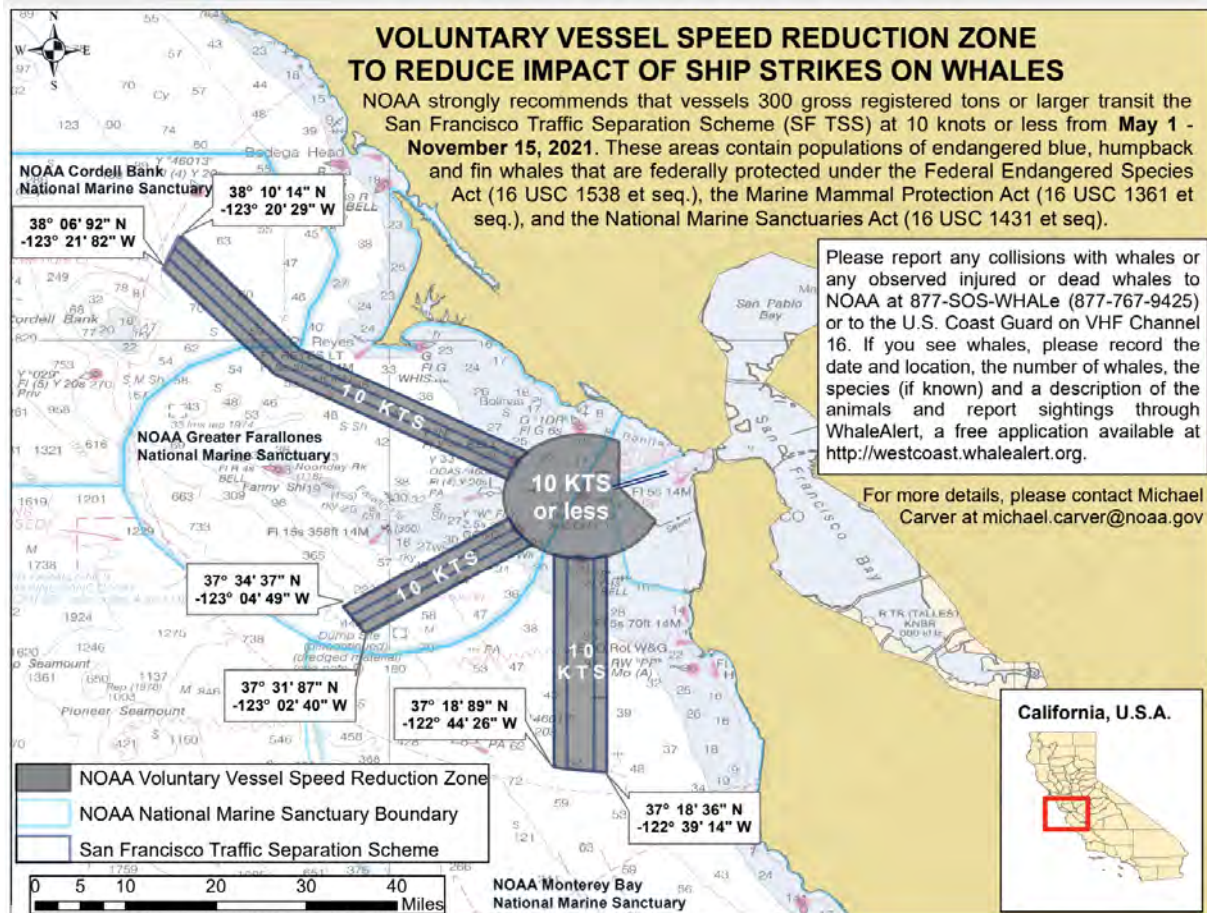
To more dynamically address vessel strike risk in areas where vessels and endangered whales overlap, Vessel Speed Reduction (VSR) measures are a commonly used management tool. Although collisions between vessels and whales may still occur at any speed level, slow speed measures have been shown to reduce the risk of fatal vessel strikes on large whales in the

<sup>12</sup> Redfern J, Moore T, Becker E, et al. (2019). Evaluating stakeholder-derived strategies to reduce the risk of ships striking whales. *Divers Distrib.* 2019;00:1–11. <https://doi.org/10.1111/ddi.12958>

areas and time periods in which they are implemented.<sup>13,14</sup> VSR has also been shown to offer additional environmental benefits, including significant reductions in air emissions<sup>15,16</sup> and underwater noise.<sup>17,18</sup>

In 2012, GFNMS, CBNMS, and MBNMS began implementing a VSR request for vessel speeds of 10 knots or less to all vessels 300 GT (gross tons) or larger in areas within the SF TSS

Figure 4: NOAA Voluntary Vessel Speed Reduction Request for the San Francisco Bay Region



<sup>13</sup> Conn, P. B., and G. K. Silber. (2013). Vessel speed restrictions reduce risk of collision-related mortality for North Atlantic right whales. *Ecosphere* 4(4):43. <http://dx.doi.org/10.1890/ES13-00004.1>

<sup>14</sup> NOAA National Marine Fisheries Service (2020). North Atlantic Right Whale Vessel Speed Rule Assessment. [https://media.fisheries.noaa.gov/2021-01/FINAL\\_NARW\\_Vessel\\_Speed\\_Rule\\_Report\\_Jun\\_2020.pdf?null](https://media.fisheries.noaa.gov/2021-01/FINAL_NARW_Vessel_Speed_Rule_Report_Jun_2020.pdf?null)

<sup>15</sup> <https://polb.com/download/171/green-flag-program/2530/green-flag-incentive-program-fact-sheet-052417.pdf>

<sup>16</sup> Protecting Blue Whales and Blue Skies Program website, 2022: <https://www.bluewhalesblueskies.org/results>

<sup>17</sup> ZoBell, V.M., Frasier, K.E., Morten, J.A. *et al.* Underwater noise mitigation in the Santa Barbara Channel through incentive-based vessel speed reduction. *Sci Rep* 11, 18391 (2021). <https://doi.org/10.1038/s41598-021-96506-1>

<sup>18</sup> Joy R, Tollit D, Wood J, MacGillivray A, Li Z, Trounce K and Robinson O. (2019). Potential Benefits of Vessel Slowdowns on Endangered Southern Resident Killer Whales. *Front. Mar. Sci.* 6:344. Doi: 10.3389/fmars.2019.00344



from May 1 – November 15 (Figure 4). These voluntary slow speed requests, which now come from NOAA’s Office of National Marine Sanctuaries (ONMS), NOAA’s National Marine Fisheries Service (NMFS), and USCG, are communicated to industry through the USCG weekly Local Notice to Mariners (LNM)<sup>19</sup>, through email announcements via industry email listservs, industry advisory bulletins, and through direct communications to all large vessel operators carried out by GFNMS and CBNMS staff each year. Voluntary cooperation with the NOAA Voluntary VSR requests in the San Francisco Bay region has been low across most of the years it was implemented, but has shown an increase in recent years (Table 2).

*Table 2: Cooperation with NOAA voluntary VSR requests in the SF region, 2017–2020<sup>20</sup>*

<b>Percentage cooperation from all vessels 300 GT or more, by year</b>	
2017	45%
2018	45%
2019	58%
2020	64%

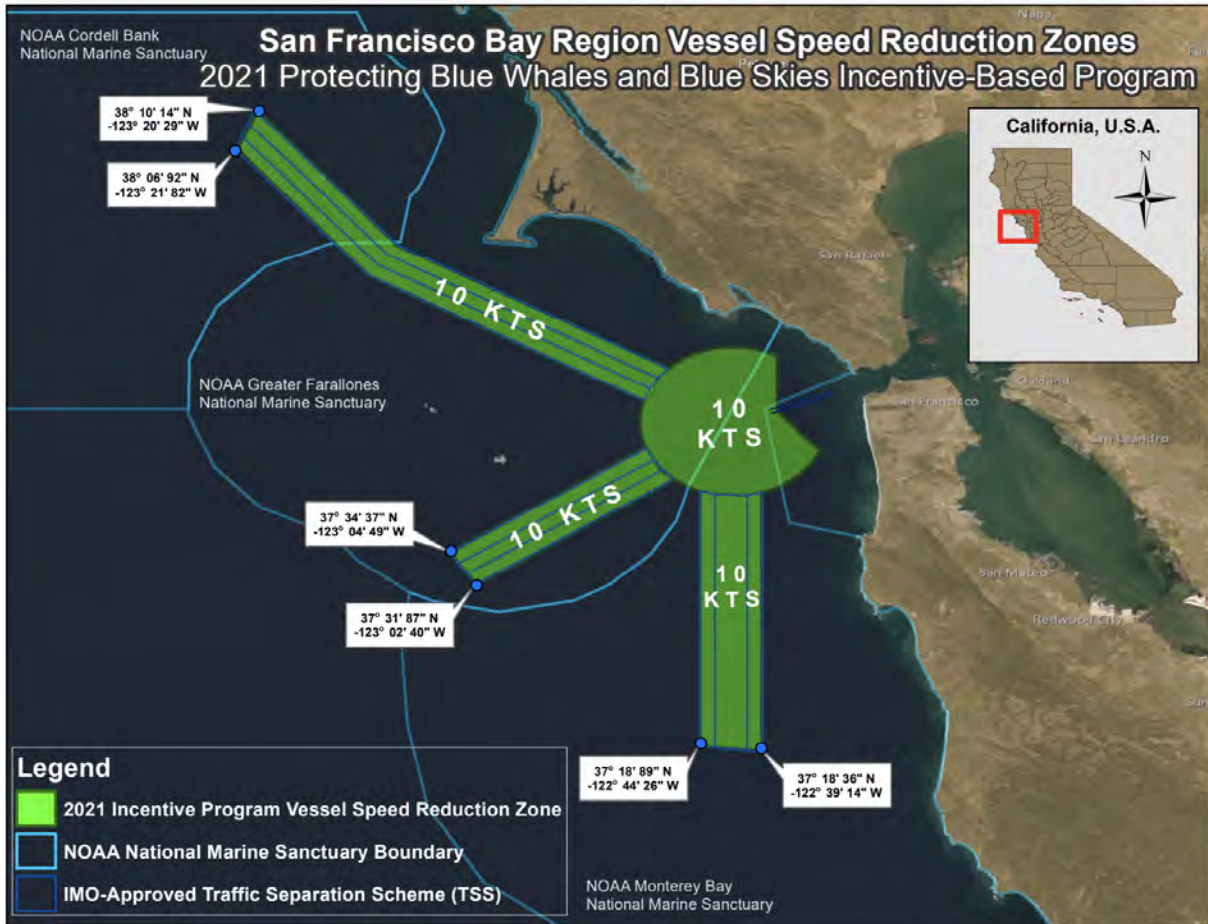
In 2014, in response to low cooperation levels with the voluntary VSR requests in the southern California region, Channel Islands National Marine Sanctuary (CINMS) partnered with California County Air District Agencies to pilot and implement the Protecting Blue Whales and Blue Skies Incentive Program.<sup>21</sup> This incentive program seeks to motivate higher cooperation with VSR requests from container and car carrier lines to contribute to a reduction in ship strike risk to endangered whales and a reduction in harmful coastal air emissions. What began as a regional effort in 2014 expanded to include the San Francisco Bay region in 2017. Voluntary enrollment in and cooperation with the Protecting Blue Whales and Blue Skies Incentive Program has increased in the San Francisco Bay region from 50% in 2017 to 68% in 2020.

<sup>19</sup> USCG, 2022: <https://www.navcen.uscg.gov/?pageName=lnmDistrict&region=11>

<sup>20</sup> NOAA ONMS

<sup>21</sup> Protecting Blue Whales and Blue Skies Program, 2022: <https://www.bluewhalesblueskies.org/>

Figure 5: Protecting Blue Whales and Blue Skies Incentive-Based VSR Program Map



Despite measurable increases in voluntary cooperation across the VSR requests, a cooperation level of 70% across large vessel traffic within the SF TSS is only estimated to achieve a ~17% reduction in fatal ship strike risk in the region, a number that falls short of the 50% reduction in risk management goal, which has been set by GFNMS and CBNMS within sanctuary jurisdictions.

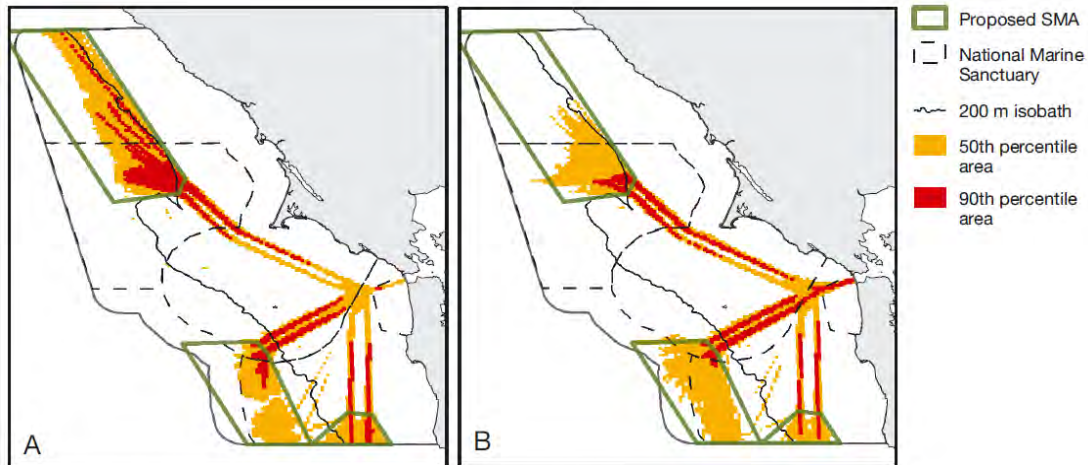
Modeling work from Point Blue Conservation Science estimates that if 80–95% cooperation with GFNMS/CBNMS current voluntary vessel speed reduction and incentive program requests were achieved, it would reduce the risk to blues and humpback whales in those areas by roughly 20–25%, compared to baseline levels in 2014 (see Table 3 below).

In addition, Rockwood et al.’s work also estimates that if the Vessel Speed Reduction zones were redrawn by GFNMS and CBNMS and expanded to include areas at the ends of the current Traffic Separation Scheme (see Figure 6 below) and 80–95% cooperation were achieved, it would reduce the risk to blues and humpbacks by an additional 25–35% in those areas.

Table 3: Percent decrease in predicted mortality in the SF TSS, ranging from 30% to 95% target cooperation scenarios<sup>22</sup>

	— Blue whale —				— Humpback whale —			
	2014	2015	2016	2017	2014	2015	2016	2017
Adherence to 10 kn speed (%)	22.8	29.2	43.3	40.4	22.8	29.2	43.3	40.4
Reference mortality	0.80	0.83	2.16	1.93	4.90	5.21	7.46	8.54
<b>Predicted decrease in mortality (%) (pre-VSR)</b>								
30% cooperation	3.3	—	—	—	3.3	—	—	—
40% cooperation	6.7	3.2	—	—	6.6	3.3	—	—
50% cooperation	10.4	6.2	1.3	2.2	10.4	6.4	1.5	2.2
60% cooperation	13.8	9.2	3.6	4.3	13.7	9.4	3.9	4.6
70% cooperation	16.7	12.2	5.8	6.8	16.5	12.4	6.1	7.1
80% cooperation	20.2	15.4	8.3	9.0	20.1	15.6	8.7	9.3
85% cooperation	22.6	16.7	9.4	10.2	22.4	17.0	10.0	10.5
90% cooperation	23.7	18.5	10.5	11.1	23.6	18.7	11.0	11.7
95% cooperation	25.6	19.9	11.7	12.4	25.4	20.1	12.4	12.9

Figure 6: Predicted whale mortality for (A) blue and (B) humpback whales with proposed expansions to current voluntary VSR zones<sup>23</sup>



<sup>22</sup> Rockwood, R. & Adams, Jeffrey & Silber, Gregory & Jahncke, Jaime. (2020). Estimating effectiveness of speed reduction measures for decreasing whale strike mortality in a high-risk region. *Endangered Species Research*. 43. 10.3354/esr01056.

<sup>23</sup> Rockwood, R. & Adams, Jeffrey & Silber, Gregory & Jahncke, Jaime. (2020). Estimating effectiveness of speed reduction measures for decreasing whale strike mortality in a high-risk region. *Endangered Species Research*. 43. 10.3354/esr01056.



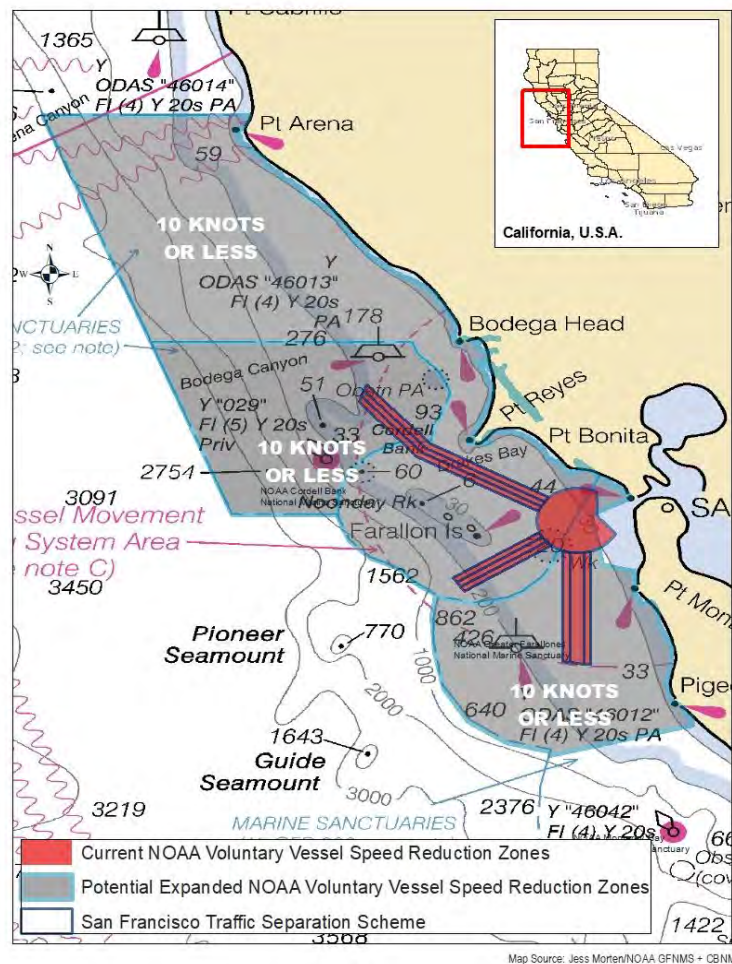
## Working Group Objectives, Process, & Feedback

### Objectives

Provide input on three conceptual designs to reduce the risk of ship strikes in the San Francisco Bay region:

- 1) Implement a year-round voluntary VSR request to all vessels 300 GT or larger throughout GFNMS and CBNMS (Figure 7);
- 2) Alter the trajectory of the northern lane and extend the northern and western shipping lanes farther west, with a year-round voluntary VSR throughout GFNMS and CBNMS;
- 3) Extend the western traffic lane to the sanctuary boundary with a year-round voluntary VSR throughout GFNMS and CBNMS, and remove the northern traffic lane.

Figure 7: Map showing the current (red) and potential expanded NOAA Voluntary VSR zones throughout sanctuaries (gray) in the San Francisco Region





## **Process**

The membership of the SSWG was selected to achieve broad representation among groups that have a vested interest in the issue of ship strikes in the San Francisco Bay region. The identified groups included the commercial shipping and maritime industry, scientists and conservationists, and the local commercial fishing industry.

The co-chairs of the working group were identified within the CBNMS and GFNMS Advisory Councils. The co-chairs, in conjunction with the CBNMS and GFNMS Advisory Councils and staff, invited the remaining members of the working group to join. Additional knowledgeable parties were invited to join meetings on a meeting by meeting basis.

The work of the SSWG generally breaks down into three tasks: 1) educating the working group about previous ship strike efforts and potential regulatory tools, 2) reaching out to interested constituencies to gather feedback on the proposed conceptual designs, and 3) drafting the final report.

- 1) The SSWG received presentations regarding research on ship strikes on whales, regulatory tools available, the designation of shipping lanes, and heard from experts from other U.S. regions that have addressed ship strikes in the past. A complete list of presentations can be found in Appendix 1, including the agendas of all SSWG meetings.
- 2) All members of the SSWG solicited feedback on the three conceptual designs. Feedback was solicited via email, phone, and in person (or virtual meetings). The members generally worked in coordinated groups (Shipping/Maritime, Fishing, Research/Conservation) to canvas as large of a population as possible. The results of those meetings, including summary write-ups of their efforts, are summarized in Appendices 2-4.
- 3) All SSWG members played a role in drafting the final report. The report was finalized by the SSWG and presented to a joint meeting of the CBNMS and GFNMS Advisory Councils for consideration of adoption.

## **Summary of Solicited Feedback**

For a more detailed look at feedback, please see Appendices 2–4.

***Conceptual Design 1: Implement a year-round voluntary VSR request to all vessels 300 GT or larger throughout GFNMS and CBNMS.***

*Science/Conservation Input* - There was consensus that slowing down ships within the sanctuaries, which contain prime whale habitat, would be beneficial. There was an unwillingness among the science and conservation communities to speculate as to the effectiveness of this conceptual design without scientific studies (see “Science and Research Recommendation” below).

*Maritime/Shipping Input* - There was consensus that this option would not pose a significant impact to maritime operations. As the VSR would remain voluntary, compliance may continue to vary based on the nature of the operation, safety and transit efficiency concerns, and the individual operators’ varying support of the program. There is a potential benefit to this option in reducing confusion around geographic and temporal limits of the VSR through consistent implementation.

*Fishing Input* - There was agreement that year-round voluntary VSR within the sanctuaries would be beneficial to the fishing fleet. This proposal was viewed as increasing safety and navigational predictability, and no adverse effects were identified.

***Conceptual Design 2: Alter the trajectory of the northern lane and extend the northern and western shipping lanes farther west, with a year-round voluntary VSR throughout GFNMS and CBNMS.***

*Science/Conservation Input* - There was no consensus among the community as to where to route the northern lane that would best avoid whale habitat. There was consensus that getting ships across the shelf break as directly (perpendicularly) as possible would reduce the risk of ship strikes; as such there was support for extending the western shipping lane beyond the shelf break. There was an unwillingness among the science and conservation communities to speculate as to the effectiveness of this conceptual design without scientific studies (see “Science and Research Recommendation” below).

*Maritime/Shipping Input* - There was mixed feedback from different sectors of the maritime industry. Tank vessels currently use the western traffic lane the majority of the time due to ballast exchange operations and an existing IMO routing recommendation through the marine sanctuaries and would not be significantly impacted by this option. Dry cargo vessels transiting an extended northern lane and complying with VSR would experience longer transit times which may impact labor schedules at the port and incur additional cost. In this scenario, some operators may choose to bypass the northern lane at normal sea speed and transit the shorter western lane instead to save time, which would increase vessel density in that lane and possibly increase navigational risk. U.S. Coast Guard representatives expressed potential concern over the ability to monitor and communicate with vessels beyond a 38-nautical mile range.

*Fishing Input* - This proposal would greatly influence gear conflict and safety concerns in the northern region. Ships constrained to a shipping lane over a greater distance would decrease conflict with Dungeness crab traps and other trap gear, as well as reduce the risk of collision with fishing vessels. There are black cod and salmon fishing grounds in an area of potential northern lane extension, but the extension removes conflict from most Dungeness crab fishing grounds. The commercial fishing community is much more in favor of removing the northern lane than extending it (see Conceptual Design 3), but extending it was attractive too.

***Conceptual Design 3: Extend the western traffic lane to the sanctuary boundary with a year-round voluntary VSR throughout GFNMS and CBNMS, and remove the northern traffic lane.***

*Science/Conservation Input* - There was consensus among the community that removing the northern lane would reduce ship strikes as the area of the northern lane is prime whale habitat. There was consensus that getting ships across the shelf break as directly (perpendicularly) as possible would reduce the risk of ship strikes; as such there was support for extending the western shipping lane beyond the shelf break. There was an unwillingness among the science and conservation communities to speculate as to the effectiveness of this conceptual design without scientific studies (see “Science and Research Recommendation” below).

*Maritime/Shipping Input* - There was mixed feedback similar to Conceptual Design 2. Tank vessels typically do not make use of the northern lane under most conditions and would not notice a significant impact. A notable exception is that during periods of heavy northwesterly wind and swell, some vessels find transiting via the northern lane preferable for vessel stability, as transiting the western lane at slow speed with wind and swell on the beam can cause significant rolling. Dry cargo vessels do use the northern lane frequently and may experience costly delays if it was removed. It would likely increase vessel density in the western lane, which may increase navigational risk. Due to the complex variables involved, it was not feasible to estimate a cost associated with potential delay based on this factor alone. The potential effect on smaller tug and tow traffic in this scenario is unclear. There is potential for tug and tow traffic to continue transiting to the north even after the removal of the northern lane.

*Fishing Input* - The removal of the northern lane would eliminate conflict with Dungeness crab traps and other trap gear, as well as reduce risk of collision with fishing vessels. Complete removal of the northern lane would minimize the tendency of the fleet to place trap gear in a line along the existing shipping lanes. This practice creates an underwater line of vertical rope which is likely to increase the risk of entanglements with marine life, including large whales.

## Recommendations to the Sanctuary Advisory Councils

### A) Science & Research Recommendations

There was a high degree of agreement among the scientific community on the preferred habitat of blue, humpback, and fin whales (Figure 1). The exact location of whales from day to day, however, is variable within that habitat, making the assignment of “whale safe” shipping lanes into San Francisco Bay virtually impossible. Whales will at some point be in any shipping lane that crosses the continental shelf.

Thus, ships moving slowly in regions on and inshore of the continental shelf would reduce the risk of ship strikes and the incident mortality of such strikes.

Conversations with the scientific community generally resulted in a high level of uncertainty in ability to determine which of the three conceptual designs or if any of the three conceptual designs would meet the stated goal of a 50% reduction in the risk of whale strikes compared to 2014 levels. There was a high degree of consensus among the scientific community that running computer models, similar to those previously published<sup>24</sup>, to simulate each of the three scenarios would be a prudent step to assess the potential benefit of each scenario.

**We recommend that CBNMS and GFNMS collaborate with research experts to model the three management scenarios considered by the SSWG. Additionally, we recommend that models are run that consider both seasonal and year-round VSR, and voluntary and mandatory VSR.**

### B) Management Recommendations

Of the three conceptual designs presented to the working group to evaluate and provide feedback on, only one of them (Conceptual Design 1) is truly within the purview of the Greater Farallones and Cordell Bank National Marine Sanctuaries and is able to be implemented without the involvement of other outside entities. The removal or amendment of any shipping lanes that are considered in Conceptual Designs 2 & 3 would require the involvement and agreement of the United States Coast Guard and other regulatory bodies. It is generally agreed that the process to remove or amend shipping lanes is a multi-year process. For that reason, we have broken up our management actions into short-term (months to year) and long-term (multiple years) actions that we recommend the sanctuaries consider.

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<sup>24</sup> Rockwood, R. & Adams, Jeffrey & Silber, Gregory & Jahncke, Jaime. (2020). Estimating effectiveness of speed reduction measures for decreasing whale strike mortality in a high-risk region. *Endangered Species Research*. 43. 10.3354/esr01056.

### Short-term management actions

**We recommend that GFNMS and CBNMS implement year-round voluntary VSR for all vessels greater than 300 GT transiting within the sanctuary boundaries of GFNMS, CBNMS, and the MBNMS northern management area.** Since discrepancies in transit time from the various approaches to each of the three shipping lanes may have an impact on usage of each of the lanes, sanctuary staff should continue to monitor and evaluate vessel traffic behavior and should assess the effectiveness of these management measures.

Though it was not included as a potential management strategy for the group to consider, depending on the efficacy of the proposed voluntary VSR actions, we think GFNMS and CBNMS should also explore and consider mandatory speed limits, similar to what is implemented by NOAA on the east coast, if deemed necessary to achieve the stated goal of 50% reduction in fatal ship strike risk.

### Long-term management actions

**We recommend that any changes to the shipping lanes be dependent on scientific studies evaluating the potential decrease in whale mortality by either removing the northern lane, altering the northern lane, or extending the western lane.** We recommend that CBNMS and GFNMS work with research experts to model the risk reduction associated with these spatial changes, share research findings with appropriate stakeholders, and work with the USCG and the U.S. West Coast Port Access Route Study (PARS) to change the lanes that would have the most desired impact.

### **C) Other Actions To Consider**

To provide broader impact on reducing risk of ship strikes, we additionally recommend that sanctuaries:

- 1) investigate the impact of other large vessels (less than 300 GT) on whales in the region.
- 2) conduct education and outreach to increase participation with the NOAA voluntary VSR requests and raise awareness on the ship strike issue. Specifically,
  - continue to work with Point Blue Conservation Science and Conserve.IO to expand Whale Alert use (<http://westcoast.whalealert.org/>) to increase available data and to raise awareness about ship strike issues in the region.
  - continue to work with The Marine Mammal Center and Benioff Ocean Initiative on Whale Safe San Francisco ([www.whalesafe.com](http://www.whalesafe.com)) to raise consumer and corporate

awareness on ship strikes, as well as increase participation with NOAA voluntary VSR requests.

- continue to work with and engage with shipping companies to increase participation with NOAA voluntary VSR requests.
- continue to partner on the Protecting Blue Whales and Blue Skies Incentive Program ([www.bluewhalesblueskies.org](http://www.bluewhalesblueskies.org)) to motivate vessel operators to cooperate with the voluntary VSR requests.
- continue to regularly engage the San Francisco Harbor Safety Committee on reducing risk on whales on the approach to San Francisco and inside central San Francisco Bay.

3) engage with the USCG to ensure navigational safety and feasibility with lane change possibilities.

4) engage in discussions with the Marine Exchange and San Francisco Bar Pilots related to the inclusion of the San Francisco-Pacifica Exclusion zone into the Greater Farallones National Marine Sanctuary (a recommendation from the GFNMS advisory council).

5) evaluate and utilize other routing options in conjunction with the USCG and designated agencies to recommend voluntary usage of the western TSS as the preferred lane.

6) continue to collect data and analyze to inform our understanding of the issue and changes implemented.

Appendix 1. Meeting Agendas

Greater Farallones & Cordell Bank National Marine Sanctuary  
Advisory Councils (GFNMS & CBNMS)

Working Group to Reduce the Risk of Ship Strikes to Whales

**Meeting 1 Agenda**

**Thursday, July 1, 2021, 9am-12pm PST**

**Google Meet**

- 9:00 Welcome from GFNMS/CBNMS Superintendent Maria Brown
- 9:10 Roll call, introductions, review agenda
- 9:25 Working group procedures & tips for success: Presentation + Q&A (Alayne Chappell, GFNMS Council Coordinator)
- 9:40 Working group goals, background, discussion, and next steps
- Presentation from Jess Morten, working group member, Greater Farallones Association
  - Discussion led by co-chairs (Jeff Dorman and Julian Rose)
  - Next steps: Set upcoming meeting dates; confirm tasks and document sharing processes
- 12:00 Adjourn

*Meeting agendas may evolve in response to the needs of the working group and/or per discussion during the meetings.*



Appendix 1. (cont.)

Greater Farallones & Cordell Bank National Marine Sanctuary  
Advisory Councils (GFNMS & CBNMS)

Working Group to Reduce the Risk of Ship Strikes to Whales

**Meeting 2 Agenda**

**Monday, September 13, 2021, 9am-12pm PST**

**Google Meet**

- 9:00 Welcome, roll call, review agenda
- 9:10 Review of 3 Conceptual Designs (for new attendees) - Jeff D
- 9:20 Discussion of how to measure success (50% reduction in SS risk) - Jeff D.
- 9:30 Presentation of USCG US West Coast Port Access Route Study - Nick B.
- 9:50 Subgroup presentations (~10 min each, 5 min for follow-up questions)
1. Research/conservation - Kathi G.
  2. Fishing interests - Dick/Sarah
  3. Maritime/shipping - John/Kai
- 10:35 Break
- 10:45 Discussion
- 11:30 Next steps (plan to dive into recommendations during meetings 3 and 4)
- 12:00 Adjourn

*Meeting agendas may evolve in response to the needs of the working group and/or per discussion during the meetings.*

Appendix 1. (cont.)

Greater Farallones & Cordell Bank National Marine Sanctuary  
Advisory Councils (GFNMS & CBNMS)

Working Group to Reduce the Risk of Ship Strikes to Whales

**Meeting 3 Agenda**

**Monday, October 4, 2021, 11am-2pm PST**

**Google Meet**

- 11:00 Welcome, roll call, summary of SSWG process thus far. (~10 minutes)  
(*Co-chairs*)
- 11:10 Presentation of written reports from information gathering within specific subgroups.  
a. "Maritime Industry/Shipping" *John Berge, Kai Martin, & Julian Rose*  
b. "Fishing" *Sarah Bates & Dick Ogg*  
c. "Research/Conservation" *Kathi George, Jaime Jahncke, Jess Morten, & Jeff Dorman*
- 1:00 Discussion of the format and drafting of a final report. Please review the 2012 GFNMS/CBNMS and 2016 CINMS reports in advance. (~30 minutes) (*Jess Morten*)
- 1:30 New business, agenda items for next meeting, other outside expertise to solicit advice from.
- 2:00 Adjourn

*Meeting agendas may evolve in response to the needs of the working group and/or per discussion during the meetings.*

Appendix 1. (cont.)

Greater Farallones & Cordell Bank National Marine Sanctuary  
Advisory Councils (GFNMS & CBNMS)

Working Group to Reduce the Risk of Ship Strikes to Whales

**Meeting 4 Agenda**

**Wednesday, November 3, 2021, 9am-12pm PST**

**Google Meet**

- 9:00 Welcome, roll call, summary of SSWG process thus far. (~10 minutes)  
*(Co-chairs)*
- 9:10 Tools and Process of the IMO -  
*Dr. Trisha Bergmann, NOAA's National Ocean Service  
and Rebecca Reese, NOAA's Office of General Counsel*
- 9:40 Development and effectiveness of vessel speed reduction on the East  
Coast in relation to the North Atlantic Right Whale population.  
*Dr. Caroline Good, NOAA's Office of Protected Resources*
- 10:15 Break
- 10:30 Presentation of the current draft of a final report from the SSWG. Please  
review the draft report in advance of the meeting and be prepared to raise  
comments and edits.  
*(Co-chairs)*
- 11:30 New business, agenda items for next meeting, other outside expertise to  
solicit advice from.
- 12:00 Adjourn

*Meeting agendas may evolve in response to the needs of the working group and/or per  
discussion during the meetings.*

Appendix 1. (cont.)

Greater Farallones & Cordell Bank National Marine Sanctuary  
Advisory Councils (GFNMS & CBNMS)

Working Group to Reduce the Risk of Ship Strikes to Whales  
**Meeting 5 Agenda**  
**Friday, January 14, 2022, 10am-12pm PST**  
**Google Meet**

- |       |   |
|-------|---|
| 10:00 | Roll call, introductions, review agenda<br><i>(Co-chairs)</i>         |
| 10:10 | Review Draft of Final Report<br><i>(Co-chairs)</i>                    |
| 11:00 | Break   |
| 11:05 | Briefing on Whale Safe<br><i>(Kathi George)</i>                       |
| 11:15 | Continue Review Draft of Final Report & Wrap Up<br><i>(Co-chairs)</i> |
| 12:00 | Adjourn   |

*Meeting agendas may evolve in response to the needs of the working group and/or per discussion during the meetings.*

Appendix 2. Feedback from Research and Conservation Communities. Outreach conducted by SSWG members Jeff Dorman, Kathi George, Jaime Jahncke, and Jessica Morten.

*Who did you interact with?*

The Marine Mammal Center – Ryan Berger, Tim Markowitz, Bill Keener, Cecily Majerus, John Warner, Cara Field, Michelle Corsi  
NOAA – Karin Forney, Jarrod Santora, Elliot Hazen  
Cascadia Research – John Calambokidis, Kiirsten Flynn  
Benioff Ocean Initiative – Callie Steffen  
California Academy of Sciences – Moe Flannery  
San Francisco State University EOS Center – Ellen Hines

*What were the general feelings from the group about proposals?*

- Many of the scientists we spoke with found it difficult to make specific recommendations about which proposal to choose without doing some sort of analysis (modeling) of the three options.
- Prime blue whale habitat is from 100 to 500 m depth. It was generally felt that the best option would likely move ships directly across the continental shelf to offshore waters.
- To access SF Bay, ships will need to transit through prime blue whale and humpback whale habitat, no matter where the shipping lanes are placed.

*What were the specific positives and negatives about each of the three proposals?*

Conceptual Design 1 positives.

- Ships would be slowed through prime whale habitat and there would be no seasonal changes, leading to hopefully higher compliance.
- No need to engage with a longer USCG and IMO process to implement.

Conceptual Design 1 negatives.

- With the exception of the western shipping lane, ships are transiting along (not across) prime whale habitat.

Conceptual Design 2 positives.

- Extension of the northern shipping lane to western boundary ensures ships are moving slowly in prime whale habitat.

Conceptual Design 2 negatives.

- Uncertainty of where to move the northern shipping lane.
- Uncertainty if altering the lane is possible.

Conceptual Design 3 positives.

- Extending the western lane moves ships across prime whale habitat as efficiently as possible.
- Removing the northern lane removes shipping from prime whale habitat, reducing ship/whale interaction possibilities.

Conceptual Design 3 negatives.

- Uncertainty if removing a lane and extending the western lane is possible.

Was there a consensus view as to which proposal the group would prefer and / or a ranking of the three conceptual designs?

- There was not a consensus as to which design is best.
- There was a tendency to believe that design 1 or design 3 would lead to a greater reduction in ship strikes than design 2.

What degree of consensus was there within the group?

- There was consensus among the science community of the need to conduct research before altering shipping lanes for fear of making the situation worse.
- There was little consensus on voluntary vs. mandatory speed reductions.

Other thoughts?

- Biggest impact will likely come from a voluntary VSR throughout the sanctuaries.
- The northern lane terminates in an important feeding region for blue whales, increasing the likelihood of ship strikes. It should be removed or be routed directly offshore.
- The northern lane should be seasonally closed to coincide with known seasonal high whale presence.

Appendix 3. Feedback from Shipping and Maritime Communities. Outreach conducted by SSWG members John Berge, Kai Martin, and Julian Rose.

Who did you interact with?

Outreach went to over 50 Maritime Activity operating companies, most of which having current operations into and out of the Bay Area. This included tanker, container, roro, project cargo, and cruise ship operators, as well as vessel agents. However, due to the current congestion crisis in the maritime supply chain, with intense pressure on shipping schedules and logistics, specific feedback to date has been very limited.

What were the general feelings from the group about proposals?

- As long as the voluntary speed reduction remains voluntary and allows operators to flex if needed to adjust their speeds as situations demand, then this is good.
- Elimination of any shipping lane may reduce flexibility and if a pre-cursor to future mandatory action, the group would prefer to leave it as an option. Extension of shipping lanes are acceptable under the voluntary VSR provisions.

What were the specific positives and negatives about each of the three proposals?

Conceptual Design 1 positives.

- As long as the speed reduction remains voluntary and allows operators to adjust their speeds as situations demand, then this is good.

Conceptual Design 1 negatives.

- None.

Conceptual Design 2 positives.

- As long as the speed reduction remains voluntary and allows operators to adjust their speeds as situations demand, then this is good.
- No other positive impact from the Maritime Activity operator perspective.

Conceptual Design 2 negatives.

- The north shipping lane change would increase overall transit time, however, it may not be a materially significant amount of increase. It may result in an incentive to use the western lane instead of the northern lane.

Conceptual Design 3 positives.

- As long as the voluntary speed reduction remains voluntary and allows operators to adjust their speeds as situations demand, then this is good.

Conceptual Design negatives.

- Operators would prefer the option of the Northern traffic lane, to avoid congestion in the western lane that could result in safety and efficiency consequences, and especially in the event that the VSR ever became compulsory or required or thresholds were set such as needing to have 90% compliance year round.

Was there a consensus view as to which conceptual design the group would prefer and / or a ranking of the three proposals?

- Designs 1 and 2 were least impactful to operators.



*What degree of consensus was there within the group?*

- Although as mentioned above, there has been very limited feedback to date, there is general consensus. Similar statements were made by all or most parties. We will continue to provide additional feedback as it is provided to us.

Appendix 4. Feedback from Commercial Fishing Community. Outreach conducted by SSWG members Sarah Bates and Dick Ogg.

*Who did you interact with?*

Sarah Bates talked with eight members of the commercial fleet from San Francisco. Dick Ogg presented the proposals to the Bodega Bay Fishermen's Association.

*What were the general feelings from the group about proposals?*

- The commercial fishing fleet in San Francisco was generally supportive of altering or removing the northern shipping lane due to increased safety and potential reduced gear conflict.
- There was less support for altering the western lane.
- The commercial fishing fleet in Bodega Bay is supportive of Proposal 3 which removes the northern shipping lane.

*What were the specific positives and negatives about each of the three proposals?*

Conceptual Design 1.

- This proposal was not seen to affect the commercial fishing fleet.

Conceptual Design 2.

- This proposal would greatly influence gear conflict and safety concerns in the northern region. Ships constrained to a shipping lane over a greater distance would decrease conflict with Dungeness crab traps and other trap gear, as well as reduce risk of collision with fishing vessels.

Conceptual Design 3.

- The removal of the northern lane would eliminate conflict with Dungeness crab traps and other trap gear, as well as reduce risk of collision with fishing vessels. Complete removal of the northern lane would minimize the tendency of the fleet to place trap gear in a line along the existing shipping lanes. This practice creates an underwater fence line of rope which is likely to increase the risk of marine entanglements.

*Was there a consensus view as to which conceptual design their group would prefer and/or a ranking of the three proposals in preferred order?*

- The commercial fishing fleet supports any design that increases predictability of shipping traffic beyond the current lanes. Designs 2 & 3 offer increased predictability.
- The commercial fleet in Bodega Bay is strongly supportive of Design 3.
- There was some concern about tug boats and their adherence to shipping lanes. Gear conflict with tug-and-tows is a bigger problem than gear conflict with shipping vessels. Without cooperation of the tug boats, there is much less benefit to altering shipping lanes.

*What degree of consensus was there within the group?*

- Consensus was high. We didn't speak to anyone who opposed changing the current scheme.

