

**ENDANGERED SPECIES ACT STATUS REVIEW  
REPORT FOR THE GUADALUPE FUR SEAL  
(*Arctocephalus townsendi*)**



West Coast Region  
National Marine Fisheries Service  
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**U.S. DEPARTMENT OF COMMERCE**  
National Oceanic and Atmospheric Administration

Cover photo: Guadalupe fur seal (*Arctocephalus townsendi*) adult female with her pup just before weaning in April, 2017, photographed at Guadalupe Island, Mexico. Photo credit: J.D. Harris, National Marine Fisheries Service, Marine Mammal Laboratory. SEMARNAT permit number SGPA/DGVS/002460/18.

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# TABLE OF CONTENTS

LIST OF FIGURES .....	iv
LIST OF TABLES .....	v
1 List of Acronyms .....	vi
EXECUTIVE SUMMARY .....	viii
2 Introduction and Background .....	1
2.1 Introduction .....	1
2.2 Endangered Species Act Background .....	1
2.3 Endangered Species Act Listing History .....	2
2.3.1 Critical Habitat.....	3
2.3.2 Recovery Planning .....	4
2.3.3 Current Conservation Status .....	4
2.4 Status Review History.....	7
2.4.1 Summary of Comments .....	8
3 SPECIES DELINEATION.....	8
4 SPECIES BACKGROUND.....	9
4.1 Species Description and Taxonomy.....	9
4.2 Current and Historical Distribution.....	10
4.3 Foraging Ecology .....	15
4.4 Reproductive Biology .....	17
4.5 Historical and Current Abundance and Productivity .....	18
5 EVALUATION OF LISTING FACTORS.....	20
5.1 Process for evaluating whether the biological and listing factor recovery criteria have been met .....	20
5.1.1 Time Frame for Evaluation: The Foreseeable Future .....	22
5.2 Evaluation of Status and Extinction Risk.....	22
5.2.1 Recent Population Status and Trend Data .....	22
5.3 Evaluation of the ESA Listing Factors and Associated Criteria .....	23

5.3.1	Factor A: The Present or Threatened Destruction, Modification, or Curtailment of a Species' Habitat or Range.....	23
5.3.2	Factor B: Overutilization for Commercial, Recreational, or Educational Purposes.....	34
5.3.3	Factor C: Disease or Predation .....	38
5.3.4	Factor D: The Inadequacy of Existing Regulatory Mechanisms .....	42
5.3.5	Factor E: Other Natural or Anthropogenic Factors Affecting Its Continued Existence .....	54
5.3.6	Final Conclusion of the Review of the Five ESA Listing Factors.....	70
6	RESULTS OF THE STATUS REVIEW .....	70
6.1	Conclusion.....	70
6.2	Recommended Recovery Actions: Continued and Increasing Research .....	71
7	ACKNOWLEDGMENTS .....	72
8	REFERENCES .....	73

## LIST OF FIGURES

Figure 1. Guadalupe fur seal range off the west coast of the United States and Mexico. ....	12
Figure 2. Tracks of Guadalupe fur seal pups (A) and non-pups (B) tagged from Guadalupe Island in 2016 and 2017.....	13
<b>Figure 3.</b> Post-release tracks for 29 Guadalupe fur seals released from rehabilitation from 2015–17. All animals were 11-15 months old at the time of release, except for one juvenile male that traveled to Guadalupe Island in 2015. Tracking durations were 64±28 days. (Norris <i>et al.</i> 2017). .....	15
Figure 5. The number of Guadalupe fur seal strandings along the U.S. west coast from 1984-2019, n=808). ....	65
Figure 6. West Coast Guadalupe fur seal strandings associated with human interaction (HI) type from 1984-2019 (n=116). ....	66
Figure 7. Guadalupe fur seal strandings along the U.S. west coast by age class from 1984-2019. ....	69
Figure 8. Guadalupe fur seal strandings along the U.S. west coast by age class by state from 1984-2019. ....	69

## **LIST OF TABLES**

Table 1. List of Fisheries Categories for annual mortality and serious injury as a proportion of Potential Biological Removal (PBR).....	55
Table 2. Human-caused Mortality and Serious Injury: Fisheries Information. ....	57

# 1 LIST OF ACRONYMS

AFSC	Alaska Fisheries Science Center
APPS	Authorizations and Permits for Protected Species
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
CDFW	California Department of Fish and Wildlife
CICIMAR-IPN	California and the Interdisciplinary Center for Marine Sciences-National Polytechnic Institute
CINMS	Channel Islands National Marine Sanctuary
CITES	Convention of International Trade and Endangered Species
COD	Cause of Death
CONANP	National Commission for Protected Areas (Comisión Nacional de Áreas Naturales Protegidas)
DA	Domoic Acid
DDT	Dichloro-diphenyl-trichloroethane
DoD	Department of Defense
DPS	Distinct Population Segment
EA	Environmental Analysis
EEZ	Exclusive Economic Zone
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FWCA	Fish and Wildlife Coordination Act
GFNMS	Greater Farallones National Marine Sanctuary
HAB	Harmful Algal Bloom
HI	Human Interaction
INRMP	Integrated National Resource Management Plan
ITIS	Integrated Taxonomic Information System
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
MMHSRP	Marine Mammal Health and Stranding Response Program

MMPA	Marine Mammal Protection Act
MNPL	Maximum Net Productivity Level
MPA	Marine Protected Area
MSA	Magnuson Stevens Fishery Conservation and Management Act
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NMS	National Marine Sanctuary
NMSA	National Marine Sanctuary Act
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
OCCRI	Oregon Climate Change Research Institute
ODFW	Oregon Department of Fish and Wildlife
PBDE	Polybrominated Diphenyl Ethers
PBR	Potential Biological Removal
PCB	Polychlorinated Biphenyls
POP	Persistent Organic Pollutants
SAR	Stock Assessment Report
SOMEMMA	Mexican Society for Marine Mammalogy-Mexican Society of Marine Mastozoology (Sociedad Mexicana de Mastozoologia Marina)
SST	Sea Surface Temperature
TMMC	The Marine Mammal Center
UAV	Unmanned Aerial Vehicles
UME	Unusual Mortality Event
UNESCO	United Nations Educational, Scientific and Cultural Organization
U.S.	United States
USFWS	United States Fish and Wildlife Service
VAFB	Vandenberg Air Force Base
WCRO	West Coast Regional Office
WDFW	Washington Department of Fish and Wildlife
ZMRG	Zero Mortality Rate Goal



## EXECUTIVE SUMMARY

On October 22, 2014, the National Marine Fisheries Service (NMFS) provided notice it was initiating a Status Review of the Guadalupe fur seal (*Arctocephalus townsendi*) (79 FR 63088). The species had been previously listed as “threatened” under the Endangered Species Act (ESA) on December 16, 1985 (50 FR 51252) following an initial Status Review in 1984 (Seagars 1984).

A recovery plan has not been initiated for the Guadalupe fur seal and therefore, we do not have recovery criteria; however, the listing decision set three criteria to determine when a status review should be initiated to determine if the listing status should be changed. Those criteria are: (1) growth to a population size of 30,000 animals; (2) establishment of one or more additional rookeries within the historical range; and (3) growth to the level at which maximum net productivity of the population occurs. As the first criterion has been met, this Status Review considers the best available scientific and commercial information to help NMFS determine whether the threatened listing status should be changed.

This Status Review and the accompanying Background Report compile the best available scientific and commercial information on Guadalupe fur seals and describe the threats to the species. They also evaluate whether the population meets the Distinct Population Segment (DPS) Policy criteria. The review does not represent a decision by NMFS on whether the threatened listing for this species warrants a change in status, or whether any subdivision thereof should be proposed for listing as threatened or endangered under the ESA. That decision will be made by NMFS after reviewing this document, the current efforts being made to conserve the species, and relevant laws, regulations, and policies. The determinations in this regard will be posted on the NMFS Office of Protected Resources web site (<https://www.fisheries.noaa.gov/resources/all-publications>).

### Demographic Factors:

The Status Review evaluates data on population status and trends summarized in the initial Status Review (Seagars 1984), the Stock Assessment Report (Carretta *et al.* 2019), information in the primary literature, and recently collected unpublished data (at the time of this review). The review evaluates and draws conclusions about these data for areas within the range of the Guadalupe fur seal. The best available information indicates that Guadalupe fur seals once had a minimum population size of 20,000 animals (Fleisher 1978) and as many as 200,000 animals (Hubbs 1979) before commercial harvests in the 19th century. Researchers estimated the population size of Guadalupe fur seals at approximately 20,000 animals in 2010, with around 17,500 at Guadalupe Island and 2,500 at San Benito Archipelago (García-Capitanachi *et al.* 2017). Based on a reanalysis of 1984–2010 data and additional 2013 pup count data in a Bayesian inference framework, Garcia-Aguilar *et al.* (2018) published an updated abundance estimate of 34,187 individuals with a minimum estimate of 31,019 fur seals in 2013.

Recent counts at Guadalupe Island indicate that the population was increasing at a steady rate through 2013. The population size trend data suggests that between 1984 and 2013, Guadalupe fur seals had an estimated annual population growth rate of 5.9 percent (Garcia-Aguilar *et al.* 2018). Thus, the information indicates that the population realized a sustained increase in

abundance through 2013. Current population estimates and trends are less clear because there were no complete censuses of the Guadalupe fur seal population from 2011–17 during a period with persistent, widespread anomalously warm waters across the Northeast Pacific Ocean that caused unprecedented ecosystem-level effects, including dramatic shifts in species distribution and abundance and mass strandings and mortalities of Guadalupe fur seals and other species related to prey limitation (Cavole *et al.* 2016; Elorriaga-Verplancken *et al.* 2016b; McClatchie *et al.* 2016; Morgan *et al.* 2019; NOAA Fisheries 2020; Norris and Elorriaga-Verplancken 2019, 2020; Sanford *et al.* 2019).

#### ESA Listing Factors and Associated Criteria:

The Status Review evaluates the best scientific and commercial information for each of the following threat factors:

- The present or threatened destruction, modification, or curtailment of a species' habitat or range;
- Overutilization for commercial, recreational, scientific, or educational purposes;
- Disease or predation;
- The inadequacy of existing regulatory mechanisms; or
- Other natural or manmade factors affecting its continued existence.

We also considered the criteria from the listing decision that noted that if one or more of these criteria are met, a Status Review should be initiated to determine if the threatened status of the Guadalupe fur seal should be changed (50 FR 51252; December 16, 1985). These criteria are:

- Growth to a population size of 30,000 animals,
- Establishment of one or more additional rookeries within the historical range, and
- Growth to the level at which maximum net productivity of the population occurs.

Given the length of time since the last Status Review and listing decision, and the fact that the first criterion (listed above) had been met, NMFS initiated a Status Review in 2014. As a result, NMFS examined the most recent information on the population status and trends and reviewed the ESA listing factors to better understand the threats to this species. We thoroughly reviewed appropriate threats under each of these factors (e.g., environmental perturbations including global climate warming and ocean acidification, direct and indirect fisheries interactions, human disturbance, toxic substances, subsistence taking, illegal direct killing, entanglement in fishing gear and marine debris, disease, predation, removal of protections provided under the ESA, and others). Guadalupe fur seals have only one main rookery, with only a few pups born on neighboring islands off Mexico and one island off the U.S. west coast. This may make them especially vulnerable to threats if they were to occur at this rookery, with potentially catastrophic impacts on the population. Threats include warm water events, sea-level rise, ocean acidification, extreme weather events, disease, and oil spills.

#### Status Review Conclusion:

In many respects, the Guadalupe fur seal population has significantly recovered from the population status it had when the species was originally protected under the ESA in 1985. Existing legal protections and likely favorable environmental conditions have supported the

species growth and productivity at the primary rookery at Guadalupe Island through at least 2010, and the species has expanded into its historical range. However, since 2010, a number of potential impacts to the population have occurred, including dramatic shifts in species distribution and abundance and mass strandings and mortalities of Guadalupe fur seals and other species related to prey limitation. No scientifically reliable population estimates have been conducted to assess these impacts on the current status of the species. Furthermore, since Guadalupe fur seals have only one rookery where greater than 99 percent of the pups are born, the cumulative impacts of potential threats due to climate change, disease outbreaks, and oil spills that may occur within the foreseeable future would be catastrophic to the population. As such, current protections for this species should continue. NMFS also recommends continued and increased research of the species throughout its range. Researchers are just starting to get a better sense of the status of the population, and this status may change as the Guadalupe fur seal continues to recolonize in its historical range while facing new pressures such as climate change, and potential exposure to novel diseases.

## 2 INTRODUCTION AND BACKGROUND

### 2.1 Introduction

The National Marine Fisheries Service (NMFS) has prepared this document to: (a) provide our evaluation of the current status of the Guadalupe fur seal (*Arctocephalus townsendi*); and (b) provide our assessment of past, present, and likely future threats to this species. Preparation of the Status Review was announced in 2014 with a notice in the Federal Register (79 FR 63088; October 22, 2014). NMFS will decide whether to propose changes to the ESA listing status of this taxon based on the review conducted by this document, a review of any other relevant biological and threat information not included herein, consideration of efforts being made to protect the species, and a review of relevant laws, regulations, and policies. NMFS will post it on the NMFS website (refer to <http://www.nmfs.noaa.gov/pr/species/>).

NMFS and others have released documents that provide and synthesize available information concerning the life history, current status, and ecology of the Guadalupe fur seal (e.g., Elorriaga-Verplancken *et al.* 2016a; Arias-Del Razo *et al.* 2017; Aurioles-Gamboa *et al.* 2017; Garcia-Aguilar *et al.* 2018; Carretta *et al.* 2019). Some of these documents also provide information about types, levels, and significance of impacts from various human and naturally occurring threats to this species. NMFS refers readers to these documents for details beyond the level provided in this Status Review.

The conclusions within this document do not represent a decision by NMFS on whether this taxon should be removed from the list of threatened and endangered species.

### 2.2 Endangered Species Act Background

The ESA defines an endangered species as “any species which is in danger of extinction throughout all or a significant portion of its range” (ESA section 3(6)). The ESA defines a threatened species as a species that is “likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range” (ESA section 3(20)). Section 4 of the ESA provides the basis for determining a species’ status. Under the ESA, a listing determination can address a species, subspecies, or a Distinct Population Segment (DPS) of vertebrate fish or wildlife which interbreeds when mature (16 U.S.C. 1532 (16)). A description of the 1996 DPS policy can be found in Section 3 of this document.

Under section 4(a)(1) of the ESA, NMFS must determine whether a species is threatened or endangered as a result of any or combination of the following factors:

- (A) the present or threatened destruction, modification, or curtailment of its habitat or range;
- (B) overutilization for commercial, recreational, scientific, or educational purposes;
- (C) disease or predation;
- (D) the inadequacy of existing regulatory mechanisms; or
- (E) other natural or manmade factors affecting its continued existence.

The agency determines whether a species should be listed based on the best scientific and commercial data available, after conducting a review of the status of the species and taking into account efforts made by any state or foreign nation to protect such species.

Regulations implementing the ESA provide the criteria for listing or revising the Lists of Endangered and Threatened Wildlife and Plants and, where appropriate, designating or revising their critical habitats (50 CFR 424.11e). In determining whether a species is a threatened species, NMFS must analyze whether the species is likely to become an endangered species within the foreseeable future. The term foreseeable future extends only so far into the future as NMFS can reasonably determine that both the future threats and the species' responses to those threats are likely. NMFS will describe the foreseeable future on a case-by-case basis, using the best available data and taking into account considerations such as the species' life-history characteristics, threat-projection timeframes, and environmental variability. NMFS need not identify the foreseeable future in terms of a specific period of time. (50 CFR 424.11(d)).

The implementing regulations also contain the factors to consider for delisting a species (50 CFR 424.11(e)). A species may be delisted for one or more of the following reasons:

- (1) the species is extinct;
- (2) the species does not meet the definition of an endangered species or a threatened species. In making such a determination, the Secretary shall consider the same factors and apply the same standards set forth in paragraph (c) of this section regarding listing and reclassification; or
- (3) the listed entity does not meet the statutory definition of a species.

The ESA authorizes any interested person to petition for the listing or delisting of a species, subspecies, or DPS (16 U.S.C.1533(b)(3)(A)). The implementing regulations also establish procedures for receiving and considering petitions to revise the lists (50 CFR 424.14) and for conducting periodic reviews of listed species (50 CFR 424.21). A status review is a periodic process conducted to ensure that the listing classification of a species is accurate and is based on the best available scientific and commercial data.

### **2.3 Endangered Species Act Listing History**

On November 21, 1983, NMFS received a petition from the Center for Environmental Education, Seal Rescue Fund to list the Guadalupe fur seal as an endangered species. Several reasons were given:

1. Overutilization of the species by 19<sup>th</sup> century commercial sealing operations reduced the population to extremely low numbers.
2. Population growth has been slow since the breeding colony was discovered at Guadalupe Island, Mexico in 1954.
3. The restricted breeding area and overall distribution increases the vulnerability of Guadalupe fur seals to human disturbance through direct or indirect intrusion into

these areas. Disruption of normal activities at both breeding and haulout areas could adversely affect population growth.

4. The Guadalupe fur seal is listed on Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Such listed species are considered by CITES to be threatened with extinction: trade in the species or its products for commercial purposes is banned by Convention members.
5. The International Union for Conservation of Nature (IUCN) Red List has listed this species as *Vulnerable*.
6. The Guadalupe fur seal was listed according to the Endangered Species Protection Act of 1966 as threatened with extinction. The omission of this species in 1970 (and subsequent lists) was without explanation.

Based on the information provided by the petitioners, the Assistant Administrator for Fisheries, NOAA, determined that the petition presented substantial information indicating that the petitioned action may be warranted and commenced a review of the status of this species to determine whether it should be listed under the ESA (49 FR 4804; February 8, 1984).

On January 3, 1985, NMFS published its proposed determination that the Guadalupe fur seal should be listed as threatened (50 FR 294) and requested comments and information by March 4, 1985. After a thorough review of all the information available, on December 16, 1985, NMFS announced its determination that the Guadalupe fur seal should be listed as a threatened species under the ESA (50 FR 51252). This determination was based on information submitted by the Center for Environmental Education/Seal Rescue Fund, as well as in a Status Review conducted by NMFS (Seagars 1984) and comments received in response to the publication of the proposed rule to list the species. The list of threatened species under the jurisdiction of NMFS is contained in 50 CFR 223.102 and was amended to reflect this final determination. The U.S. Fish and Wildlife Service (USFWS), Department of the Interior, maintains the U.S. List of Endangered and Threatened Wildlife (50 CFR Part 17) of all species determined by NMFS or USFWS to be endangered or threatened. Concurrent with this rule, USFWS amended the list of threatened and endangered species by adding the Guadalupe fur seal as a threatened species.

On October 22, 2014, NMFS published its notice to initiate a Status Review for the Guadalupe fur seal under the ESA and opened a public comment period (79 FR 63088), with a request for information by December 22, 2014. The comment period ended December 22, 2014, with two comments received from the public.

### 2.3.1 Critical Habitat

The 1982 amendments to the ESA require that the Secretary of Commerce or Interior designate critical habitat, to the extent prudent and determinable, concurrent with listing a species as endangered or threatened (section 4(a)(3)). The regulations implementing section 4 of the ESA state, however that “The Secretary will not designate critical habitat within foreign countries or in other areas outside of the jurisdiction of the United States.” (50 CFR 424.12(g)).

Critical habitat has never been designated for the Guadalupe fur seal. In its 1984 Status Review (Seagars 1984), NMFS considered critical habitat for the Guadalupe fur seal. At that time, however, the only known breeding area was in Mexico, which could not be designated as critical habitat because it is outside of the United States jurisdiction. In addition, there was little information available regarding movements, food habits, or foraging areas of the Guadalupe fur seal. Therefore, with insufficient information available at the time, NMFS could not determine whether critical habitat should be proposed for designation in the United States. NMFS noted that protections existed on the California Channel Islands, where Guadalupe fur seals were known to haul out in small numbers and where their bones were found in middens. Also, the restricted public access to some of the Channel Islands established by the National Park Service and the U.S. Navy (for San Miguel and San Nicolas Islands) provided sufficient protection to the species while on United States lands, such that any additional benefit or protection would not seem prudent. In its final rule, NMFS reviewed the available data and relevant comments to consider designating critical habitat and determined that reoccupation of the Channel Islands, in particular, was not essential to the conservation of the species (December 16, 1985; 50 FR 51252, 51254).

### 2.3.2 Recovery Planning

Section 4(f) of the ESA directs the responsible agency to develop and implement a Recovery Plan, unless such a plan will not promote the conservation of a species. Since the listing of the Guadalupe fur seal as a threatened species in 1985, NMFS has not developed a recovery plan for this species.

In the final rule listing this species as threatened (50 FR 51252; December 16, 1985), NMFS noted that a Status Review for this species may be initiated if one or more specific criteria identified in the listing decision were met to determine if the population has recovered. The specific criteria are:

- (1) Growth to a population size of 30,000 animals;
- (2) Establishment of one or more additional rookeries within the historical range; and
- (3) Growth to the level at which maximum net productivity of the population occurs.

We discuss these criteria and the ESA listing/delisting criteria in more detail in Section 5.

### 2.3.3 Current Conservation Status

#### 2.3.3.1 *The International Union for Conservation of Nature*

The International Union for Conservation of Nature (IUCN) was founded in 1948 as the world's first global environmental organization. Today, it remains the largest of such organizations. The IUCN Red List of Threatened Species provides taxonomic determination, conservation status, and distribution information on plants, fungi, and animals that have been globally evaluated using the *IUCN Red List Categories and Criteria*. The system is designed to determine the relative risk of extinction. The main purpose of the IUCN Red List is to catalog and highlight those species that are facing a greater risk of global extinction (i.e., those listed as Critically Endangered, Endangered, or Vulnerable). The IUCN Red List also

includes information on species that are categorized as Extinct or Extinct in the Wild, taxa that cannot be evaluated because of insufficient information (i.e., are Data Deficient), and taxa that are either close to meeting the threatened thresholds or that would be threatened were it not for an ongoing taxon-specific conservation program (i.e., are Near Threatened).

The Guadalupe fur seal was first assessed by the IUCN in 1965, when it was considered “very rare but believed to be stable or increasing” (Auriolles-Gamboa 2015). In subsequent years – including 1982, 1986, 1988, 1990, 1994, and 1996 – the IUCN determined that Guadalupe fur seals met the criterion for “Vulnerable” on the Red List. In 2008 the IUCN’s Pinniped Specialist Group assessed the status of the Guadalupe fur seal and concluded that the species met the criterion for “Near Threatened,” primarily due to its increasing population growth rate over 30 years, at approximately 13.7 percent per year; however, the assessors stated that it was still close to meeting the criterion for “Vulnerable.” In 2015, the IUCN downgraded the status of Guadalupe fur seals to “Least Concern” with an “increasing” population trend, primarily due to their most recent abundance estimate of around 20,000 animals in 2010, from 200 to 500 animals in the 1950s (Auriolles-Gamboa 2015).

### *2.3.3.2 Convention on International Trade in Endangered Species of Wild Fauna and Flora*

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) treaty was implemented in 1975 and was designed to regulate international trade in a wide range of wild animals and plants. There are currently 183 parties (i.e., countries) included in CITES, which does not limit legal harvest within countries. Animal and plant species are listed in three CITES Appendices (described below). Additional information is available at <http://www.cites.org>.

CITES Appendix I lists species that are the most endangered among CITES-listed animals. They are threatened with extinction and CITES prohibits international trade of specimens of these species except when the purpose of the import is not commercial, for instance for scientific research. In these exceptional cases, trade may take place provided it is authorized by the granting of both an import permit and an export permit (or re-export certificate).

CITES Appendix II lists species that are not necessarily threatened with extinction but that may become so unless trade is closely controlled. It also includes so-called “look-alike species” (i.e., species whose specimens in trade look like those of species listed for conservation reasons). International trade in specimens of Appendix II species may be authorized by the granting of an export permit or re-export certificate, both of which have specific conditions associated with the grant. An import permit shall require the prior presentation of either an export permit or a re-export certificate. Permits or certificates should only be granted if the relevant authorities are satisfied that certain conditions are met, above all that trade will not be detrimental to the survival of the species in the wild.

CITES Appendix III contains a list of species included at the request of a party that already regulates trade in the species and that needs the cooperation of other countries to prevent unsustainable or illegal exploitation.



Guadalupe fur seals are the only otariid listed under CITES Appendix I, with all other *Arctocephalus* species listed under Appendix II. Therefore, international trade of Guadalupe fur seal is prohibited unless in exceptional circumstances, such as for scientific research. CITES Parties selected this species for review between CITES Conference of the Parties (COP) 17 (2016) and COP19 (2022). The United States and Mexico, as range states agreed to conduct this review. <https://cites.org/sites/default/files/eng/com/ac/29/com/E-AC29-Com-07-R.pdf>.

### 2.3.3.3 *Marine Mammal Protection Act*

As a member of the suborder *Pinnipedia*, the Guadalupe fur seal is included within the provisions of the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. 1361 *et seq.*), and is listed as “depleted” under the MMPA by virtue of its listing as threatened under the ESA. The MMPA established a moratorium on the taking and importation of marine mammals, their parts, and products. Exceptions to this moratorium may be authorized by permit for research, public display, taking incidental to commercial fishing, or for small numbers taken incidentally in the process of short-term specified activities.

Related aspects of the MMPA provide procedures for implementing specific protections to marine mammals by limiting the degree and circumstances of potential take due to human activities. For example, Congress amended the MMPA in 1981, 1986, and 1994 to provide various mechanisms for the authorization of “incidental take” (including harassment) of marine mammals due to various activities, provided that NMFS finds that the takings would be of small numbers and would have no more than a “negligible impact” on affected marine mammal species, and not having an “unmitigable adverse impact” on subsistence harvests of these species (see <https://www.fisheries.noaa.gov/protected-species-permits>). NMFS regulations define a “negligible impact” as “an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival” (50 CFR 216.103). Before authorizing the incidental take of marine mammals, NMFS must provide an opportunity for public comment on its proposal to do so and must specify the: (1) permissible methods and the specified geographical region in which take will be authorized; (2) means of effecting the least practicable adverse impact on the species or stock and its habitat and on the availability of the species or stock for “subsistence” uses; and (3) requirements for monitoring and reporting, including requirements for the independent peer-review of proposed monitoring plans where the proposed activity may affect the availability of a species or stock for taking for subsistence uses. Such authorizations may be obtained for taking endangered or threatened marine mammals, again provided NMFS finds the taking (lethal, injurious, or harassment) will be small in number and will have no more than a negligible impact on the affected stock(s) of marine mammals.

### 2.3.3.4 *States of California, Oregon, and Washington*

The California Code of Regulations Title 14, Section 670.5, “Animals of California Declared to be Endangered or Threatened,” includes the Guadalupe fur seal, which is listed as a “threatened” species (14 §670.5(b)(6)(H)).

Guadalupe fur seals are not listed on the Washington or Oregon Endangered or Threatened Species Lists; however, after NMFS declared an Unusual Mortality Event (UME) from 2007–09, the authors of the UME summary report recommended listing the Guadalupe fur seal on both Oregon and Washington’s Species of Concern lists to bring more awareness to this species’ presence off those coasts (Lambourn *et al.* 2009).

#### 2.3.3.5 Mexico

Guadalupe fur seals are found year-round on Guadalupe Island (Isla Guadalupe) and the San Benito Archipelago (Islas San Benito), Mexico. Guadalupe Island is the only established breeding colony for this species, with greater than 99 percent of all births occurring at this site (Garcia-Aguilar *et al.* 2018). San Benito Archipelago is an important recolonization site and is primarily used by immature animals with less than 30 pups born on these islands each year since 2007 (no surveys in 2011, 2016, or 2020; Aurióles-Gamboa *et al.* 2010; Sierra-Rodríguez 2015; Elorriaga-Verplancken *et al.* 2016a; Norris and Elorriaga-Verplancken 2019, 2020). As such, there are protections in place in Mexico to protect these seals. Guadalupe Island was dedicated as a Mexican nature reserve in 1927. In 1975, the government of Mexico declared Guadalupe Island a pinniped sanctuary in a bid to preserve the Guadalupe fur seal and northern elephant seal (*Mirounga angustirostris*) populations. Moreover, in 2005, the island was declared as a Biosphere Reserve, regulated by the National Commission for Protected Areas (CONANP). The Guadalupe fur seal is listed as endangered under Mexican Law NOM-059-ECOL-2010 (SEMARNAT 2010).

#### 2.3.3.6 National Marine Sanctuaries Act

The National Marine Sanctuaries Act (NMSA) authorizes the Secretary of Commerce to designate and protect areas of the marine environment with special national significance due to their conservation, recreational, ecological, historical, scientific, cultural, archeological, educational or aesthetic qualities as national marine sanctuaries. Within sanctuary waters, the NMSA allows for regulations to be issued that can, among other things, specify the types of activities that can and cannot occur within the sanctuary (section 308 of the NMSA), and to develop plans that guide day-to-day activities at each sanctuary (sections 304(a) and 304(e) of the NMSA). Five marine sanctuaries overlap with Guadalupe fur seal distribution. The NMSA could provide a potential pathway to protect Guadalupe fur seals and their habitat.

## 2.4 Status Review History

NMFS initiated a Status Review for the Guadalupe fur seal on October 22, 2014 (79 FR 63088). To ensure that a complete review was conducted based on the best available scientific and commercial information, we solicited new information from the public, relevant governmental agencies, tribes, scientific communities, industry, environmental entities, and other interested parties concerning the status of the Guadalupe fur seal. Comments were due on December 22, 2014. We received two comments: one from the Humane Society of the United States and one from The Marine Mammal Center (TMMC).

### 2.4.1 Summary of Comments

The Humane Society of the U.S. was concerned with several factors that could affect the status of Guadalupe fur seals. They stated that even though there was a positive trajectory for the population, it was clouded by incipient threats. These threats included impacts from interactions with fisheries, pollutants, oil spills, climate change, El Niño, and hurricanes. They recommended that we understand these threats better before we suggest a change in protection for Guadalupe fur seals.

TMMC provided information and figures on stranded Guadalupe fur seals that were brought into their facility. These data identified the number of stranded individuals, stranding location, and movement patterns of some individuals that were subsequently satellite-tagged and released.

## **3 SPECIES DELINEATION**

A key task in any ESA Status Review is the delineation of the biological entity whose status it is appropriate to consider under the ESA. The ESA defines a “species” to include:

*“...any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature.”*

A USFWS and NMFS policy (1996) regarding DPS recognition provides that “(T)hree elements are considered in a decision regarding the status of a possible DPS as endangered or threatened under the Endangered Species Act.” These are applied similarly for addition to the lists of endangered and threatened wildlife and plants, reclassification, and removal from the lists:

1. Discreteness of the population segment in relation to the remainder of the species to which it belongs;
2. The significance of the population segment to the species to which it belongs; and
3. The population segment’s conservation status in relation to the ESA’s standards for listing (i.e., is the population segment, when treated as if it were a species, endangered or threatened?).

A population segment of a vertebrate species may be considered discrete if it satisfies either one of the following conditions:

1. It is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors. Quantitative measures of genetic or morphological discontinuity may provide evidence of this separation.
2. It is delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant in light of section 4(a)(1)(D) of the ESA.

If a population segment is considered discrete under one or more of the above conditions, its biological and ecological significance will then be considered in light of Congressional guidance (see Senate Report 151, 96th Congress, 1st Session) that the authority to list DPSs be used “...sparingly” while encouraging the conservation of genetic diversity. In carrying out this

examination, NMFS will consider available scientific evidence of the discrete population segment's importance to the taxon to which it belongs. This consideration may include, but is not limited to, the following:

1. Persistence of the discrete population segment in an ecological setting unusual or unique for the taxon,
2. Evidence that loss of the discrete population segment would result in a significant gap in the range of a taxon,
3. Evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historical range, or
4. Evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics.

Because precise circumstances likely vary considerably from case to case, it is not possible to describe prospectively all the classes of information that might inform the biological and ecological importance of a discrete population segment. If a population segment is discrete and significant (i.e., it is a distinct population segment), its evaluation for endangered or threatened status will be based on the ESA's definitions of those terms and a review of the factors enumerated in section 4(a) of the ESA. It may be appropriate to assign different classifications to different DPSs of the same vertebrate taxon.

The Guadalupe fur seal is not separated into separate populations or segments of populations, as described by the criteria for delineation of the species or distinct population segments, and we do not have genetic information to provide any further species or sub-species/DPS delineation. Consequently, for this review, the Guadalupe fur seal population is considered as a single population and species with only one well-established breeding site.

## 4 SPECIES BACKGROUND

This section summarizes the natural history, biological, ecological, and other information about Guadalupe fur seals that is valuable for describing the status of the taxon under review, and how it may be affected by factors that could potentially threaten its long-term existence. Readers are referred to Gallo-Reynoso (2005) for more details regarding physical description, behavior, and basic biology.

### 4.1 Species Description and Taxonomy

Guadalupe fur seals are classified in the Order Carnivora, Suborder Pinnipedia, Family Otariidae, and Subfamily Arctocephalinae. Their taxonomic status is currently an issue of debate, and there is discussion as to whether they are a separate species (Aurioles-Gamboa and Trillmich 2018). Until recently, the Guadalupe fur seal and Juan Fernandez fur seal were treated as distinct species. The Society for Marine Mammalogy regards them as two subspecies of *Arctocephalus philippii*: *A.p. philippii* (Juan Fernandez fur seal) and *A.p. townsendi* (Guadalupe fur seal) while acknowledging that this classification is based on small sample sizes and the number of genes sampled (<https://www.marinemammalscience.org/species-information/list-marine-mammal-species-subspecies/>). Other entities have not adopted this subspecies classification, and

Guadalupe fur seals are still considered a separate species (*A. townsendi*) by Integrated Taxonomic Information System (ITIS), IUCN, and CITES.

In the North Pacific, the Guadalupe fur seal is found in waters along the west coast of North America from central Mexico (Ortega-Ortiz *et al.* 2019) to southern British Columbia, Canada (Norris *et al.* 2017; Norris and Elorriaga-Verplancken 2019), with rare sightings in Alaska (Lambourn *et al.* 2012; S. Pemberton, California Academy of Sciences, personal communication, 2019). The species breeds primarily in Mexico on Guadalupe Island, but in recent years a small number of pups (<30 per year) have been born at the San Benito Archipelago (Auriolles-Gamboa *et al.* 2010; Sierra-Rodríguez 2015; Elorriaga-Verplancken *et al.* 2016a; Norris and Elorriaga-Verplancken 2019, 2020). In the U.S., they haul out on the California Channel Islands and occasionally on the Farallon Islands. Their presence along the U.S. west coast has increased, and in the last several years a few pups, some of which likely are hybrid Guadalupe fur seals and California sea lions (*Zalophus californianus*) (J. Harris, NMFS, personal communication, 2019), have been born on the Channel Islands (i.e., San Miguel Island) off southern California.

Guadalupe fur seals are dark brown to silver with thick tan-colored underfur. They are sexually dimorphic with adult males considerably longer, larger-bodied, and three to four times heavier than the adult females. Adult males are greater than 2.5 meters (m) in length and weigh >220 kilograms (kg) (Gallo-Reynoso 1994), but these measurements are likely underestimations because the largest males cannot be safely handled and measured. Adult females average 1.5 m (range: 1.37-1.65 m) and 50 kg (range: 40-55 kg) (Gallo-Reynoso 1994). On average, pups weigh 5 kg and are 64 centimeters (cm) long at birth, and 14 kg and 89 cm at weaning, with males longer but not heavier than females at birth and weaning (Gallo-Reynoso and Figueroa-Carranza, 2010). The species has long vibrissae (i.e., whiskers), and those of adult females typically are white. They also have long, prominent, and slightly downturned ear pinnae that stick out from the head, making the pinnae conspicuous. The snout is elongated and pointy with a flattened top. Adult males have a broad neck, chest, and shoulders with a mane comprised of longer and thicker guard hairs that is lighter in color than the body pelage and may have a slightly reddish hue. The foreflippers have dark, short fur on the dorsal surface that extends from the shoulder in a V-pattern but does not reach the tip of the flipper. The hindflippers are long, especially distal to the nail bed as is typical of fur seals, and have fur that covers part of the dorsal surface but the entire sole is covered in black, leathery, hairless skin.

## 4.2 Current and Historical Distribution

Historical records indicate that, before exploitation (1800–1900s), Guadalupe fur seals were distributed along the west coast of North America from at least the northwest Washington Coast to the Revillagigedo Islands off central Mexico (Fleischer 1978; Etnier 2002; Rick *et al.*, 2009; Figure 1). However, most harvest records did not differentiate between northern fur seals (*Callorhinus ursinus*) and Guadalupe fur seals, and Guadalupe fur seals may have been found outside this range. The population was believed to be extinct in the early 1900s until an adult male was observed on San Nicolas Island, CA in 1949 (Bartholomew, 1950) and a small number of animals were found on Guadalupe Island, Mexico, in 1954 (Hubbs 1956). Guadalupe fur seals may have been the most abundant pinniped around the California Channel Islands in the recent

past, though it remains unknown if breeding occurred on these islands (Hubbs 1979; Walker and Craig 1979; Rick *et al.* 2009).

The majority of the Guadalupe fur seal population is centered on Guadalupe Island, a volcanic oceanic island off the west coast of the Baja California Peninsula, Mexico where nearly all (>99%) pups are born (Garcia-Capitanachi *et al.* 2017; Garcia-Aguilar *et al.* 2018; Norris and Elorriaga-Verplancken 2019, 2020). Their preferred habitat is characterized by basaltic rocks and boulders bounded by high cliffs and contains a variety of sizes of crevices along narrow coastlines. In 1997, a small colony with nine pups was discovered at one of the islands comprising the San Benito Archipelago, southeast of Guadalupe Island and on the continental shelf, indicating a potential recolonization of one of their former rookeries (Maravilla-Chavez and Lowry 1999). Less than 30 pups are now born on these islands each year (Aurioles-Gamboa *et al.* 2010; Sierra-Rodríguez 2015; Elorriaga-Verplancken *et al.*, 2016a; Norris and Elorriaga-Verplancken 2019, 2020). Also in 1997, a pup was born on San Miguel Island in California (Melin and DeLong 1999), and since then, a small number of pups have been born there, with some pups likely hybrids with California sea lions (J. Harris, NMFS-AFSC, personal communication, 2019). Guadalupe fur seals are occasionally observed hauled out on other islands off southern California and the Farallon Islands off northern California (Hanni *et al.* 1997; Carretta *et al.* 2017). Additionally, Guadalupe fur seals have been sighted in southwest Gulf of California infrequently since the 1980s (six total sightings from 1985-2015), but with more frequency in recent years; there have been five sightings on Los Islotes from 2016 to 2019 and three sightings of six individuals at sea from 2016 to 2020 (Elorriaga-Verplancken *et al.*, 2021). Since the population was rediscovered in the early 1950s, Guadalupe fur seals have been sighted as far south as Oaxaca, Mexico (Villegas-Zurita *et al.* 2015) and as far north as Alaska, but movements this far south and north are rare (Aurioles-Gamboa *et al.* 1999; Carretta *et al.* 2019; Ortega-Ortiz *et al.* 2019).



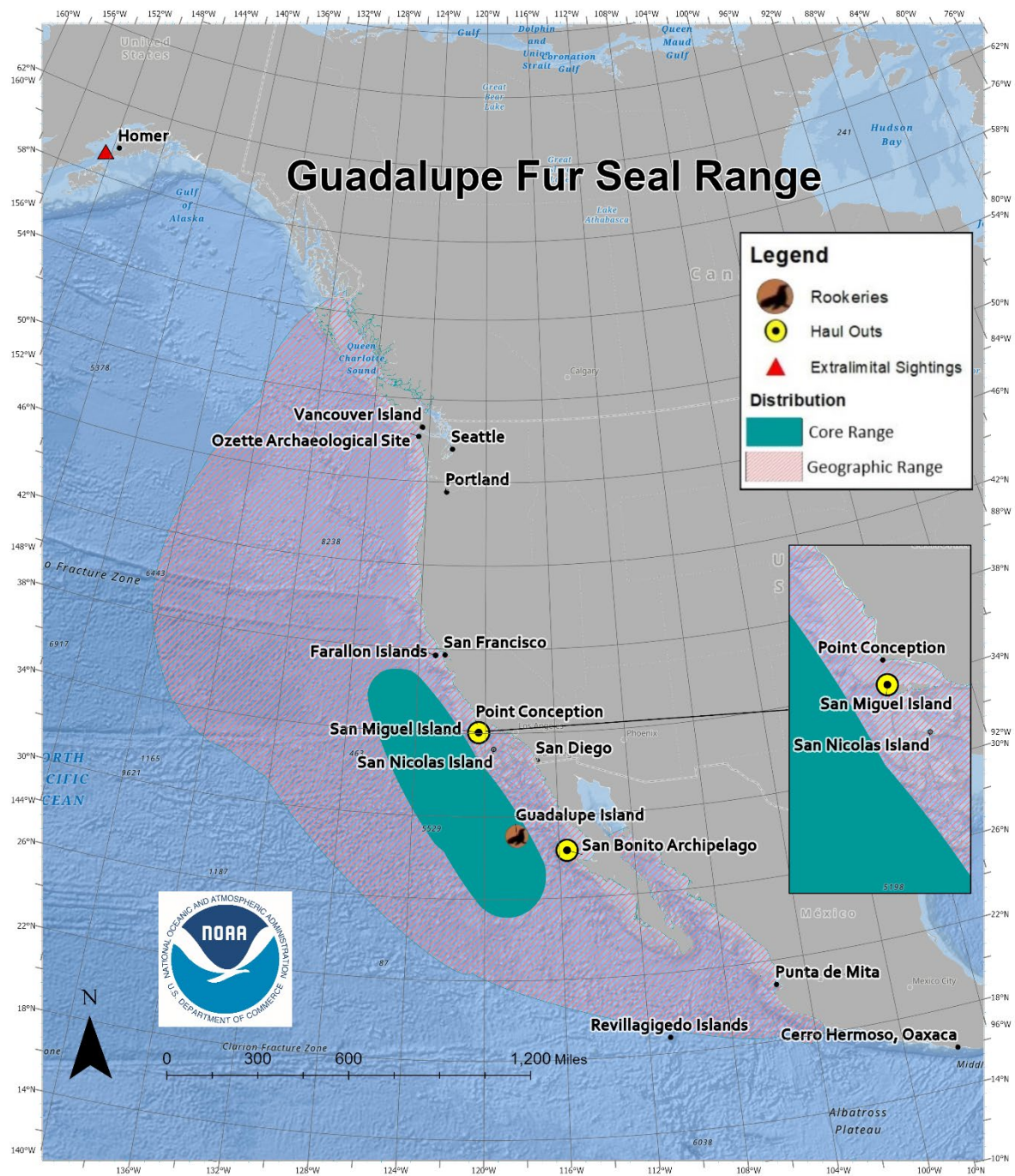


Figure 1. Guadalupe fur seal range off the west coast of the United States and Mexico.

Recent tracking data collected from Guadalupe fur seals tagged at Guadalupe Island in 2016 and 2017 revealed habitat use within the fur seals' range. Tags that were attached to pups showed animals traveling mostly north of Guadalupe Island towards offshore waters of central California (Figure 2A; Norris *et al.* 2017). Non-pups (adult females and juvenile males and females) tagged in April 2017 ranged up to 2,000 kilometers (km) north and south of Guadalupe Island, with juvenile males dispersing farther than juvenile and adult females (Figure 2B; Norris *et al.* 2017).

All animals traveled north except three males that traveled south to the southern tip of the Baja California Peninsula. Animals were rarely found in continental shelf waters (seafloor <200 m deep), but remained within 800 km of the mainland coast (Figure 2; Norris *et al.* 2017). More recent tracking data showed a potentially larger habitat range, with animals traveling up to 1,400 km from shore within the California current ecosystem. More information can be found on the Integrated Ocean Observing System’s Animal Tracking Network, where the behavior, distribution and habitat use of Guadalupe fur seals in the northeast Pacific Ocean from 2016-2021 can be found at: <https://portal.atn.ioos.us/#metadata/4e6441b3-7b64-4352-8110-85d4327c1906/project>.

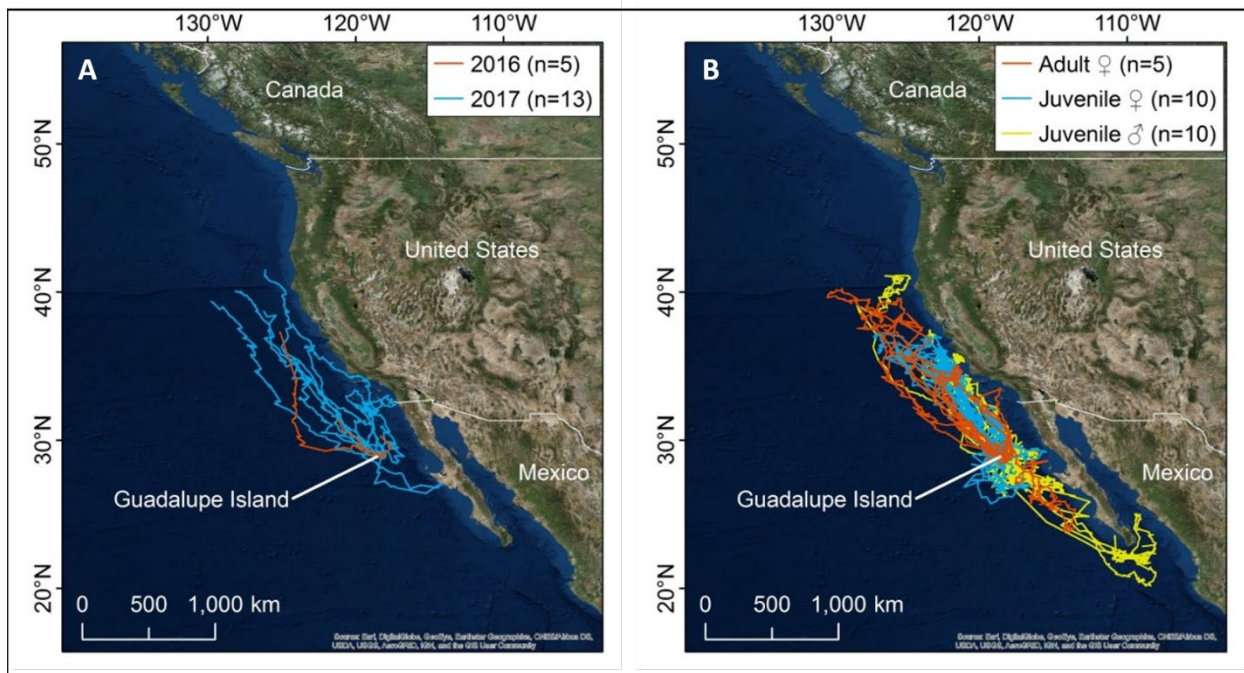


Figure 2. Tracks of Guadalupe fur seal pups (A) and non-pups (B) tagged from Guadalupe Island in 2016 and 2017. Pups were tagged in March-April of both years, but non-pups were tagged in April 2017 only (Norris *et al.* 2017).

Strandings of Guadalupe fur seals have increased in recent years and have provided insight into the distribution of all age classes of animals. Under the MMPA, a “stranding” means “an event in the wild in which (A) a marine mammal is dead and is (i) on a beach or shore of the United States; or (ii) in waters under the jurisdiction of the United States (including any navigable waters); or (B) a marine mammal is alive and is (i) on a beach or shore of the United States and unable to return to the water; (ii) on a beach or shore of the United States and, although able to return to the water, is in need of apparent medical attention; or (iii) in the waters under the jurisdiction of the United States (including any navigable waters), but is unable to return to its natural habitat under its own power or without assistance. (16 U.S.C. 1421h(3)).

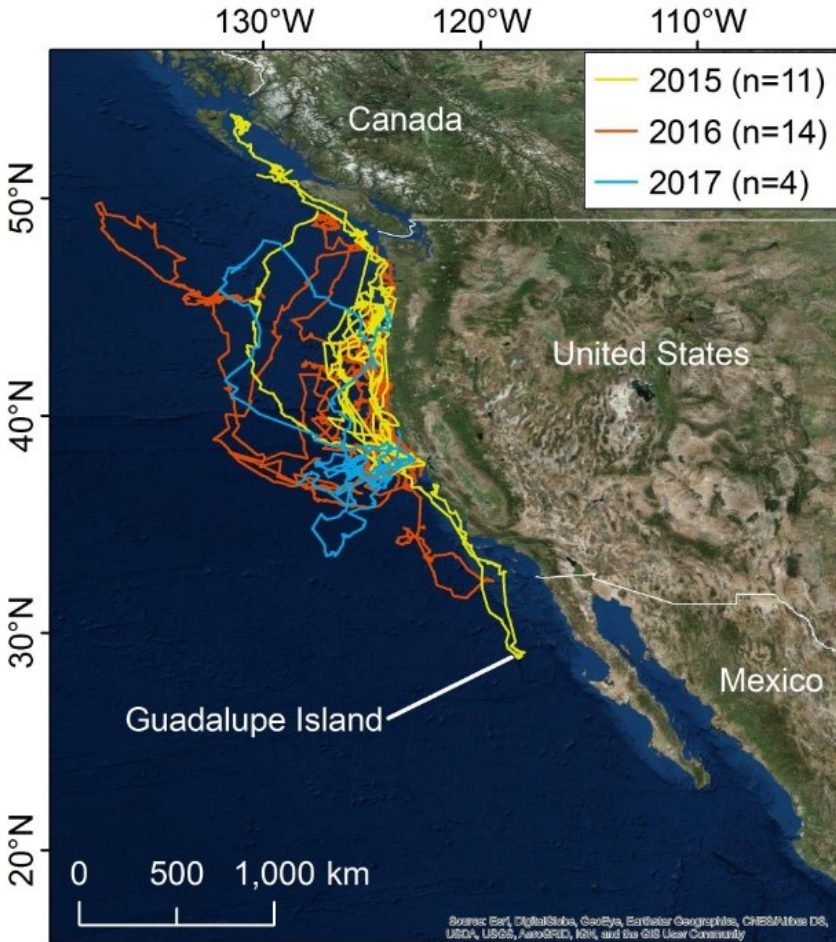
Guadalupe fur seals have stranded in California, Oregon, and Washington and one animal stranded in 1992 farther north, in Cook Inlet, Alaska, during a strong El Niño (Hanni *et al.*, 1997; Lander *et al.* 2000; Lambourn *et al.* 2012; Norris *et al.* 2015). In 2015, strandings were greater than eight times the preceding 5-year average in California and NMFS declared an Unusual



Mortality Event (UME), which is still open. In July 2019, NMFS also declared a UME off the coasts of Oregon and Washington due to unusually high stranding events (<https://www.fisheries.noaa.gov/national/marine-life-distress/2015-2018-guadalupe-fur-seal-unusual-mortality-event-california>). As of May 2021, 649 Guadalupe fur seals have stranded as part of this event, most of which were weaned pups and yearlings (9–15 months old), with both live and dead strandings occurring. Current findings from the majority of stranded animals indicate that malnutrition is the primary cause of stranding, with secondary bacterial and parasitic infections (<https://www.fisheries.noaa.gov/national/marine-life-distress/2015-2018-guadalupe-fur-seal-unusual-mortality-event-california>).

Approximately 50 individuals that stranded during this current UME between 2015–19 along the west coast of the U.S. were rehabilitated and tagged with a satellite transmitter to monitor post-release movement (Norris *et al.* 2017; Norris and Stewart unpublished data). From 2015–17 and in 2019, three juvenile male and 34 weaned pup and yearling Guadalupe fur seals were released from central California with tracking devices. All juvenile males traveled south post-release with two hauling out for 10–12 days on Guadalupe Island, but pups and yearlings primarily traveled north, and those tracked in 2015 had less variable movements, traveled farther north, and remained closer to shore than animals tracked in 2016–17 (Norris *et al.* 2017; Figure 3). More recent satellite telemetry data/maps for Guadalupe fur seals tagged in 2019 can be found on the Animal Telemetry Network website: <https://portal.atn.ioos.us/#metadata/e37b59c0-f5a5-4827-8cad-6c9dca7b553d/project>.

Overall, stranded Guadalupe fur seals released from rehabilitation in central California ranged from British Columbia, Canada to Guadalupe Island, Mexico. They primarily remained offshore of the continental shelf but less than 800 km from the mainland coast of North America. All these data indicate that Guadalupe fur seals are year-round, full-time residents of the California Current System; breeding, traveling, and feeding mostly within the confines of this diverse oceanographic current system.



**Figure 3.** Post-release tracks for 29 Guadalupe fur seals released from rehabilitation from 2015–17. All animals were 11–15 months old at the time of release, except for one juvenile male that traveled to Guadalupe Island in 2015. Tracking durations were  $64 \pm 28$  days. (Norris *et al.* 2017).

### 4.3 Foraging Ecology

Knowledge of the general foraging ecology of Guadalupe fur seals may help us evaluate potential threats to the population. Some threats may affect the physical characteristics of fur seal feeding habitat (e.g., changes in temperature or acidity that affect prey species distribution, survival, or reproduction). Other threats may affect the availability or quality of prey by altering the composition, abundance, or seasonal and temporal distribution of fur seal prey species (e.g., due to pollution and fishery-related removals of prey taxa).

Guadalupe fur seals breed and feed within the California Current System (Gallo-Reynoso *et al.* 2005; Gallo-Reynoso *et al.* 2008), an expansive productive eastern boundary current reaching from the coast to 900 km offshore and extending from the southern tip of Vancouver Island, British Columbia to the tip of the Baja California Peninsula, Mexico. Three Guadalupe fur seals tagged in the early 1990s made large-scale foraging trips, which can last between 3 and 28 days and cover up to 2,375 km (Gallo-Reynoso 1994; Gallo-Reynoso *et al.* 2008). These adult females ranged widely and traveled great distances while foraging during the rearing time

between trips ashore to attend to their pup, which will remain at the rookery until they wean. Trips with distances of 435 to 2,485 miles (700–4,000 km) with durations of 4 to 24 days were reported. Gallo-Reynoso *et al.* (2008) reported that 75 percent of a fur seal's time at sea was spent foraging. Most of their foraging trips occur in feeding areas over the continental shelf in epipelagic waters (Gallo-Reynoso 1994).

Guadalupe fur seals do not make deep dives for prey, preferring to stay at depths shallower than 200 m and feeding mostly between dusk and dawn when prey are closer to the surface (Gallo-Reynoso *et al.* 2008). Gallo-Reynoso (1994) reported an average dive depth of an adult female Guadalupe fur seal of approximately 7–27 m. Foraging occurs throughout the night and dive durations are relatively short. Gallo-Reynoso (1994) reported average dive durations between approximately 1.2 to four minutes, with most dives lasting less than one minute. Dive duration increased as dive depth increased (Gallo-Reynoso *et al.* 2008). Diving capacity is measured by their aerobic dive limit (oxygen concentration, which is related to body size), which is smaller for Guadalupe fur seals than for other pinnipeds (e.g., California sea lion), indicating that their diving abilities, and depths at which Guadalupe fur seals can reach, are physiologically constrained (Aurioles-Gamboa and Camacho-Rios 2007).

During the breeding season, females may fast while caring for their pups for the first week. After approximately eight days, they start alternating foraging trips that range between 4 and 28 days, with nursing periods of 4 to 6 days at the colony. This attendance pattern continues until the pup is weaned at approximately nine months of age (Gallo-Reynoso 1994). Feeding trips of nursing females averaged 10 days (Gallo-Reynoso *et al.*, 2008) and increased in duration as pups got older. Although Guadalupe fur seals often travel great distances to forage, three nursing females traveled an average of 444 km from Guadalupe Island on a single foraging trip (Gallo-Reynoso *et al.* 2008).

Though relatively little empirical data exists to describe population-level dispersal or migratory patterns, like most otariids, adult females tend to remain around the breeding areas when they are nursing pups, but males appear to migrate away from these areas during the winter (Gallo-Reynoso 1994; Norris *et al.* 2017; Norris and Elorriaga-Verplancken 2019, 2020).

Guadalupe fur seals mainly feed on squid and other cephalopods, but also eat fish, including myctophids, mackerel, anchovies, and sardines. The composition of their diet can be determined in several ways, the most common being samples taken from Guadalupe fur seal stomachs and scat. Scat samples from Guadalupe fur seals in Mexico contained relatively little fish (less than 17%) and between 83 percent and 96 percent squid beaks (Gallo-Reynoso 1994; Hanni *et al.* 1997; Aurioles-Gamboa and Camacho-Rios 2007; Gallo-Reynoso *et al.* 2008; Gallo-Reynoso and Esperon-Rodriguez 2013; Amador-Capitanachi *et al.* 2017). Dietary composition may not change with age class (Esperon-Rodriguez and Gallo-Reynoso 2013); however, many of the scat samples may have been from adult females, and therefore, differences in diet may not have been adequately assessed in this study. There also may be a seasonal component to the Guadalupe fur seals' diet and foraging strategy. Aurioles-Gamboa and Camacho-Rios (2007) found that more squid were consumed during the summer compared to the winter, but there was no defined pattern of the diet variation between these two seasons. Juárez-Ruiz *et al.* (2018) found differences in the diet of Guadalupe fur seals during the first half of the breeding season

compared to the last half of the season. One limitation from scat samples is that some targeted prey species or prey parts may not be represented in the sample (Tollit *et al.* 1997), so more data from stomach contents and other sources (e.g., feeding observations) is needed to supplement a more comprehensive understanding of Guadalupe fur seal diet. Seagrass and other plant material also have been found in Guadalupe fur seal scat samples (Aurioles-Gamboa and Camacho-Rios 2007; Pablo-Rodriguez *et al.* 2016). The ingestion of plant matter may be accidental when ingesting squid and fish; however, due to the high proportion in the scat, it may be intentional and used as a natural laxative (Pablo-Rodriguez *et al.* 2016). Conversely, the occurrence of plant matter found in scat samples may be an overrepresentation of their total consumption given that scat samples have a greater proportion of items ingested close to shore, just prior to an animal's return to land, as would be expected for plant matter. Guadalupe fur seals have a clear preference for cephalopods, particularly squid, because of the constraints with their diving abilities and their ability to capitalize on the diurnal vertical migration of the squid; however, there is a diversity of diets consumed by individuals within the same colony (Juárez-Ruiz *et al.* 2018). Foraging diversification may exist among adult female Guadalupe fur seals on Guadalupe Island, based on stable isotopes analyses and scat contents (Juárez-Ruiz *et al.* 2018). Some segregation may also occur between these individuals and those from the San Benito Archipelago, with fur seals from the archipelago feeding on lower trophic level squids and southern foraging grounds relative to the fur seals from Guadalupe Island (Amador-Capitanachi *et al.* 2017).

#### **4.4 Reproductive Biology**

The reproductive behavior of the Guadalupe fur seal resembles that of other otariids. The breeding season occurs from May through August (Seagars 1984; Gallo-Reynoso 1994). During this period, males establish and defend territories, primarily at the south tip (Punta Sur) and along the east side of Guadalupe Island, Mexico. A small number of smaller adult males establish territories on San Benito Archipelago, Mexico. As mentioned previously, most of the terrestrial habitat occupied by Guadalupe fur seals is characterized by narrow coastlines consisting of basaltic rocks and boulders bounded by high cliffs and containing a variety of sizes of crevices.

Territorial males generally arrive at the rookeries in June and depart by early August (Seagars 1984; Gallo-Reynoso 1994) and are largely absent from the breeding sites until the next breeding season, though year-round monitoring does not occur to be able to confirm this (Gallo-Reynoso *et al.* 2005). Subadult and juvenile animals are restricted to peripheral areas of the rookery during the breeding season (Seagars 1984), and are present in lesser numbers (e.g., the breeding population was composed of 35.7% adult females vs. 9.7% juveniles and 4.7% subadult males from 1991 to 1993; Gallo-Reynoso 1994). Females begin arriving in late May, with the majority of females arriving on the rookery during the second and third weeks of June (Seagars 1984). Males are polygamous, forming small territories, and mate with numerous females during a single breeding season. Gallo-Reynoso (1994) found an average of 16 (range: 3-25) females per territorial male, based on 11 successful males followed during three breeding seasons. Mating peaks near the beginning of July. Mating occurs on land when the females are in estrous, approximately one week after females give birth (range: 4 hours to 8 days; Gallo-Reynoso 1994). The median pupping date is July 8 (Gallo-Reynoso and Figueroa-Carranza 2010) and a parturition period from June 5 to August 4 (Gallo-Reynoso 1994). Pups are weaned when they

are around 14 kg (Gallo-Reynoso and Figueroa-Carranza 2010), at approximately 9 months old. Pups are born with a black natal coat that lightens to a dark brown and they molt this lanugo coat approximately four months after birth. With their range overlap and increasing populations in the California Current System, hybrids of Guadalupe fur seal with California sea lions are suspected to have occurred, and perhaps with northern fur seals (*Callorhinus ursinus*) (J. Harris, NMFS AFSC, personal communication, 2019).

Pups have high rates of growth due to the mother's rich milk at 43 percent fat content, which can lead to pups doubling their mass within their first 70 days (Carranza 1994; Gallo-Reynoso and Figueroa-Carranza 2010). Gallo-Reynoso and Figueroa-Carranza (2010) found that the average birth weight at Guadalupe Island was approximately 5 kg, and there was no difference in birth weights between the sexes and across consecutive years (1991–93). There was, however, a difference in pup lengths: males were on average, 67.2 cm and females were 62.5 cm.

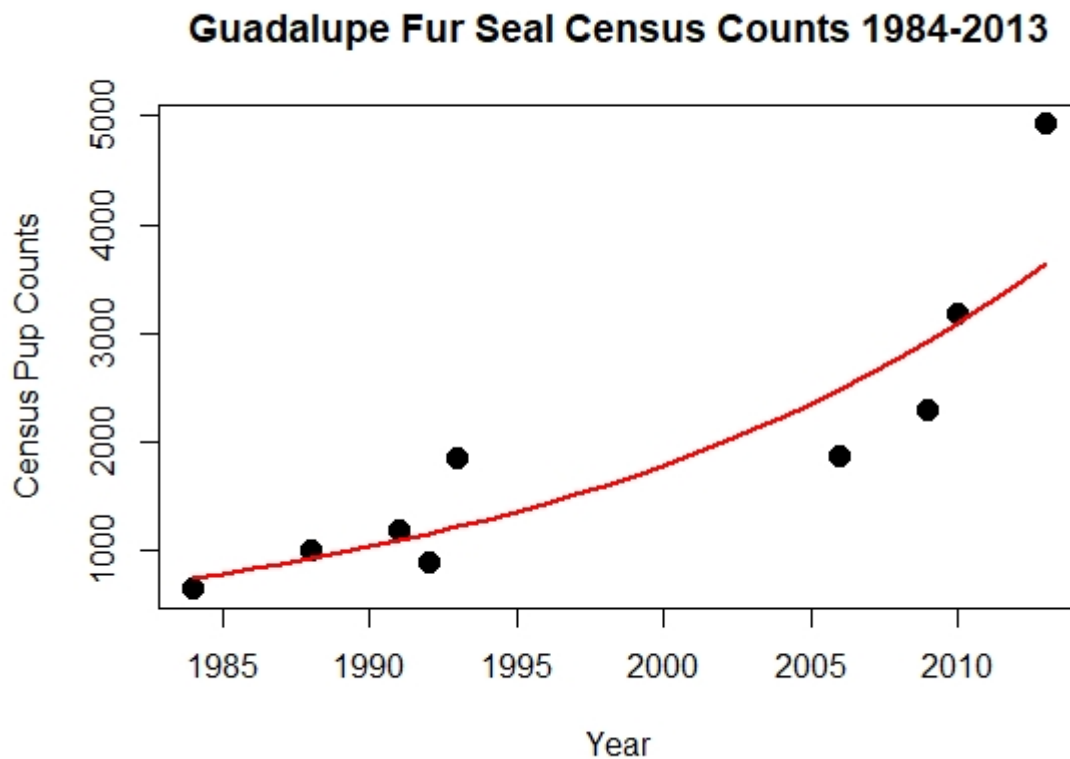
There is no definitive information on survival, reproductive rates, or longevity of Guadalupe fur seals. The age at first reproduction of one satellite-tagged female that was initially tagged as a pup was four years (Gallo-Reynoso 1994), and this is similar to other species in the genus. Like other pinnipeds, Guadalupe fur seals presumably have delayed implantation, resulting in a gestation of approximately nine months and one pup born per season, though females likely do not give birth every year. There is no information on age at sexual maturity, but males and females of other *Arctocephalus* species (e.g., Southern fur seals (*Arctocephalus gazelle*)) reach sexual maturity around 3 to 5 years of age, and males do not establish or maintain territories until they are approximately 7 to 10 years old (Arnould 2009).

#### **4.5 Historical and Current Abundance and Productivity**

This section provides abundance estimates and trends for the Guadalupe fur seal. These data provide insight into whether recovery has been achieved and is likely to continue for the foreseeable future, given assumptions about current and possible future threats.

Guadalupe fur seals were almost hunted to extinction for their fur in the late 1800s. Pre-exploitation numbers could have been as high as 200,000 individuals (Hubbs 1979), and they were likely once the most abundant pinniped that used Guadalupe Island and the San Benito Archipelago and surrounding waters (Walker and Craig 1979). They were thought to be extinct until a reported observation in 1926. Following this discovery, all animals were collected as specimens, and once again, the species was thought to be extinct. Their survival today is likely due to a small number of animals that escaped collection and hunting. There were unconfirmed sightings of animals in the 1930s, but in 1949, a bull was sighted on San Nicolas Island, California (Bartholomew 1950). An expedition to Guadalupe Island in 1954 confirmed the survival of the species (Hubbs 1956). Since the 1950s, the species has recovered from an estimated population of 200–500 animals to approximately 20,000 in 2010, and researchers estimate the population has increased at a rate of 10.3 percent annually through 2010 (Figure 4; García-Capitanachi et al. 2017; Carretta *et al.* 2017). However, García-Aguilar *et al.* (2018) provided an updated estimate of 34,000 to 44,000 individuals in 2013 using Bayesian inference and provided the best available estimated annual growth rate between 1984 and 2013 at 5.9 percent. Specifically, and as presented in the latest stock assessment report (SAR; Carretta *et al.*

2020), the most recent estimate of the population size for Guadalupe fur seals is based on pup count data collected through 2013, with a range of correction factors applied to pup counts to account for age classes that were not counted and pre-census pup mortality. García-Aguilar *et al.* (2018) estimated a total population size by scaling up pup counts and assuming two different total population size-to-pup count ratios (3.5:1 and 4.5:1) that have been used as defaults for other pinniped populations (Harwood and Prime 1978). Using these two ratios, the abundance estimates for Guadalupe fur seals at Guadalupe Island were 34,187 individuals (range 31,019-38,043) and 43,954 individuals (39,882-48,912), respectively. Given this, Carretta *et al.* (2020), used the lower bound of the estimate provided by García-Aguilar *et al.* (2018) (population size: pup count ratio of 3.5:1) to provide a minimum estimate of 31,019 animals. Because the San Benito Archipelago rookery represents a relatively small proportion of the total population and is comprised almost exclusively of immature animals, with a negligible numbers of pups produced at this site (Elorriaga-Verplancken *et al.* 2016b), only the abundance estimates from Guadalupe Island were used to produce a minimum population estimate for the 2019 SAR.



**Figure 4. Guadalupe fur seal census counts (1984-2013). Source: Carretta *et al.* 2020.**

Guadalupe fur seals have been recovering in part because of the protections provided by the MMPA and ESA in the United States and government protections in Mexico. However, it is difficult to determine current population estimates and trends because consistent monitoring of the population at Guadalupe Island has been lacking, with no complete census data available for 2011–2017. Population censuses at Guadalupe Island and San Benito Archipelago was

performed in summer 2018 and 2019. The population counts (represented in Figure 4 *in* Norris and Elorriaga-Verplancken 2020) are not directly comparable to the most recent published population estimates from Garcia-Aguilar *et al.* (2018) but are comparable with all raw counts although there may have been differences in survey methods through time. In 2018 and 2019, approximately the same number of animals were observed at Guadalupe Island, but the number of pups decreased by 19.2% in 2019 relative to 2018 (Figure 4 *in* Norris and Elorriaga-Verplancken 2020). This decrease in the number of pups from one year to the next may reflect unavoidable differences in survey methods, interannual population fluctuations, or a longer term decrease in abundance. Pup production has remained relatively constant at San Benito Archipelago from 2007–2019, but overall abundance has decreased significantly at this site since 2009 (Aurioles-Gamboa *et al.* 2010; Elorriaga-Verplancken *et al.* 2016b; García-Capitanachi *et al.* 2017; Norris and Elorriaga-Verplancken 2019, 2020). Thus, Guadalupe fur seal abundance at Guadalupe Island appeared to be inversely related with abundance at San Benito Archipelago. With these opposing population trajectories, recurrent UMEs along the U.S. west coast, and persistent warm water anomalies in the California Current System in recent years, ongoing annual population monitoring at Guadalupe Island and San Benito Archipelago are necessary to generate accurate and current population estimates and trends for Guadalupe fur seals.

## **5 EVALUATION OF LISTING FACTORS**

### **5.1 Process for evaluating whether the biological and listing factor recovery criteria have been met**

Following regulations implementing the ESA (50 CFR 424.10 and 424.11) and recommendations by NMFS’ finalized guidance on the content of Status Reviews under the ESA, this section reviews the best available scientific and commercial information to evaluate whether recovery of the species has or has not occurred. The evaluation considers the five listing factors included in section 4(a) of the ESA. We evaluate whether the best available information indicates that the Guadalupe fur seal currently meets the definition of a threatened or endangered species under the ESA.

ESA section 4(f)(1)(B) requires that recovery plans, to the maximum extent practicable, include “objective, measurable criteria which, when met, would result in a determination ... that the species be removed from the list.” Since NMFS has not developed a recovery plan and therefore, we do not have recovery criteria for this species, we used the criteria listed in the Final Rule for listing Guadalupe fur seal as threatened under the ESA to prompt the initiation of this Status Review; however, we formed our conclusions about the species’ status based on the best available information about the current and projected status of this species.

In the final rule listing Guadalupe fur seals as threatened (50 FR 51252; December 16, 1985), NMFS noted that a species may be delisted if it is determined that the species is neither endangered nor threatened, with general criteria for determining recovery listed in 50 CFR 424.11(e). NMFS did not include recovery criteria in the listing decision but did include specific criteria that, if one or more were met, would indicate a Status Review for the Guadalupe fur seal

was warranted. These criteria were determined based on the best available information at the time. The specific criteria are:

- 1) Growth to a population size of 30,000 animals;
- 2) Establishment of one or more additional rookeries within the historical range; and
- 3) Growth to the level at which maximum net productivity of the population occurs.

For criterion 1, the estimated size of the pre-exploitation population was 30,000 animals (Seagars 1984) and NMFS stated in the listing rule that this level would be sufficient to warrant reassessment of the species' status (50 FR 51252; December 16, 1985). After a thorough review of the best available science, we have determined that the pre-exploitation numbers may have been underestimated in the original Status Review. Pre-exploitation numbers could have been as high as 200,000 individuals (Hubbs 1979), and the species was likely once the most abundant pinniped that used Guadalupe Island and the San Benito Archipelago and surrounding waters (Walker and Craig 1979). Population abundance was likely higher given that it was reported that at least 52,000 Guadalupe fur seals were killed on several islands off the Pacific coasts of Mexico and the United States from the late 1700s to 1800s (Townsend 1931). Regardless, the population growth to 30,000 animals meets one of the criteria to warrant a review of the Guadalupe fur seals' status. We note that the population size at which we might determine the species has recovered has not yet been determined.

Criterion 2 indicates healthy population growth. The establishment of isolated breeding sites may indicate that the primary colony is no longer able to support the size of the population, thus resulting in breeding range expansion. Multiple rookeries also may reduce the potential for adverse effects on a population from a localized catastrophic event, or from human interactions, thereby diminishing the need for protective measures of the ESA. Even though Guadalupe fur seal births have occurred at San Benito Archipelago and San Miguel Island, these births represent less than one percent of the total annual births (Aurióles-Gamboa *et al.* 2010; Sierra-Rodríguez 2015; Elorriaga-Verplancken *et al.* 2016a; Norris and Elorriaga-Verplancken 2019, 2020), of which the rest of the births (99%) occur on Guadalupe Island. Recent observations of Guadalupe fur seals in more northern locations may indicate that the current range is expanding to encompass parts of its historical range. While these sites do represent an expansion of their current range, they are well within the limits of their historical range, and therefore, should be considered recolonization sites, and not the establishment of new rookeries or range expansion.

To meet criterion 3, the population level must be resilient to threats; the maximum net productivity level (MNPL) is a definitive point in the dynamics of a recovering population. The growth rate of the population begins to decline at the MNPL as density-dependent factors begin to manifest. A qualitative determination that a population has passed the point at which the MNPL occurs can be made by monitoring the rate of population growth over time. A population above its MNPL is resilient and may be able to respond to reductions by increasing productivity. This resiliency provides some protection to the population and may indicate that the protective measures of the ESA are not necessary. The rate of population growth over time has not been monitored consistently for Guadalupe fur seals. Until more reliable (i.e., annual) data is collected, MNPL cannot be calculated for Guadalupe fur seals.



### 5.1.1 Time Frame for Evaluation: The Foreseeable Future

The ESA and implementing regulations provide the following definitions of an “endangered species” and a “threatened species” (16 USC 1532(6) & (20); 50 CFR 424.02):

*Endangered species means any species which is in danger of extinction throughout all or a significant portion of its range.*

*Threatened species means any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.*

“The foreseeability of a species’ future status depends upon the foreseeability of both the threats to the species and its response to those threats. When a species is exposed to a variety of threats, each threat may be foreseeable on a different time frame...” (Cameron *et al.* 2010).

The term “foreseeable future” is used here to refer to the timeframe over which identified threats to the species can be reasonably foreseen, in terms of both type and magnitude, and the species’ response to those threats can be assessed. In this review, the term is not interpreted to limit the timeframe under consideration to the length of time into the future for which a species’ status can be quantitatively modeled or predicted. The appropriate period of time corresponding to the foreseeable future depends on the particular kinds of threats, the life-history characteristics, and the specific habitat requirements for the species under consideration. A wide range of values has been offered regarding the appropriate time horizon for the foreseeable future when evaluating “threatened” status (e.g., 10–20 years, 100 years, or various multiples of a species’ generation time). Different threats, however, may be foreseeable over different periods. Various threats to a species, and the species’ response to those threats are not, in general, equally predictable or foreseeable (Cameron *et al.* 2010). In some cases, the ability to foresee a potential threat to the species is greater than the ability to foresee the effect of the threat on a species, the population-level response to such effects, or the timeframe of such a response, to that threat.

We rely on the best scientific and commercial data available in assessing any given threat and its foreseeability. In the following analysis, the foreseeability of each threat is considered separately as is the foreseeability of the species’ response to each threat.

## **5.2 Evaluation of Status and Extinction Risk**

### 5.2.1 Recent Population Status and Trend Data

Section 3.5 of this document reviews the best scientific information available concerning Guadalupe fur seal population status and trends, and newly available information since the listing rule (50 FR 51252; December 16, 1985). The best available information indicates that the Guadalupe fur seal population has increased from an estimated 200–500 individuals in the 1950s to approximately 20,000 in 2010 (Garcia-Capitanachi *et al.* 2017). Garcia-Aguilar *et al.* (2018) included information from 2013 pup counts at Guadalupe Island (4,924 individuals), and noted an updated estimate of 34,000 to 44,000 individuals in 2013 using Bayesian inference. The

estimated annual growth rate of the Guadalupe fur seal between 1955 and 2010 was 10.3 percent (Carretta *et al.* 2017). A refined growth estimate from 1984 to 2013 was at an average annual growth rate of 5.9 percent (range 4.1–7.7%; Garcia-Aguilar *et al.* 2018). However, these population estimates and growth rates were based on census data collected eight years ago and do not include a period with unprecedented strandings in California (ongoing 2015 UME for this species) that likely will have population-level consequences.

### **5.3 Evaluation of the ESA Listing Factors and Associated Criteria**

As required under regulations implementing the ESA (50 CFR 424.11(e)), NMFS acknowledged that, before delisting, the agency needs to determine if the species still needs protection under the ESA. “To delist...a species, we follow a process similar to” that “when we consider a species for listing” (USFWS, Delisting a Species: <https://www.fws.gov/endangered/esa-library/pdf/delisting.pdf>). Thus, as part of our Status Review, we have explicitly considered whether there are threats to the population under the five factors specified in section 4(a) of the ESA, using the best available scientific information. We evaluated whether such threats render the species to be in danger of extinction throughout all or a significant portion of its range, or likely to become so in the foreseeable future. “Threats” are human or natural events/actions that are responsible for, contributing to, or could contribute to, the key limiting factors. Residual threats are those that “...collectively, are sufficiently reduced and contained that the species no longer meets the definition of threatened or endangered” (USFWS and NMFS 2008). Future threats are activities that are likely to happen but are not currently occurring, or that currently may exist and are likely to continue to and/or result in a mounting risk to the species. The focus of this evaluation is on those threats that may be reasonably thought to be of sufficient magnitude that they could render Guadalupe fur seals, which are currently listed as threatened, as likely to remain in danger of extinction throughout all or a significant portion of its range.

#### **5.3.1 Factor A: The Present or Threatened Destruction, Modification, or Curtailment of a Species’ Habitat or Range**

##### *5.3.1.1 Global Climate Change*

Climate change is a long-term, sustained trend of change in the climate. Human-emitted greenhouse gases have resulted in long-term warming of the planet, with much of the excess heat (>90%) stored within the world’s oceans. The past five years (i.e., 2015–19) are the warmest in the ocean since the mid-1950s, according to measurements using modern instruments (e.g., measuring ocean heat content), and the past ten years are also the warmest years on record (Cheng *et al.* 2020). The effects of warming waters have impacted marine ecosystems and are likely to continue in the future. These impacts include changes in circulation, ocean stratification, upwelling, acidification, nutrient input, oxygen content, primary production, species distribution, phenology, food webs, sea-level rise, extreme weather events, and ecosystem functions (NOAA 2013). Several of these specific climate change-driven threats are analyzed in separate sections below (Sections 4.3.1.1.1 – 4.3.1.1.4).

There is a high degree of variability in the vulnerability and response of marine organisms to the impacts of climate change. Species with more plastic life histories and/or higher physiological tolerance for changes in environmental conditions will likely experience fewer impacts related to climate change (NOAA 2013). In general, marine mammals are K-selected organisms, meaning they reproduce at a later age, are slow to mature, and give birth to fewer offspring compared to r-selected organisms, which produce many offspring. They are fast learners and have an innate resilience to respond to environmental changes; however, they may not be able to change their physiology or other biology to adapt quickly to large- or small-scale changes.

There is a level of uncertainty as to how climate change may affect Guadalupe fur seals. However, past events caused by climate change, give us an idea of how these changes in the climate and the ocean will affect Guadalupe fur seals. These include anomalously warm water events, increased extreme weather events (e.g., hurricanes), ocean acidification, and harmful algal blooms.

Physiological effects on Guadalupe fur seals due to climate change may include changes in growth, reproduction, and survival. Other associated impacts include increases in exposure to novel diseases, contaminants, and biotoxins, and shifts in species distributions and ranges that can lead to increased competition for resources, exposure to predators, and increased risk of human interactions (NOAA 2013), or even exposure to new threats. As ocean temperatures continue to increase, sea-level rise is likely to become more extensive and impact habitat (NOAA 2013), such as in coastal areas that Guadalupe fur seals depend on for breeding and hauling out (discussed further in detail below).

Changes in ocean temperature may lead to thermal stress, which can cause an increase in metabolic oxygen, resulting in an oxygen deficiency at the cellular level. Warm-blooded animals, like Guadalupe fur seals, must maintain constant body temperature. Therefore, temperature changes outside of their preferred range require additional energy to regulate body temperature. If temperatures become too warm or too cold to maintain their body temperature, sub-lethal and lethal effects may occur (NOAA 2013).

Extreme weather events are increasing due to changes in climate. These changes may alter average winter and summer temperatures, which can have negative impacts on marine mammals and their prey, leading to mortality events due to thermal stress.

The distribution of animals, including the food supply for Guadalupe fur seals, will change with changes in ocean temperature (Sanford *et al.* 2019). The geographic and depth ranges of prey are expected to change, altering food webs. This could have negative or beneficial impacts on marine species. Decreases in prey are known to cause nutritional stress and immune suppression. Increased exposure to unfavorable environmental temperatures, like increased ocean temperatures, may increase nutritional deficiencies (NOAA 2013). Guadalupe fur seals may be more impacted by climate change than other pinnipeds because their feeding strategy is narrower (i.e., they can dive to shallow depths only and are prey specialists, eating mostly squid) and they may not be able to adapt to changes in prey availability, especially if the prey moves to waters outside the range of the seals' physiological abilities (Auriolles-Gamboa and Camacho-Rios 2007; Pablo-Rodriguez *et al.* 2016).

Disease outbreaks in marine mammals have occurred for many years, but climate change may be exacerbating this threat. The impacts of climate change on disease likely are related to species distribution shifts, changes in contact frequency, changes in the number of individuals carrying disease, novel disease introductions, pathogen reproduction, and increased stress of hosts (NOAA 2013). Harmful algal blooms also are influenced by the changing climate, and there has been an increase in the blooms and associated marine mammal mortality due to these events over the past three decades (OCCRI 2010).

The effects of climate change on Guadalupe fur seals are discussed in more detail below. Because Guadalupe fur seals have only one main rookery, have physiological diving constraints, and are prey specialist—consuming cold-blooded species that are especially sensitive to changes in ocean temperatures—the effects of climate change and the specific threats driven by climate change may have negative consequences to the population. As stated previously, these specific threats driven by climate change include anomalously warm water events, increased extreme weather events (e.g., hurricanes), ocean acidification, and harmful algal blooms.

#### *5.3.1.1.1 Anomalously Warm Water Events*

Warm water events such as El Niño and marine heatwaves such as “the blob” (NASA Earth Observatory 2016) can significantly impact species distributions. El Niño events occur, on average, every three to five years, and are characterized by an unusual warming of the waters that are nutrient-poor in the central and east-central equatorial Pacific. During El Niño events, the normally westward flowing Equatorial Currents reverse direction and flow eastward, enabling warm, nutrient-depleted water from the tropical Pacific to flow southward along the South American coast and northward along the North American coast. The southward flow weakens during this time, decreasing nutrient enrichment in southern areas. Water temperatures are determined by measuring the top millimeter down to 20 meters below the sea surface, referred to as the sea surface temperature (SST), but warming at depth also occurs. “The blob” was a mass of warm water in the North Pacific Ocean caused by a combination of warmer air temperatures, changes in the patterns of wind speed, direction and duration, and the persistent mass of warmer water along the equator. This was an anomalous event, unprecedented in its magnitude and duration. Recent information has indicated that this type of warming event occurred again in 2019 (<https://www.fisheries.noaa.gov/feature-story/new-marine-heatwave-emerges-west-coast-resembles-blob>), suggesting this may become a more common phenomenon.

Guadalupe fur seal distribution along the U.S. west coast may be influenced by El Niño events, depending on the strength and longevity of the event. Guadalupe fur seals may move outside of their usual range (e.g., northward or farther from shore over larger areas) following warmer conditions (Hanni *et al.* 1997; Elorriaga-Verplancken *et al.* 2016a). Reduced sightings of species in their normal range, or increased sightings outside of their normal range, may indicate a change in population size in those areas during an El Niño event (Elorriaga-Verplancken *et al.* 2016b). For example, the only known sightings/strandings of Guadalupe fur seals in Alaska also occurred during the strong El Niño events of 1992–93 (Lambourn *et al.* 2012) and 1997–98 (S. Pemberton, California Academy of Sciences, personal communication, 2019). In addition, a single pup was born on San Miguel Island during the 1997–98 El Niño event, which was the first

evidence of Guadalupe fur seal reproduction observed in the Channel Islands in recent history (Melin and DeLong 1999). These relatively recent changes in the distribution and movement of Guadalupe fur seals may be attributed to anomalously warm waters in the California Current System.

Elorriaga-Verplancken *et al.* (2016a) found that during anomalously warm water events (including El Niño), Guadalupe fur seals at San Benito Archipelago increased their isotopic niche breadth (i.e., the isotopic values of elements in their tissues) in 2015 compared to 2014, likely due to an increase in the distance traveled and foraging effort rather than a change in diet. These authors also found a reduction in the abundance of the total Guadalupe fur seal population at this site by nearly 60 percent that year. This indicates that warming conditions likely require animals to forage farther from their terrestrial sites and spend more time at-sea, which may mean females have to leave their pups for longer periods. Because greater than 99 percent of Guadalupe fur seals breed on Guadalupe Island, lactating females, which need to stay close to the rookery for nursing, will be restricted in the areas accessible for foraging due to warm water events. Additionally, a wealth of information documents linkages between climate and ocean systems, as well as changes in the climate that can produce dramatic changes in the characteristics of the marine ecosystem (NOAA 2013). Future impacts from climate are not entirely known, but it is expected that these two changes will result in reduced productivity and loss of marine diversity in many marine regions (OCCRI 2010).

Warming oceans can impact Guadalupe fur seals' prey (e.g., fish and squid) – which are cold-blooded – by impacting their vertical and horizontal distribution and abundance. Squid species also have faster growth rates and shorter life spans than small pelagic fish species, which could lead to smaller size and reduced reproductive output due to increasing temperatures (Pech and Jackson 2008) and subsequently impact the prey availability and quality for Guadalupe fur seals. Elorriaga-Verplancken *et al.* (2016a) and Pablo-Rodriguez *et al.* (2016) found that Guadalupe fur seals were less resilient than other otariids (e.g., California sea lion) to changes in prey availability because they have a smaller natural foraging range and narrower diet.

Warming conditions in the northeast Pacific Ocean and subsequent changes in distribution can have adverse effects on Guadalupe fur seal health and survival. For example, warmer summer air temperatures may impact breeding behavior (e.g., males' ability to defend territories; pups may be born closer to the water line leading to a higher likelihood of being washed away; and overcrowding of all animals, increasing the potential for pups to get trampled). Repeated mortality events may result in decreased populations (NOAA 2013). As detailed above, increasing ocean temperatures can also impact prey distribution, and thus require Guadalupe fur seals to increase their foraging efforts by traveling farther and longer to access their prey. For lactating females and their dependent pups, this increase in time that a mother is away from the rookery may affect reproductive success and pup survival. The pup may starve before the mother can return to the rookery, or be weaned at a lower than normal weight due to less nutrient transfer from the mother to a pup, leading to potentially reduced survival at weaning and during the initial post-weaning period (Elorriaga-Verplancken *et al.* 2016a; Gálvez *et al.*, 2017). In addition, females may abandon their pups, leading to pup mortality. For example, females foraged for longer durations, an average of 9 days during the 1992 El Niño and 13.5 days in post-El Niño 1993, which may be attributed to a northward shift in food distribution during El Niño

years, although the increased foraging durations during these two years were not significantly different than years without El Niño events (Gallo-Reynoso *et al.* 2008).

Strandings of Guadalupe fur seals have also increased during warm water events, and emaciation, septicemia, and pneumonia were common findings (Hanni *et al.* 1997; Elorriaga-Verplanckan *et al.* 2016b). This increase in stranding numbers for Guadalupe fur seals may be due to the difficulty in finding prey in warmer water conditions, which may lead to emaciation and poor health. In addition, because Guadalupe fur seals are a pelagic species, tending to stay offshore of the outer continental shelf, their occurrence in shallower near-shore waters is not consistent with their normal distribution and may be a sign of distress leading to strandings.

Recently, increased strandings of Guadalupe fur seals have occurred along the entire coast of California beginning in January 2015 with strandings eight times greater than the preceding 5-year average (<https://www.fisheries.noaa.gov/national/marine-life-distress/2015-2018-guadalupe-fur-seal-unusual-mortality-event-california>). This event was declared an Unusual Mortality Event, and while El Niño conditions disappeared until 2019 and La Niña or neutral conditions occurred from mid-2016 to late 2018, the elevated strandings continued. This UME is considered ongoing as of May 2020. In 2019, the number of strandings increased in the states of Oregon and Washington, prompting the inclusion of those states into the ongoing UME designated in California.

With increasing pressures from climate change, the severity and number of El Niño events are likely to double (Cai *et al.* 2014). These events could influence the survival of pups and/or adults at breeding sites, pups during the post-weaning period, and prey distribution and availability. El Niño is an irregular event but generally occurs every few years. Climate models are predicting that these types of events may occur more frequently in the future (Horton 2018). Although past El Niño events have had negative effects on the Guadalupe fur seal population, the population is still increasing, suggesting that they can recover from these events. However, future events are predicted to be more intense and occur more often and the Guadalupe fur seals may not be able to recover as successfully in between these events. In addition, there are events, such as other unusual warming events (e.g., “the blob”), that can compound the issue.

Other warm water anomalies like “the blob,” are separate from El Niño events, but together, they have strong negative impacts on marine productivity. The blob is a mass of warm water in a location where winds normally blow surface water temperatures west into the Pacific. El Niño events include these same winds diminishing or disappearing. Together, warm waters stay in the area and the effects, both terrestrial and marine, increase. These types of anomalously warm events known as marine heatwaves are predicted to continue and increase in frequency.

Another effect of climate change and increasing water temperatures is thermal expansion caused by warming of the ocean (since water expands as it warms) and increased melting of land-based ice, such as glaciers and ice sheets, leading to increases in the sea level. Over the period 1901 to 2010, the global average sea level rose by 0.19 meters (approximately 7.5 inches) (IPPC 2014). Sea level continues to rise, and some models predict that global sea-level rise could exceed two meters by 2100, though with a high level of certainty (Bamber *et al.* 2019). Many beaches and coastlines have experienced the impacts of rising sea levels worldwide, especially island

communities. Guadalupe fur seals' terrestrial habitat at their major haulouts is a primarily narrow coastline backed by steep cliffs, which may be especially problematic if shoreline disappears due to sea-level rise.

#### 5.3.1.1.2 *Increased extreme weather events*

In addition to warm water events, such as El Niño, other natural occurrences driven by climate change can impact Guadalupe fur seals, including hurricanes, volcanic activities, earthquakes, and tsunamis, flooding, and storms. In 1992, the Guadalupe fur seal population decreased due to a 33 percent pup mortality rate caused by a combination of El Niño and Hurricane Darby (July 6-10, 1992) that struck Guadalupe Island during the peak of the pupping season (Gallo-Reynoso 1994). The hurricane caused the sea level to rise  $\pm 30$  cm above normal, resulting in high surf and tides that flooded the territories, creating confusion between individuals and separating pups from their mothers. The high surf, with waves as high as 15 m, dragged pups away from the rookery, causing injuries and death by drowning, and modified the attendance behavior of females, who took from 3 to 28 days to return and nurse their pups (Gallo-Reynoso 1994). Many of the pups that did not die as a result of the hurricane were orphaned and eventually died; pups started to die after 30 days of fasting (Gallo-Reynoso 1994). Due to this hurricane, the population was reduced by more than 60 percent; the population peaked at approximately 6,400 individuals in 1993 and decreased to approximately 2,400 individuals in 1995 (when the effects of pup mortality from Darby in 1992 was evident in pup production). The population did not return to pre-hurricane numbers until nearly a decade later, between 2000 and 2003 (Figure 4).

The Guadalupe fur seals' habitat remains susceptible to future hurricanes. Models predict that hurricanes in the Pacific may become less frequent with climate change, but they are likely to be more intense, have higher precipitation rates, and persist for longer periods (Knutson *et al.* 2015). With only one established rookery, a single hurricane or tropical storm hitting Guadalupe Island, especially during the breeding season, likely would be catastrophic to the Guadalupe fur seal population.

Other natural events may not have impacted Guadalupe fur seals or their habitat in the past but may affect their habitat in the future. These include volcanic activities (i.e., Guadalupe Island and San Benito Archipelago are volcanic islands, although they are currently dormant), as well as potential impacts from nearby earthquakes and tsunamis and flooding or storm damage due to storms, high winds, ocean swells, and surges. As mentioned previously, sea-level rise at Guadalupe fur seal rookeries and haulouts would be especially problematic given the seals' preferred habitat of narrow shorelines backed by steep cliffs. Besides the loss of important habitat, damage to the cliffs could cause Guadalupe fur seal injury or mortality. There would be no alternative area for the seals to utilize if this habitat was damaged or lost.

#### 5.3.1.1.3 *Ocean Acidification*

Recent analyses have begun to elucidate the impacts of ocean acidification on marine organisms and the ecosystems upon which they depend. Different areas may respond to ocean acidification differently. Regions with strong upwelling, like along the United States west coast, may be more

vulnerable because upwelled waters have naturally higher carbon dioxide and lower pH levels. This makes the marine ecosystem of the U.S. west coast especially vulnerable to the impacts of ocean acidification (NOAA 2013).

Gruber *et al.* (2012) concluded that they were "...able to project with some confidence the chemical changes associated with the future evolution of ocean acidification in the California" Current System and that the results of their simulations indicate that this system "...is moving rapidly towards conditions that are well outside of the natural range..." that "will be challenging" to both calcifying and other organisms and related fisheries. The specific responses of most marine species to ocean acidification are not yet known (NMFS, 2010), and with regards to ocean acidification and the California Current System specifically, Gruber *et al.* (2012) stated that "... the impacts of these chemical changes on organisms, ecosystems, and biogeochemistry remain highly uncertain."

Virtually every biological function has been shown to respond to ocean acidification. Impacts may include changes in survival, growth, metabolism, timing and magnitude of reproduction, and increased susceptibility to disease (NOAA 2013). Changes in pH associated with ocean acidification also can impact sound absorption; a decrease in pH results in a decrease of sound absorption of seawater. This change in sound absorption may impact marine mammals (NOAA 2013) since loud anthropogenic sounds can be heard farther away potentially having behavioral or injurious impacts (e.g., temporary threshold shift, permanent threshold shift), and may impact underwater communication.

The potential threats to the Guadalupe fur seal from both ocean acidification and climate change are considered foreseeable, given assumptions about carbon emissions and atmospheric carbon levels, with the window of foreseeability (how far out we can predict the threat) extending to about 2100. This timeframe is associated with current model predictions about both climate change and ocean acidification (e.g., see the IPCC 2014). This threat is considered to be present currently at some level but, more importantly, is expected to increase over time. However, our ability to make predictions about the magnitude, pathways, or timing of long-term effects on Guadalupe fur seals is limited.

Nonetheless, the general effects that ocean acidification may have on the marine ecosystems within the range of the Guadalupe fur seal are becoming more clear, and we can begin to hypothesize about potential pathways through which this species may be impacted. As a large mobile marine predator, Guadalupe fur seals likely are to be more affected indirectly by these factors through cascading trophic level effects. Considering that almost 90 percent of their diet is comprised of cephalopods, the effects of ocean acidification on this marine taxon may be key to how these environmental changes affect Guadalupe fur seals. The geographical and vertical distribution of squid is related to ocean temperature and they also are sensitive to ocean acidification; exposure to high carbon dioxide levels during early developmental stages can result in developmental and physiological effects that could alter survival and behavior (Kaplan *et al.* 2013). Although Guadalupe fur seals also feed on fish, studies conducted during past warm water anomalies show that they do not shift their foraging preferences and behavior to target other taxa, but instead follow the squid to new foraging habitat (Elorriaga-Verplanckan *et al.*



2016a; Amador-Capitanachi *et al.* 2017). This same behavior is expected during future changes in climate.

Consequently, we are concerned about the effects of these factors on the marine ecosystems that Guadalupe fur seals rely on, specifically the California Current System and the Gulf of California. During certain periods of their life history, flexibility to respond to changes in their environment due to a changing ocean is limited by life-history constraints that tie Guadalupe fur seals to terrestrial habitats and specific marine habitats. In particular, the foraging success of nursing females with dependent pups may be negatively affected by environmental factors that change the availability or composition of prey near the breeding rookeries at Guadalupe Island. Additionally, Guadalupe fur seals have a more restricted diet, and less physiological diving capabilities than many other pinnipeds, potentially reducing their ability to adapt to changes in prey availability.

#### *5.3.1.1.4 Harmful Algal Blooms*

Harmful algal blooms, also known as red tide, occur when colonies of algae grow uncontrollably (so-called “blooms”) and produce toxic or harmful effects on people and animals. The effects from different types of algae include: blooms that produce toxins that can kill fish, mammals, birds, and humans; other nontoxic algae can consume all of the oxygen in the water as they decay, and can clog the gills of fish and invertebrates, or smother corals and submerged aquatic vegetation; and other types of algae discolor water, form odorous piles on beaches, or contaminate drinking water. For Guadalupe fur seals, harmful algal blooms can be lethal.

Harmful algal blooms can cause domoic acid (DA) intoxication in marine mammals, including Guadalupe fur seals. Domoic acid is a neurotoxin produced by algae and can accumulate in small fish, which are then eaten by marine mammals in large quantities. DA primarily affects the marine mammal’s brain, causing lethargy, disorientation, seizures, and possibly death. The toxin will naturally flush from an animal’s system over time, but repeated exposure to the toxin will lead to longer-lasting and more serious effects.

The algae that causes DA intoxication in marine mammals thrive in warm waters. With an increase in warming waters off the west coast of the U.S. and Mexico in recent years due to climate change, these blooms and subsequent DA intoxication will likely increase.

Domoic acid was detected for the first time in Guadalupe fur seals in 2014. Samples from 39 Guadalupe fur seals that stranded from 2008 to 2018 were analyzed for the presence of DA. Of those 39, DA was detected in 11 animals (NMFS, unpublished data, 2019). More information about DA can be found in Section 4.3.3.1.

#### *5.3.1.2 Pollutants/Marine Debris/Toxic Substances/Contaminants*

As with other pinnipeds that use the California Current System, Guadalupe fur seals are at risk of exposure to a wide range of persistent organic pollutants (POPs) and anthropogenic contaminants. Among these are Polybrominated diphenyl ethers (PBDEs), polychlorinated biphenyls (PCBs), and persistent insecticides such as Dichloro-diphenyl-trichloroethane (DDT).

Contamination sources can include oil and gas development, industrial and agricultural runoff, vessel discharge, microplastics, and oil spills. These contaminants have the potential to affect the health, reproduction, and immune system of mammals, leaving them more susceptible to disease and other health-related issues (Tanabe 2002).

POPs bioaccumulate through the Guadalupe fur seal's food chain; the pollutants are first ingested by zooplankton and small fish, which are eaten by squid, which are then eaten by Guadalupe fur seals (Bacon *et al.* 1992; Meng *et al.* 2009). Studies also show that a significant fraction of POPs found in juvenile marine mammals are transferred from their mother's milk during lactation. When compared to other parts of the world, pinniped milk samples from California contain the highest overall levels of organochlorines and PCBs (Bacon *et al.* 1992). POPs have also been observed in other marine species found on Guadalupe Island (e.g., Laysan albatross (*Phoebastria immutabilis*); Rios *et al.* 2007).

Marine debris is a threat to all marine species. Plastic is ubiquitous in the environment, including the ocean, and it is having major impacts on marine life. For example, in 2017, the Marine Mammal Care Center of Los Angeles, which responds to stranded marine mammals in Los Angeles County, California, saw an increase from previous years in the number of pinnipeds that died as a result of garbage ingestion. In the previous 24 years, the average number of cases of plastic garbage ingestion was zero to two each year, but in 2017, there were seven cases. In all seven cases, the passageway from the stomach to the intestine was blocked, including one animal that had six plastic bags blocking the passageway (Palmer 2018). While it is unclear what species of pinniped most often ingests macroplastics, it is safe to assume that Guadalupe fur seals are ingesting these same materials. Microplastics are also consumed by marine animals. These can be ingested directly or through the ingestion of prey that have previously consumed microplastics. Seals also consume other types of debris. Ingested styrofoam and other marine debris, for example, were reported in two necropsied Guadalupe fur seals (D'Agnese *et al.* 2020).

Much remains to be learned about the contaminants related to physiological mechanisms and the reproductive health and survival consequences of such substances in Guadalupe fur seals. We note that there are relatively few data on the type, quantity, and extent of contaminants that may be impacting the population; however, in the past two decades there has been an emerging understanding that contaminants, especially those that bioaccumulate and are persistent, can pose a risk to reproductive success and health (e.g., Ross *et al.* 1995; Beckmen *et al.* 2003; Hammond *et al.* 2005). Studies conducted in southern and central California (e.g., DeLong *et al.* 1973; Sydeman and Jarman 1998; Ylitalo *et al.*, 2005) show the potential for adverse consequences of high levels of contaminants in pinnipeds in this more industrialized portion of their range. However, the robust populations of many pinnipeds, such as California sea lions, in these areas indicate that if toxic compounds have affected reproduction or survival, the effects have not been sufficient to impede sustained recovery, given that the populations of most pinnipeds are increasing off western North America. At present, while it is clear that these substances have harmful and even lethal effects on individual animals, we have unanswered questions about the potential for toxic substances to affect health, reproduction, survival, and population-level trends in the range of Guadalupe fur seals.

### *5.3.1.3 Coastal Development and Disturbance*

Coastal development – construction, dredging, marine industry, vessel traffic, and other activities – may lead to more noise, human presence, and other outcomes that can increase disturbance to marine mammals or their prey. Many areas off the west coast of the United States are being developed or repaired. Coastal construction, including repairs, replacements, and installations of piers, wharves, and bridges occur daily. Because Guadalupe fur seals breed and haul out in remote areas with restricted access or that are not inhabited by humans (and not on the mainland coasts with high amounts of human disturbance and coastal development), this species is less likely to be impacted by coastal development activities than many other species. When the seals are not hauled out, they primarily are foraging or traveling offshore in the pelagic zone; and therefore often too far offshore to be significantly impacted by coastal projects.

In conclusion, coastal development is occurring across the west coast of the United States and Mexico; however, Guadalupe fur seals' haulouts in the United States are remote and have limited access or habitation by humans, or they have other protections under federal law.

### *5.3.1.4 Oil and Gas Development*

This section refers to oil and gas exploration and development. For the effects of oil spills on Guadalupe fur seals, see Section 5.3.5.2 of this document.

While Mexico has 88 offshore oil rigs, all of them are on the east coast, in the Gulf of Mexico. There is no available information on any potential oil and gas development activities on the west coast of Mexico, near Guadalupe fur seal habitat. Therefore, we assume that activities are not occurring there, and the risk for effects of oil exploration and development activities to Guadalupe fur seals in Mexico is considered low.

California is the third-largest oil-producing state in the United States, behind Texas and North Dakota. The Bureau of Ocean Energy Management (BOEM) and the Bureau of Safety and Environmental Enforcement (BSEE) manage offshore conventional and renewable marine mineral resources on the U.S. outer continental shelf. There are currently 38 active offshore oil and gas leases within 23 platforms in the Pacific, all of which occur off the coast of southern California. There are no new leases currently planned in offshore California (BOEM 2018). There are also 32 offshore oil and gas platforms and artificial islands where oil is produced, all located in Southern California approximately 4-10 miles off the coasts of Santa Barbara, Ventura, Los Angeles, and Orange counties (BSEE 2014). In 2017, BOEM approved the ongoing discharges, emissions, and vessel and aircraft use under the existing development and production activities in the Southern California Planning Area; no new development or production plans were anticipated for the future. Thus, NMFS concurred that listed species, including Guadalupe fur seal and their critical habitat, were not likely to be adversely affected (NMFS 2017b). However, in January 2018, the federal government proposed new offshore oil drilling off the coast of California, including seven new lease areas along the West Coast, through 2023. Drilling would be restricted in some areas, including national marine sanctuaries (of which there are four along the California coast), state waters (up to 3 miles offshore), and

areas that have local laws that ban the construction of onshore oil terminals, pipelines, and other oil equipment without a public vote, which could stop production from occurring in those areas in the future.

When exploring for oil and gas reserves, geophysical/seismic surveys are used to map the seafloor. These surveys typically use sound waves made with bursts of compressed air from airguns (BSEE 2014). There are concerns with seismic surveys impacting marine mammals due to sound levels from the airgun exceeding hearing thresholds and causing harassment or injury to individuals. When conducting these surveys, certain measures are in place to reduce any potential harm to marine mammals (BSEE 2014). These include marine mammal monitoring, vessel speed restrictions, shutdown zones, and soft starts, among other mitigation measures. Further, any surveys conducted in areas where marine mammals may be present and affected would need authorization under the MMPA, which would require that any taking be of small numbers and have a negligible impact on marine mammal populations.

Guadalupe fur seals can be affected by oil and gas exploration, development, and production activities due to airborne noise from aircraft and vessels, underwater noise (due to seismic surveys, vessels, sonar devices, operation, and deconstruction of production facilities, etc.), and pollution due to discharges and fuel spills. Such disturbance could potentially affect the use of rookeries and haulouts, foraging areas, and other important habitats.

NMFS recognizes that the exploration and development of oil and gas reserves and transportation of products within the Guadalupe fur seal range have the potential to adversely affect portions of this population in the event of large spills or accidents. For more information about oil spills, please refer to Section 5.3.5.2 of this document.

In summary, while oil and gas exploration and development activities have the potential to have adverse effects on Guadalupe fur seals, evidence indicates that Guadalupe fur seals spend very little time in the nearshore habitat of the Southern California Bight, where these activities occur.

#### *5.3.1.5 Military Activities*

Military activities that currently occur in the Guadalupe fur seals' range in the United States include the space launch program at Vandenberg Air Force Base (VAFB) near Pt. Conception and the California Channel Islands, California; military training and testing activities in the Southern California Range Complex and Northwest Training and Testing Offshore Area; and port defense training along the West Coast. Any activities conducted in areas where marine mammals may be present and affected would need authorization under the MMPA, which would require that any taking be of small numbers and have a negligible impact on marine mammal populations.

Space launch activities at VAFB include space vehicle and missile launches; aircraft operations; recovery activities, including in-air boost-back maneuvers and landings, which cause sonic booms. Activities are performed by VAFB and tenant organizations Space Exploration Technology Corporation (SpaceX) and United Launch Alliance (ULA). Military activities include training, testing, and routine military operations (all categorized as military readiness

activities) from the use of sonar and other transducers, in-water detonations, airguns, and pile driving.

Mid-frequency active sonar activities occur in waters near Guadalupe Island, estimated to be within 10-15 km of the training range of Composite Training Unit or Joint Task Force Exercises (NMFS 2007). These activities have source levels of approximately 235 dB re 1  $\mu$ Pa at 1 m. The effects of these activities on Guadalupe fur seals are unknown but are potentially detrimental depending on how close the activities are to Guadalupe fur seals, considering the level at which behavioral effects occur to otariids in water is 160 dB re 1  $\mu$ Pa at 1 m for impulsive sources, and 120 dB re 1  $\mu$ Pa at 1 m for non-impulsive sources, and the level at which injury (PTS) occurs is 232 dB<sub>pk</sub> re 1  $\mu$ Pa at 1 m for impulsive sources and 219 dB<sub>24h</sub> re 1  $\mu$ Pa at 1 m for non-impulsive sources. Examples of short- and long-term effects on Guadalupe fur seals could be displacement or abandonment of foraging areas or rookeries, effects to prey, separation of mothers and pups, and hearing threshold shifts.

NMFS recognizes that military activities within the Guadalupe fur seal range may adversely affect portions of this population; however, activities to date have not reported any population-level effects to Guadalupe fur seals (Navy 2017) despite repeated activities occurring near the only established rookery (Guadalupe Island) and important foraging areas.

#### *5.3.1.6 Conclusion for Factor A*

After weighing these findings, which are based on the best available science, NMFS finds that the Guadalupe fur seal continues to face extinction risks due to threats related to the present or threatened destruction, modification, or curtailment of the species' habitat or range under Factor A. Climate change-driven threats, including warming water events, rising sea levels, extreme natural events, and ocean acidification, are particularly concerning to Guadalupe fur seals because they only have one rookery, with no additional rookeries established should the primary rookery become uninhabitable.

### 5.3.2 Factor B: Overutilization for Commercial, Recreational, or Educational Purposes

#### *5.3.2.1 Subsistence Harvests*

Like other pinnipeds, Guadalupe fur seals were hunted or scavenged by Native Americans. A variety of hunting technologies have been identified along the U.S. west coast, including a distinct stone projectile called the "Channel Islands Barbed," that may have been used to hunt marine mammals, including Guadalupe fur seals. Other types of projectile points and clubs also may have been used to hunt Guadalupe fur seals. The development of the plank canoe roughly corresponds with an increase in Guadalupe fur seals and other pinniped remains in the area. This may suggest an increase in hunting Guadalupe fur seal offshore (Rick *et al.* 2009). Today, Guadalupe fur seals are protected from subsistence harvests based on their status in the United States under the ESA and MMPA, and under Mexican laws.

#### *5.3.2.2 Legal Commercial Harvest (Fur Trade)*

Commercial harvesting of marine mammals has been prohibited in the United States since the MMPA was enacted in 1972. Guadalupe fur seals are also protected by Mexican laws (Fleischer 1978). Guadalupe fur seals were not described as a new species until 1897 after commercial sealing depleted the population (Fleischer 1978). Fur seals on the Farallon Islands were originally identified as Guadalupe fur seal, but a reexamination of the bones indicated they were northern fur seals.

There is a lack of information on Guadalupe fur seal harvest before large-scale commercial sealing, which began in the 19<sup>th</sup> century; however, Hubbs (1979) noted that pre-exploitation numbers could have been as high as 200,000 individuals. By the end of the 19<sup>th</sup>-century, commercial sealers had decimated the Guadalupe fur seal population (Rick *et al.* 2009). There are records of sealing during the initial settling of California, which suggests harvesting of this species may have begun off the islands off the Baja California Peninsula, Mexico just before the 18<sup>th</sup> century (Fleischer 1978).

Due to the competitive nature of the fur seal trade and secrecy of the sealers, there is not a complete set of data of Guadalupe fur seal harvests (Fleischer 1978). According to available published records of fur seals taken on Guadalupe and San Benito Islands from 1834–94, a total of 6,644 fur seals were harvested during that time (Fleischer 1978). There are reports for 1805 that during 19 days 8,338 fur seals, likely Guadalupe fur seals, were killed on the San Benito Archipelago (Hubbs 1956). Reports describe the killing of at least 52,000 Guadalupe fur seals on several islands off the Pacific coasts of Mexico and the United States from the late 1700s to 1848, and the last few were harvested in Mexican waters in the late 1800s (Townsend 1931).

Based on dates engraved on walls at the ruins of sealing stations on Guadalupe Island, there appears to have been at least nine visits to Guadalupe Island by sealers between 1834 and 1881. This population of Guadalupe fur seals was commercially depleted and nearly biologically extinguished (Fleischer 1978). Guadalupe fur seals were thought to be extinct until 1928 when commercial fishermen caught two adult males at Guadalupe Island (Rick *et al.* 2009).

Several laws protect Guadalupe fur seals, including the MMPA and ESA in the United States. In addition, the Fur Seal Act of 1966, prohibits the taking, transportation, importing, or possession of fur seals and sea otters. The Lacey Act prohibits trade in wildlife, fish, and plants that have been illegally taken, possessed, transported, or sold. More information about the requirements of legal trade can be found in the CITES section of Factor D of this document. Illegal trade of Guadalupe fur seals may occur; however, information regarding this activity is not readily available.

### 5.3.2.3 *Scientific Research*

Current scientific research on Guadalupe fur seals is conducted on rescued or stranded animals and wild animals at the California Channel Islands, Guadalupe Island, and San Benito Archipelago. A record of all scientific research conducted on marine mammals within the United States is tracked in an online database called Authorizations and Permits for Protected Species (APPS).

Stranded or rescued Guadalupe fur seals offer a unique opportunity to investigate causes of strandings that might be related to population or ecosystem health and can be used to identify threats that may have important population-level consequences. One project involves collecting blood samples from up to 25 stranded or rescued seals to perform immunodiffusion assays to detect *Coccidioides* spp, commonly known as valley fever (APPS# 19706). Occasionally, rescued seals cannot be released into the wild, and these animals find permanent homes in aquariums or zoos where they are regularly monitored for potential health issues, and also can be studied in a captive environment to help address questions about their behavior in the wild.

Current research in the United States on wild Guadalupe fur seals on the Channel Islands (San Miguel, San Clemente, Santa Barbara, and San Nicolas) and the west coast of California, Oregon, and Washington, includes capturing, tagging, and measurements to assess the health of the species (APPS# 21585), as well as one study looking at the behavioral response of controlled noise exposure (APPS# 19116). One current study researches marine mammal population sizes and structures, habitat use, movement, behavior, and ecology, which could include Guadalupe fur seals (APPS# 20605). There are also current studies researching the interaction between Guadalupe fur seals and anthropogenic noise sources (e.g., military activities, construction, offshore energy exploration; APPS# 21482). The levels of mortality from research-directed activity are very small relative to population size and productivity.

Additionally, several permits have been issued for research on species other than Guadalupe fur seals that may indirectly affect the seals. These projects include research on sea turtles; surveys of, and controlled sound exposure to, other marine mammals off California; fisheries research; and research on endangered abalone. In all instances of scientific research (both direct and indirect research), the determinations under section 7 of the ESA have been that these research activities may affect, but are not likely to adversely affect Guadalupe fur seals.

In general, research on Guadalupe fur seals in Mexico includes abundance estimations, population trends, trophic ecology, health assessment, and telemetry studies. All studies are carefully coordinated with the National Commission for Protected Areas (CONANP) and Secretariat of Environment and Natural Resources (SEMARNAT) in Mexico, specifically the office of the Guadalupe Island Biosphere Reserve and the Pacific Islands of the Baja California Peninsula and Biosphere Reserve. Research on Guadalupe Island has been conducted since the late 1970s and 1980s when a concerted effort was made to census the population (Seagars 1984). Censuses have been sparse and sporadic but occur during the breeding season with a high level of disturbance in areas where surveys are done on foot (Punta Sur, Guadalupe Island). Researchers currently are exploring using unmanned aerial vehicles (UAV, or “drones”) to census the Guadalupe fur seal population to improve the counts and minimize disturbance (Flores Hernandez 2018; Norris and Elorriaga-Verplanckan 2020). Efforts during the breeding season also include flipper-tagging pups that are less than 2 months old, which can be highly disruptive. Research on San Benito Archipelago began in 1999, with a primary focus on juveniles and subadults, since there is little breeding/pupping on the island and fur seal presence is seasonal. Researchers have conducted trophic analyses based on stable isotopes and scat analyses at both Guadalupe Island and San Benito Archipelago (Gallo-Reynoso and Esperon 2013; Elorriaga-Verplanckan *et al.* 2016a; Amador-Capitanachi *et al.* 2017; Juárez-Ruiz *et al.* 2018), as well as health assessments of neonates to determine the cause of death at Guadalupe

Island (Gálvez 2015; Gálvez *et al.* 2017). Other studies in Mexico have tracked abnormal dispersal and strandings of Guadalupe fur seals (Villegas *et al.* 2015; Elorriaga-Verplancken *et al.* 2016b; Ortega-Ruiz *et al.* 2019). During the non-breeding season, TMMC in Sausalito, California, the Interdisciplinary Center for Marine Sciences-National Polytechnic Institute (CICIMAR-IPN), and others have been collaborating on telemetry studies, tagging adult females, juveniles, and/or weaned pups on Guadalupe Island each year since 2016. This work continued through at least the spring of 2020 (T. Norris, TMMC, personal communication, 2019).

DeRango *et al.* (2019) presented the first study to quantify adrenal and thyroid function in Guadalupe fur seals from Guadalupe Island in an effort to measure their stress response to capture. During the capture of adult females and weanling pups, multiple corticosteroids were released, with aldosterone associated with the response to stress only in adults. The study suggests that aldosterone plays an active role in regulating blood pressure and volume by controlling electrolyte and water balance. These results offer further support of the enhanced regulation of aldosterone secretion by the hypothalamic-pituitary-adrenal axis in otariid seals (DeRango *et al.* 2019). This study revealed that evaluating individual and population health by using endocrine responses to capture stress is a viable option.

Scientific research, while having the potential to negatively impact Guadalupe fur seals, may provide indirect benefits to the species, based on the data collected and its application to conservation and management measures for the species.

#### 5.3.2.4 *Ecotourism*

Within the Guadalupe fur seals' range in the United States, ecotourism generally targets other marine mammal species (e.g., whales and dolphins). Pinnipeds, including Guadalupe fur seals, may be encountered on these trips, but are not directly targeted. In general, impacts on Guadalupe fur seals from ecotourism in the United States are considered low.

In Mexico, ecotourism targeting pinnipeds occurs in multiple areas, including Los Islotes (southern Gulf of California) to view California sea lions and on San Benito Archipelago for walking tours to view pinnipeds, including Guadalupe fur seals. Regulatory agencies in Mexico are considering opening Guadalupe Island for ecotourism despite its designation as a biosphere reserve. There have been proposals submitted requesting permission to allow tourists to land on the island and drive small boats close to the island to view the pinniped colonies. If overexploited, ecotourism around wild animals can become problematic for the animals as observed with other species around the world (e.g., Constantine 1999; Boren *et al.* 2002; Bejder *et al.* 2006; Tyne *et al.* 2015). Ecotourism at Guadalupe Island already exists for white sharks. In this regard, if protections for Guadalupe fur seals were removed or weakened, there could be an increasing pressure from U.S. and Mexican tour companies that work in Guadalupe Island, which are currently not allowed to access the island.

In conclusion, impacts to Guadalupe fur seals from ecotourism activities in the United States and Mexico are considered negligible. While there is potential for this activity to expand in the future, we are not able to predict the magnitude of these future activities nor their impact on the



population, although, given that Guadalupe Island is the primary rookery for this species, prolonged exposure, especially during the breeding season, could be detrimental.

#### 5.3.2.5 *Conclusion for Factor B*

After weighing these findings, which are based on the best available science, NMFS finds that the Guadalupe fur seal does not face extinction risks due to threats related to overutilization for commercial, recreational, or educational purposes under Factor B.

### 5.3.3 Factor C: Disease or Predation

#### 5.3.3.1 *Disease, Parasites, and Biotoxins*

In this section, we consider current and future threats posed by infectious disease, parasites, and biotoxins. While disease can result from other factors, such as exposure to contaminants, we consider those elsewhere in this Status Review (e.g., under toxic substances in Factor A). Available information indicates that Guadalupe fur seals may carry many different kinds and species of parasites, are naturally exposed to many parasites, and will continue to be exposed to them for the indefinite future. Based on available data discussed below, it is likely that the prevalence of at least some parasites will increase with increased exposure to novel environments and individuals (Gulland and Hall 2005). However, exposure to many of the likely parasites is normal in a natural population and considered a natural part of the outcome of the recovery of this species.

Novel, and possibly pathogenic, infectious diseases may be a future threat to Guadalupe fur seals. If there is increased interaction with other species at haulouts, Guadalupe fur seals may have increased exposure to interspecific diseases; diseases not currently found within their range. Further, changing climatic and oceanic conditions could enhance the probability of Guadalupe fur seals exposure to novel disease agents. Moreover, “[It] has become increasingly clear that infectious diseases represent an emerging cause of population declines and extinctions in threatened species” (Lafferty and Gerber 2002; Smith *et al.* 2006; Pedersen *et al.* 2007, citing: Daszak *et al.* 2000). Guadalupe fur seals are found in very small numbers on San Miguel Island, and breeding between Guadalupe fur seals and California sea lions has been suspected to have occurred there (J. Harris, NMFS, personal communication, 2018). Parasites (*Uncinaria* spp.) that cause mortality in large numbers of pups have been found in other species that inhabit this island (i.e., northern fur seals and California sea lions; Lyons *et al.* 2000), and may potentially be passed on to Guadalupe fur seals, although none have been reported. In addition, a parasite (*Parafilaroides decorus*) commonly found in California sea lions was documented for the first time in May 2015, in a male yearling Guadalupe fur seal that stranded in Santa Cruz, California (Seguel *et al.* 2018).

Opportunities to determine the types of diseases that occur in Guadalupe fur seals most often come from stranded animals along the U.S. west coast. Between 1988 and 1995, nine stranded Guadalupe fur seals from central and northern California were analyzed for cause of death, and many seals were found to have a variety of diseases, including bacterial pneumonia (*Klebsiella* sp. and *Pseudomonas aeruginosa*); septicemia related to bacterial infections (*Klebsiella* sp.,

*Proteus sp.*, and *Enterobacteria sp.*); umbilical hernia; and gastric nematodiasis, an infestation caused by a nematode worm (Hanni *et al.* 1997).

Gerber *et al.* (1993) describe the findings of disease, some related to parasitism, among six species of pinnipeds, including the Guadalupe fur seal, that stranded along the central and northern California coast between 1984 and 1990 and were treated by TMMC (1,446 animals treated). Causes of the strandings were varied between species and included verminous pneumonia and pneumonia of unknown etiology, renal disease, internal parasitism, ophthalmologic problems, gastrointestinal disorders, otitis externa, and external wounds. Two Guadalupe fur seals, one pup and one yearling, were examined; both had hemorrhagic gastroenteritis, and the pup was found to have been infected by both nematodes and cestodes. Gerber *et al.* (1993) noted that the disease findings in their study are not proportionally representative of all such threats in the pinniped populations.

Between 2005 and 2016, 169 Guadalupe fur seals stranded in Washington and Oregon, of which 155 of the stranded seals were dead or subsequently died (D'Agnese *et al.* 2020). Most of these animals were 9 months to 2 years old, which is the age class that most commonly strands because this post-weaning period is a transition for young animals to forage independently, and is the greatest time for mortality to occur. This time period included Guadalupe fur seals that were part of the UME from 2007–09. Of the 155 dead seals, necropsies and histopathological analyses were conducted on 93 animals to determine the cause of death (COD). The three major causes of death were emaciation, trauma, and infectious disease. Emaciation and infectious disease occurred concurrently in nearly half of examined seals (n=40). Emaciation was the most common contributing COD (n= 66) and was determined to be the primary COD in 41 cases. Infectious or inflammatory disease was the second most common contributing cause (n=46) and was the primary COD in 17 cases. Trauma of various origins, including entanglement, led to the mortality of 34 seals and was the second most common primary COD (n=26; D'Agnese *et al.* 2020).

Among those diagnosed with infectious pathogens, parasites were most common, including *Toxoplasma gondii*, *Sarcocystis neurona* and gastrointestinal parasites. The most common gastrointestinal helminths were tapeworms, nematodes/ascarids, hookworms, and anthocephalans (D'Agnese *et al.* 2020). The seals could have encountered these parasites anywhere along the West Coast as they migrated north from Mexico; however, *T. gondii*, *S. neurona*, and *N. caninum* are common and prevalent in pinnipeds that strand along the coasts of Oregon and Washington, but not California (Barbosa *et al.* 2015). *Anisakis simplex*, a zoonotic parasite typically found in dolphins and whales that can cause disease in humans, was also found in a juvenile Guadalupe fur seal. A variety of bacterial infections of the intestinal tract, lung, brain, spleen, or lymph nodes were detected by PCR and/or serology (D'Agnese *et al.* 2020).

Domoic acid (DA) is a neurotoxin produced by the diatom genus *Pseudo-nitzschia* and bio-accumulates in the food chain. Studies of squid in Monterey Bay, California and southern California during times of *Pseudo-nitzschia* blooms detected the occurrence of DA in market squid, (*Loligo opalescens*) and humboldt squid (*Dosidicus gigas*), two species Guadalupe fur seals may prey on (Bargu *et al.* 2008; Mazzillo *et al.* 2011). While DA intoxication in Guadalupe fur seals is not well known, the occurrence and signs of DA intoxication are well studied in other

U.S. west coast otariids. In California sea lions, the toxin can cause neurological disease, seizures, reproductive failure, and death (Gulland *et al.* 2002; Goldstein *et al.* 2008). Examinations of California sea lions that stranded and died following toxic exposure to DA have revealed the hippocampus as the primary site of neuronal necrosis, which is a part of the brain needed for memory and navigation (Silvagni *et al.* 2005; Goldstein *et al.* 2008). Approximately half of the northern fur seals tested during a DA-producing bloom in California also exhibited the classic clinical signs of DA intoxication, listed above (Lefebvre *et al.* 2010). These two species partially overlap in habitat and prey resources with Guadalupe fur seals, and it is expected that the signs of DA intoxication will present similarly in Guadalupe fur seals. For Guadalupe fur seal that stranded in California from 2008–19, results showed that of the 69 animals tested, 21 were positive for DA in one or more body fluid (30% of those tested; NMFS, unpublished data, 2019). Most of these animals (n=62) stranded during the Guadalupe fur seal UME that began in 2015 and was ongoing as of May 2020. At least eight Guadalupe fur seals that were admitted to TMMC, seven of which were adult females (one was pregnant), had clinical signs and/or pathological lesions consistent with DA intoxication (TMMC, unpublished data, 2019). In addition, five animals stranding in Oregon and Washington between 2005 and 2016 tested positive for DA (15% of those tested), only one had a pathology indicating that it contributed to mortality (D’Agnese *et al.* 2020). However, during the 2007–09 Guadalupe fur seal UME, DA analysis was conducted on urine and fecal and/or stomach content samples from five animals with no toxin detected (Lambourn *et al.* 2012).

Lafferty and Gerber (2002) concluded that several key threats to biodiversity, such as climate change, resource exploitation, pollution, and habitat alteration, can affect the transmission of infectious diseases. Other conclusions from Lafferty and Gerber (2002) relevant to the Guadalupe fur seal are that:

- conditions that cause stress may increase susceptibility to disease,
- cross-species contact may increase transmission, and
- pathogens are of increasing concern for conservation.

The marine environment of the eastern North Pacific is changing and is likely to change in the future at an accelerated rate due to climate change and related changing ocean conditions, leading to range shifts that may increase the likelihood of exposure to novel disease agents brought in by other species or that is present in new habitats (e.g., Lafferty and Gerber 2002).

In a review of information about the potential ability of infectious diseases to affect the overall status and trend of a population, which is the central issue here, Gulland and Hall (2005) noted:

“Little is known about the ecological significance of disease in marine mammal populations because work to date has focused mostly on individual health. Limited data from terrestrial populations indicate that the effect that a living disease may have on a wild population is influenced by... nutrition and... body condition, levels of genetic variation within the population (e.g., Siddle *et al.* 2010), and climate (Hudson *et al.* 2002). Detailed studies sufficient to make these determinations are rare in marine mammal populations.”

However, much has been learned since this was published in 2005, and it is clear that disease is more common in marine mammal populations than previously thought.

The risk of disease and parasitism to Guadalupe fur seals is likely higher than was known at the time of the listing decision in 1985, and it is likely to increase over time due to species distribution shifts of both fur seals and pathogens. With at least two genetic population bottlenecks, one in 1894 and one in 1928 (Hubbs 1956 in Bernardi *et al.* 1998), Guadalupe fur seals may be more susceptible than other pinnipeds to the effects of a disease outbreak. Fur seals are naturally exposed to many parasites and will continue to be exposed to them for the indefinite future, and it is likely that the prevalence of at least some parasites, will increase with increased crowding at the rookery. These fur seals almost exclusively breed on one island (greater than 99%), leading to an increased potential for catastrophic results if a disease outbreak were to occur. Additionally, harmful algal blooms are increasing worldwide, and similar to California sea lions, adult female Guadalupe fur seals may be at greater risk of domoic acid exposure because of their distribution and habitat use.

Presently, little is known about the current or future exposure risk to novel pathogens or the potential health effects of known pathogens and biotoxins at the individual and population level, and we cannot make reasonably accurate predictions about the severity of impact. This increased risk and a large amount of uncertainty about the potential for population-level effects argue for regular and systematic disease surveillance. The MMPA formalized the Marine Mammal Health and Stranding Response Program (MMHSRP) in 1992, which focuses on responses to sick, injured, distressed, or dead marine mammals. NMFS recognizes the need to continue to test and monitor for the presence of novel and potentially threatening disease-causing agents, both in stranded and non-stranded animals.

#### 5.3.3.2 Predation

Scarce information is available about the natural predators of Guadalupe fur seals. They are a reclusive species on land and tend to stay in caves and rock crevices that may protect against predators. In the past, one of the most significant threats on land for predation of Guadalupe fur seals may have been from feral dogs, which were common on Guadalupe Island and San Benito Archipelago, and may have preyed on this species, particularly pups (Gallo-Reynoso *et al.* 2005). Other predators exist in the water. Like most marine species, apex predators such as sharks are natural predators of the Guadalupe fur seal (Stirling 1983), including white sharks (*Carcharodon carcharias*; Figueroa-Carranza and Gallo-Reynoso 2001; Gallo-Reynoso *et al.* 2005). White sharks are seasonally a common species around Guadalupe Island, but are primarily found off the northwest coast of the island and target elephant seals that use these areas more than Guadalupe fur seals. Cookiecutter shark (*Isistius brasiliensis*) wounds have been observed on Guadalupe fur seals at Guadalupe Island (Gallo-Reynoso and Figueroa-Carranza 1992; Figueroa-Carranza and Gallo-Reynoso 2001; Gallo-Reynoso *et al.* 2005), but these injuries are rarely fatal. Additional predators are likely to exist, including killer whales (*Orcinus orca*), but because of the pelagic behavior of the Guadalupe fur seal, the degree of predation on Guadalupe fur seals is underrepresented/underestimated and the impacts to the population are unknown.

Predators of the Guadalupe fur seal exist and pose some risk to individual animals; however, the Guadalupe fur seal population has continued to increase even as it has experienced current levels of natural mortality associated with predation.

#### *5.3.3.3 Conclusion for Factor C*

After weighing these findings, which are based on the best available science, NMFS finds that the Guadalupe fur seal faces ongoing extinction risks due to disease or predation under Factor C. Given that Guadalupe fur seals are gregarious on land, haul out in large numbers, and share habitat with other species, the potential for disease transmission from other animals is likely high. In addition, because Guadalupe fur seals have only one rookery, a disease outbreak on their only rookery would be catastrophic to the population. Finally, one of the main causes of death from the past UME for Guadalupe fur seals (2007–09), was due to malnutrition with secondary bacterial and parasitic infections, and the current UME has preliminary causes of death due to bacterial and parasitic infections.

#### 5.3.4 Factor D: The Inadequacy of Existing Regulatory Mechanisms

Currently, the conservation of the Guadalupe fur seal is governed by national laws and related regulations and policies in both the United States and Mexico. In the United States, the species is protected under both the ESA and the MMPA, which provide some overlapping protections, particularly in terms of the prohibitions against “take” included in both statutes. State laws offer additional protections. These are discussed briefly below; the reader is referred to each of these laws and regulations and the related citations for the specific details.

Protections also have been afforded to the Guadalupe fur seal trade and harvest under the Fur Seal Trade Act and the Lacey Act. A myriad of regulations provides varying levels of protection; the following review addresses the laws that are key to the conservation of the Guadalupe fur seal. In particular, protections afforded under the MMPA are examined since this would be the primary federal law in the U.S. to govern the conservation of this species, should it be delisted under the ESA.

At issue is whether, in the absence of ESA protection, the existing regulatory mechanisms would be inadequate to the extent that the species would be in danger of extinction throughout all or a significant portion of its range or likely to become so within the foreseeable future. This section evaluates the adequacy of existing regulatory mechanisms in light of the potential threats to the species that have been identified in previous sections. If a potential threat presents little or no danger of extinction within the foreseeable future, then regulatory mechanisms that provide minimal protection against such threat, or even a complete absence of such regulatory mechanisms, may still be adequate.

##### *5.3.4.1 Protections afforded under the MMPA*

The moratorium on “taking,” and other mechanisms, in the MMPA protect marine mammals, including the Guadalupe fur seal, from a wide variety of human activities and development

activities in the United States. Below we review the moratorium on taking and other relevant provisions of the MMPA. Note that these protections do not occur in Mexico, where nearly the entire population breeds.

Guadalupe fur seals are protected under the MMPA (16 U.S.C. 1361 et seq.) in U.S. waters and from impacts from U.S. citizens on the high seas. The MMPA was enacted in response to growing concerns that certain species and populations of marine mammals were in danger of extinction depletion or extinction as a result of human activities. The MMPA set forth a national policy to prevent marine mammal species or population stocks from diminishing to the point where they are no longer a significant functioning element of their ecosystems. In section 2 of the MMPA, Congress included the following findings:

“(2) [marine mammal] species and population stocks should not be permitted to diminish beyond the point at which they cease to be a significant functioning element in the ecosystem of which they are a part, and, consistent with this major objective, they should not be permitted to diminish below their optimum sustainable population. Further measures should be immediately taken to replenish any species or population stock which has already diminished below that population. In particular, efforts should be made to protect essential habitats, including rookeries, mating grounds, and areas of similar significance for each species of marine mammal from the adverse effects of man’s actions;

...

(6) marine mammals have proven themselves to be resources of great international significance, esthetic and recreational as well as economic, and it is the sense of the Congress that they should be protected and encouraged to develop to the greatest extent feasible commensurate with sound policies of resource management and that the primary objective of their management should be to maintain the health and stability of the marine ecosystem. Whenever consistent with this primary objective, it should be the goal to obtain an optimum sustainable population keeping in mind the carrying capacity of the habitat.”

Under the MMPA, NMFS has jurisdiction over the management of activities that may affect Guadalupe fur seals in U.S. waters or by U.S. citizens. With respect to Guadalupe fur seals, NMFS is responsible for conducting scientific research, issuing permits, promulgating regulations, and conducting enforcement as necessary to carry out the purposes of the MMPA. Advisement is provided by the Marine Mammal Commission and the Committee of Scientific Advisors on Marine Mammals.

The MMPA includes a general moratorium on the taking and importing of marine mammals. The moratorium is subject to several exceptions, including take for subsistence use by Alaska Natives, for scientific purposes, and for purpose of public display. The MMPA provides for NMFS and USFWS to authorize unintentional incidental take coincident with conducting lawful activities. The MMPA defines “take” as “to harass, hunt, capture, or kill, or to attempt to harass, hunt, capture, or kill any marine mammal.” The MMPA defines “harassment” to include “any act

of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild” (Level A harassment), or “has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering” (Level B harassment).

As described in Cameron *et al.* (2010), the MMPA provides for NMFS to authorize the incidental, but not intentional take of marine mammals, provided the agency finds that the authorized take will have no more than a negligible impact on the species and will not have an unmitigable impact on the availability of the species for taking for subsistence purposes:

“U.S. citizens who engage in a specified activity other than commercial fishing (which is specifically and separately addressed under the MMPA) within a specified geographical region may petition the Secretaries to authorize the incidental, but not intentional, taking of small numbers of marine mammals within that region for a period of not more than five consecutive years (16 U.S.C. 1371(a)(5)(A)). The Secretary “shall allow” the incidental taking if the Secretary finds that “the total of such taking during each 5 year (or less) period concerned will have a negligible impact on such species or stock and will not have an immitigable [sic] adverse impact on the availability of such species or stock for taking for subsistence uses.” If the Secretary makes the required findings, the Secretary also prescribes regulations that specify (1) permissible methods of taking, (2) means of affecting the least practicable adverse impact on the species and their habitat, and (3) requirements for monitoring and reporting. The regulatory process does not authorize the activities themselves, but authorizes the incidental take of the marine mammals in conjunction with otherwise legal activities described within the regulations.

Similar to promulgation of incidental take regulations, the MMPA also established a process by which citizens of the United States can apply for an authorization to incidentally take small numbers of marine mammals where the take will be limited to harassment (16 U.S.C. 1371(a)(5)(D)). These authorizations are limited to one-year and, as with incidental take regulations, the Secretary must find that the total of such taking during the period will have a negligible impact on such species or stock and will not have an immitigable adverse impact on the availability of such species or stock for taking for subsistence uses. The Service refers to these authorizations as Incidental Harassment Authorizations.”

To authorize such incidental take or incidental harassment, NMFS must prescribe means of effecting the least practicable impact on the species and must establish monitoring and reporting requirements.

Under these provisions, NMFS may not authorize incidental take or harassment of marine mammals, including Guadalupe fur seals, if such take is likely to, or reasonably expected to, adversely affect the species’ rates of survival or recruitment. To authorize incidental take, the

agency must find that the total of such authorized take will have a negligible impact on the species or stock. NMFS regulations (50 CFR 216.103) define “negligible impact” as “an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.”

The MMPA provides for NMFS to authorize the incidental take of marine mammals that are designated as depleted under the MMPA because they are listed as threatened or endangered species under the ESA, by persons using certain commercial fishing vessels (16 U.S.C. 1371(a)(5)(E)). Among other limitations, to authorize such take, NMFS must first determine that the take will have no more than a negligible impact on the species or stock.

The intentional lethal take of any marine mammal during commercial fishing is prohibited unless such taking is “imminently necessary in self-defense or to save the life of a person in immediate danger,” and is promptly reported (16 U.S.C. 1371(c); 16 U.S.C. 1387(a)(5)). In addition, the provisions of section 118 of the MMPA (16 U.S.C. 1387), apply to take of all marine mammals by commercial fisheries.

The MMPA provides a mechanism to permit deterring, moving, hazing, or intentionally (non-lethally) taking individual marine mammals for certain purposes. These include the use of measures:

- i. by the owner of fishing gear or catch, or an employee or agent of such owner, to deter a marine mammal from damaging the gear or catch;
- ii. by the owner of other private property, or an agent, bailee, or employee of such owner, to deter a marine mammal from damaging private property;
- iii. by any person, to deter a marine mammal from endangering personal safety; or
- iv. by a government employee, to deter a marine mammal from damaging public property,

so long as such measures do not result in the death or serious injury of a marine mammal. (16 U.S.C. 1371(a)(4)(A)(i)(ii)(iii)(iv)).

As described in Cameron *et al.* (2010), the MMPA emphasizes ecosystem and habitat protection:

“The habitat and ecosystem goals set forth [in 16 U.S.C. 1361] include: (1) management of marine mammals to ensure they do not cease to be a significant [functioning] element of the ecosystem to which they are a part, (2) protection of essential habitats, including rookeries, mating grounds, and areas of similar significance “from the adverse effects of man's actions,” (3) recognition that marine mammals “affect the balance of marine ecosystems in a manner that is important to other animals and animal products [which move in interstate commerce]” and that marine mammals and their habitats should therefore be protected and conserved, and (4) directing that the primary objective of marine mammal management [should be] “the health and stability of the marine ecosystem.” Congressional intent to protect marine mammal habitat is also reflected in the definitions section of the MMPA. The terms “conservation” and “management” of marine mammals are specifically defined to include habitat acquisition and improvement [(16 U.S.C. 1362)].”



The MMPA's moratorium against take of marine mammals, including Guadalupe fur seals, provides a measure of protection to habitat when that habitat is occupied by marine mammals. Terrestrial habitat sites such as rookeries or haulouts are used for important behaviors, including breeding, rearing, and nursing pups, resting, and seeking refuge from marine predators. Marine habitats are used for behaviors that include feeding and migration. Any activity with the potential to disturb a Guadalupe fur seal by disrupting such behaviors could constitute harassment that would be prohibited under the MMPA unless otherwise authorized. Therefore, the MMPA's moratorium against take of marine mammals protects many of the important attributes of occupied habitat of Guadalupe fur seals within the marine jurisdiction (*i.e.*, the exclusive economic zone (EEZ)) of the United States, albeit indirectly.

Should it become necessary to protect specific habitat of Guadalupe fur seals in the future, the MMPA provides authority that NMFS could use to develop additional and specific protections for Guadalupe fur seal habitat. Section 112(a) of the MMPA provides an existing mechanism that NMFS could use to develop future regulations to protect habitat, but only in the United States. NMFS has used this authority to regulate vessel approach to certain marine mammals (60 FR 3775; 62 FR 6729; 66 FR 29502) or to limit vessel speed in certain marine habitats during times that correspond to North Atlantic right whale occurrence. Baur (1996) noted that this section of the MMPA could be used to protect marine mammal habitat:

“Section 112 authorizes the Secretary to "prescribe such regulations as are necessary and appropriate to carry out the purposes of the MMPA".... This authority can be used to promulgate regulations to protect habitat areas. In the legislative history of the 1994 Amendments, Congress made it clear that section 112 includes such authority. As stated by the House Merchant Marine and Fisheries Committee in its legislative history for amendments to section 2(2), by adding the phrase “essential habitats,” “[t]he Committee believes that the Secretary currently has the authority to protect marine mammals and their habitats under the general rulemaking authority of section 112 of the MMPA” (H.R. Rep. No. 439, 103d Cong., 2d Sess. 29 (1994)). The Committee expressly noted, as an example, that this authority would apply “to protect polar bear denning, feeding, and migration routes . . .” (Id.).

Therefore, NMFS concludes that the MMPA's moratorium on take of marine mammals, though subject to exceptions, and ability to promulgate new regulations to protect species and their habitat, will afford adequate protection to Guadalupe fur seals if it were removed from the ESA list of threatened and endangered species. However, as discussed below, there are several protections afforded under the ESA that are not captured within the MMPA, which may create a gap in protection if the species were removed from the ESA list of threatened and endangered species.

#### 5.3.4.2 *Protections afforded under the ESA*

The ESA includes a prohibition against take of listed species that prohibits many of the same acts that are prohibited under the MMPA's moratorium on take. The definition of “take” under the ESA is, on its face, broader than the MMPA's definition of the term. The ESA provides that

“take” means “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct” (16 U.S.C. 1532(19)). As discussed below, the ESA’s prohibition against take may provide protection that may not be provided by the MMPA’s moratorium on take. This added measure of protection would be eliminated if the species were removed from the list of threatened species.

Unlike the MMPA prohibition against take, the ESA’s prohibition against take expressly prohibits “harm,” to a listed species, which may include “significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding or sheltering” (50 C.F.R. 222.102).

The ESA also provides a level of habitat protection by requiring the designation of “critical habitat” for a listed species (16 U.S.C. section 1533(a)(3)(A)(i)). Further, the ESA requires consultations on federal agency actions to ensure that such actions do not jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat for the species. (16 U.S.C. section 1536(a)(2)). Under the ESA, federal agencies proposing actions that “may affect” or are “likely to adversely affect” listed species must consult with NMFS or USFWS. As part of this consultation, NMFS (the responsible agency in the case of Guadalupe fur seals) prepares a Biological Opinion to determine whether the subject federal action (project) is likely to jeopardize the continued existence, or to adversely modify the critical habitat, of any listed species in the project area. If a finding of jeopardy or adverse modification is made, then NMFS must prepare Reasonable and Prudent Alternatives that outline how the action must be modified to avoid jeopardy and/or adverse modification.

During the time that the Guadalupe fur seal has been listed as a threatened species, NMFS has completed section 7 consultations (formal and informal) on numerous proposed actions by federal agencies. NMFS has concluded that none of these actions were likely to jeopardize the continued existence of Guadalupe fur seals. For example, recently, NMFS authorized incidental take of Guadalupe fur seals in the 2018 Longline Exempted Fishing Permit (NMFS 2018). In that formal consultation biological opinion, NMFS imposed reasonable and prudent measures to minimize the impact of such takes. In the context of any future formal consultations where NMFS may authorize incidental take of Guadalupe fur seals, the agency’s incidental take statements would impose reasonable and prudent measures to minimize the impact of such takes. If the species were delisted, the agency would not have the authority to impose such measures for future federal agency actions.

Based on this review, we conclude that the ESA provides a variety of regulatory measures designed to provide protection from unauthorized disturbance to Guadalupe fur seals. These measures, if implemented effectively, provide protections against the unauthorized take of Guadalupe fur seals, mechanisms for authorizing take, and mechanisms for monitoring and minimizing the effects of take from activities in which take is authorized. This additional layer of protection, especially the mechanism for imposing measures to reduce take that otherwise would not be covered by other acts such as the MMPA, as well as the additional protections to the species’ habitat, are beneficial to Guadalupe fur seals, and may be necessary for their continued recovery.

#### 5.3.4.3 *U.S. Protected Areas, including National Marine Sanctuaries and National Parks*

While on land, the majority of the Guadalupe fur seal population occurs in Mexico. However, the population also utilizes the U.S. west coast; they occur in waters along the entire U.S. West Coast and at haulouts from California to Washington. Protective federal land and water area designations provide some benefit to Guadalupe fur seals and their habitats in parts of their range. For example, five of the eight Channel Islands are part of the Channel Islands National Marine Sanctuary (CINMS) that includes a network of state and federal marine reserves that comprise a Marine Protected Area (MPA) Network, designed to protect ecosystems and conserve natural or cultural resources. The MPA consists of marine reserves where all take and harvest is prohibited within the MPA and marine conservation areas that allow limited take. Five of the Channel Islands are also encompassed in the Channel Islands National Park, where commercial and recreational fishing and access to Guadalupe fur seal terrestrial habitat are restricted within the park boundaries, one nautical mile (1.8 km) from the shore of each island. However, outside of the national park and MPA boundaries, commercial fishing of species that may be prey for Guadalupe fur seals is allowed. The Guadalupe fur seals' foraging habitat has limited protections in this area.

In addition to being protected areas, San Nicolas and San Clemente Islands are also under Navy jurisdiction and have Sikes Act Integrated Natural Resources Management Plans (INRMPs) that provide additional protections. The Sikes Act (16 U.S.C. 670a-670o) was established in 1960 to ensure that the Department of Defense (DoD) conserves and protects the natural resources they use, and develops INRMPs. INRMPs are planning documents that outline how each military installation will manage their resources by integrating military mission requirements, environmental and master planning documents, cultural resources, and outdoor recreation to ensure both military operations and natural resources conservation are included and consistent with stewardship and legal requirements. INRMPs require installations to look holistically at natural resources on a landscape or ecosystem basis. They are living documents that provide direction for daily natural resources management activities, and they provide a foundation for sustaining military readiness. An internal review of each INRMP is conducted annually, with a formal review by federal and state agencies conducted every five years.

##### 5.3.4.3.1 *National Marine Sanctuaries*

Several National Marine Sanctuaries (NMS) also exist within the Guadalupe fur seal's range, including the Olympic Coast, Cordell Bank, Greater Farallones, Monterey Bay, and, as mentioned above, Channel Islands NMS. NMSs are established and managed under provisions of the National Marine Sanctuaries Act (NMSA). This act provides tools that protect designated sanctuaries and living resources within them. For example:

- The NMSA requires federal agencies whose actions are likely to destroy, cause the loss of, or injure any sanctuary resource, to consult with the NMS program before taking the action. The program is, in these cases, required to recommend reasonable and prudent alternatives to protect sanctuary resources. (See section 304(d) of the NMSA.)

- The NMSA authorizes NOAA and the program to assess significant civil penalties for violations of the NMSA or its implementing regulations and damages against people that injure sanctuary resources. (See sections 306, 307, and 312 of the NMSA.)
- The NMSA provides the program with the authority to issue regulations for each sanctuary and the system as a whole. These regulations can, among other things, specify the types of activities that can and cannot occur within the sanctuary. (See section 308 of the NMSA.)
- The NMSA requires the program to prepare management plans that guide day-to-day activities at each sanctuary. These plans are to be evaluated and revised, as necessary, every five years concerning the substantive progress toward implementing the plan and goals for the sanctuary, especially the effectiveness of site-specific management techniques and strategies. (See sections 304(a) and 304(e) of the NMSA.)

An example of protections that specifically exist because of the NMS, NPS, or other special designation are protections put in place by the Channel Islands National Marine Sanctuary to restrict flying a motorized aircraft at less than 1,000 feet over the waters within one nautical mile of any islands (15 CFR Part 922.72(a)(7)), an activity that has the potential to disturb pinnipeds on haulouts, rookeries, or in the water.

The Farallon Islands are part of the Greater Farallones National Marine Sanctuary (GFNMS), which affords protections for species and habitat on the islands and in the surrounding waters. It is also a national wildlife refuge, established in 1909 by the U.S. Fish and Wildlife Service to protect seabirds and marine mammals. The public is not allowed to visit these islands, allowing the habitat and species to remain undisturbed by human presence, except for permitted researchers. The Farallon Islands are also designated as a State of California Ecological Reserve, with the intent to protect threatened or endangered native plants, wildlife, aquatic organisms, specialized habitat types, terrestrial and non-marine aquatic habitats, and large heterogeneous natural gene pools for the future use of mankind. In 1998, UNESCO designated the area as the Golden Gate Biosphere Reserve, which protects the natural and cultural resources of the dynamic North-Central California coastal bioregion through conservation, education, research and monitoring, and sustainable development.

Guadalupe fur seals may be present elsewhere along the U.S. west coast, including mainland shorelines and in the surrounding waters. Between CINMS and the GFNMS are two additional national marine sanctuaries: Monterey Bay NMS and Cordell Bank NMS. Farther north, Guadalupe fur seals also travel through the Olympic National Marine Sanctuary located off the northern coast of Washington State. Guadalupe fur seals traversing or foraging in these areas are also afforded their protective measures.

#### 5.3.4.3.2 *National Park Service*

The overall mission of the NPS (Organic Act, 16 U.S.C. section 1) is:

*to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.*

The National Park Service (NPS) supplied NMFS with information about the occurrence of Guadalupe fur seals within their parks. NPS reported current occurrence in Channel Islands National Park, Golden Gate National Recreation Area, and Point Reyes National Seashore, and historic occurrence in the Santa Monica Mountains National Recreation Area. National parks occur in both terrestrial and marine habitats. Guadalupe fur seals were first recorded by the NPS at Golden Gate National Recreation Area in 2000 and Point Reyes National Seashore in 2003. The occurrence of Guadalupe fur seals in these two parks is described as occasional visitors. NPS first reported Guadalupe fur seals in Channel Islands National Park in 2001 and describes their occurrence here as occasional residents. Guadalupe fur seals were observed on San Miguel Island as early as the 1970s; with the first recorded birth of a Guadalupe fur seal in the Channel Islands National Park in 1997 (Melin and DeLong 1999).

Other national parks that exist within the Guadalupe fur seal's range include: Cabrillo National Monument and Redwood National Park in California; Lewis and Clark National Historical Park in Oregon; and Olympic National Park, Ebey's Landing National Historical Reserve, and San Juan Island National Historical Park in Washington. However, the NPS reports that Guadalupe fur seal occurrence in these parks is either unknown or non-existent. Information about these National Parks and their locations and boundaries can be found at:

<https://www.nps.gov/findapark/index.htm>.

In conclusion, in addition to federal protections afforded through the MMPA and ESA, these U.S. protected areas, including National Marine Sanctuaries and National Parks, provide additional protections for the Guadalupe fur seals within their respective boundaries.

#### *5.3.4.4 Magnuson-Stevens Fishery Conservation and Management Act*

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) is the primary domestic legislation governing the management of the nation's marine fisheries. Because all marine mammals are protected under the MMPA, any fisheries action that may take Guadalupe fur seals would require complying with the provisions of the MMPA, including those associated with section 118 and 101(a)(5)(E) as appropriate, including categorization on the List of Fisheries and the Marine Mammal Authorization Program. Any marine mammal caught as bycatch that leads to serious injury or mortality needs to be identified and reported under the MMPA. The Guadalupe fur seal was added to the list of stocks in the 2019 List of Fisheries (84 FR 22051; May 16, 2019) due to interactions with the Hawaii-based shallow-set longline fishery in 2015 and 2017 that resulted in serious injury. The Guadalupe fur seal is currently listed under the ESA; therefore, NMFS is required to consult under section 7 of the ESA on its authorization and management of such fisheries if Guadalupe fur seals may be directly or indirectly affected. If the species were to be delisted, NMFS would continue to consider the effects of proposed fishery management measures to Guadalupe fur seals through the MMPA and National Environmental Policy Act (NEPA) analyses of Fishery Management Plans, amendments, and associated regulations. However, section 7 consultations and the conservation benefits provided by the ESA would no longer apply.

#### *5.3.4.5 The National Environmental Policy Act (NEPA)*

The NEPA became law in 1969. NEPA established a public policy and procedural framework designed to ensure that before any proposed federal action is approved by a federal agency, the

agency evaluates the impacts of its actions on the human environment, informs the public of those impacts, and considers other alternative courses of action that reduce such impacts. The human environment is defined as being comprised of the physical, biological, economic, and social environment in the affected area. To document this process, NEPA requires federal agencies to prepare analyses of the potential environmental effects of each action alternative (e.g., an Environmental Assessment (EA) or Environmental Impact Statement (EIS)). NEPA does not require an agency to adopt the alternative with least environmental effects; rather, the law established a public process where the agency evaluates alternatives that meet the agency's purpose and need for the action and, after evaluating the environmental impacts of the alternatives, makes an informed choice among the alternatives. NEPA does not in itself provide protections to Guadalupe fur seals, but the NEPA process may lead to the development of alternatives and mitigation measures that may minimize impacts of a major federal project to Guadalupe fur seals. NMFS provides review and comment on draft and final EAs and EISs issued under NEPA used to assess the consequences of proposed federal actions that may impact trust resources and their habitat. When relevant, these reviews often recommend design alternatives and protective measures to avoid, reduce, and mitigate any adverse effects to marine mammals such as Guadalupe fur seals.

#### *5.3.4.6 Fish and Wildlife Coordination Act (FWCA)*

The FWCA was enacted to protect fish and wildlife when federal actions result in the control or modification of a natural stream or water body, including marine waters. The statute requires federal agencies to take into consideration the effect of such development on fish and wildlife resources; to take action to prevent injury to these resources; and provide for the development and improvement of these resources. The statute requires consultation with the USFWS or NMFS (as appropriate) to develop measures to protect, develop, and improve wildlife. Where possible, the federal action agency must incorporate the recommendations of these agencies into project plans.

#### *5.3.4.7 State laws (California/Oregon/Washington)*

In addition to the federal statutes described above, various state laws and land use policies may be significant to the recovery and management of Guadalupe fur seals. Although state laws directly governing fur seals or other marine mammals are preempted by the MMPA (Baur 1996), many state laws intended to protect a variety of species provide benefits to marine mammals, including Guadalupe fur seals. Throughout the waters off California, Oregon, and Washington, there are fishing restrictions depending on the area and the target fish species. With these restrictions, Guadalupe fur seals may be protected to some extent from interactions with the fisheries.

Washington, Oregon, and California currently have Limited Cooperative Agreements with NMFS under section 6 of the ESA (Sec. 6 Agreements). Section 6 Agreements promote interaction and cooperation between NMFS and the states for the conservation of specified endangered and threatened species in their state waters. These agreements allow state wildlife agencies (e.g., California Department of Fish & Wildlife) to apply for the competitive ESA section 6 Species Recovery Grant program. Guadalupe fur seals have been identified by NMFS and the California Department of Fish and Wildlife as “urgently in need of conservation

programs” (NMFS and CDFW 2016). If Guadalupe fur seals were to be delisted, projects related to this species would no longer be eligible for section 6 grants.

Specific state laws for California, Oregon, and Washington, are described below.

#### *5.3.4.7.1 Washington Department of Fish & Wildlife (WDFW):*

Guadalupe fur seals are not listed in Washington’s state ESA list. However, the species is included in WDFW’s Limited Cooperative Agreement with NMFS under section 6 of the ESA. Guadalupe fur seals occur in Washington waters and WDFW is part of the West Coast Marine Mammal Stranding Network (Stranding Network), as authorized under the MMPA. As part of the Stranding Network, WDFW cooperates with NMFS staff on necropsies performed on Guadalupe fur seals found dead in Washington to determine health status and causes of death. Recent stranding data suggests that the species has become more common in Washington waters. Currently, there are no state-directed surveys or research studies on fur seal presence in Washington’s waters. Any information that WDFW gathers from future Guadalupe fur seal encounters in Washington State will be shared with NMFS to advance this species’ protection and conservation.

#### *5.3.4.7.2 Oregon Department of Fish & Wildlife (ODFW):*

Guadalupe fur seals are not listed in Oregon’s state ESA list nor have they been included in ODFW’s Limited Cooperative Agreement with NMFS under section 6 of the ESA. Guadalupe fur seals occur in Oregon waters. While ODFW is not a member of the Stranding Network, several state universities in Oregon do participate in the network. Currently, there are no state-directed surveys or research studies on fur seal presence in Oregon’s waters.

#### *5.3.4.7.3 California Department Fish & Wildlife (CDFW):*

Guadalupe fur seals are listed in California’s state ESA list and are included in CDFW’s Limited Cooperative Agreement with NMFS under section 6 of the ESA. Guadalupe fur seals occur in California state waters, defined as three nautical miles from the coast, and have been observed breeding on the California Channel Islands. While CDFW is not a member of the Stranding Network, several state universities in California do participate in the network. Currently, there are no state-directed surveys or research studies on this fur seals’ presence in California’s waters.

State-based enforcement and public education associated with these laws can help to reduce human disturbance to resting or breeding animals.

California state law restricts gill net and trammel fisheries to mitigate impacts of fisheries on non-target species (see details in Wendell *et al.* 1986). A 1991 closure restricted gill and trammel nets to waters deeper than 30 fathoms (55 meters) throughout most of the southern sea otter’s range, along California’s central coast, from approximately San Mateo County in the north to near Santa Barbara in the south (California Senate Bill No. 2563), which was being lethally by-caught in this fishery. An order was made permanent in September 2002, prohibiting the use of gill and trammel nets year-round in ocean waters of 60 fathoms or less from Point Reyes, Marin County, to Point Arguello, Santa Barbara County in California. In the waters south of Point Arguello, the Marine Resources Protection Act of 1990 (California Constitution Article 10B) defined a Marine Resources Protection zone in which the use of gill and trammel nets is banned.

This zone includes waters less than 70 fathoms (128 meters) or within one nautical mile (1.9 kilometers), whichever is less, around the Channel Islands, and waters generally within three nautical miles (5.6 kilometers) offshore of the mainland coast from Point Arguello to the Mexican border (Carretta *et al.* 2017). Although Guadalupe fur seals typically occur in deeper waters, they would be protected from fisheries interactions if they were to enter these areas.

In conclusion, state laws, including those with the state Departments of Fish and Wildlife, provide an additional means for protecting listed species, such as the Guadalupe fur seal. Section 6 grants, if awarded in the future, and state involvement in stranding response of Guadalupe fur seals, further the protective measures for this listed species.

#### *5.3.4.8 Protections in Mexico*

Mexico has several protections in place to protect Guadalupe fur seals, which started in 1928 on Guadalupe Island when it was declared a nature conservancy area. Guadalupe Island was declared a Biosphere Reserve in 2005, and the Baja California Pacific Islands Biosphere reserve was declared in 2016, which includes San Benito Archipelago and several other islands. A Biosphere reserve is a label given by UNESCO to help protect an ecosystem with plants and animals of unusual scientific and natural interest. The goal is to promote management, research and education in ecosystem conservation, including sustainable use of natural resources. Because of this designation, anyone visiting Guadalupe Island must obtain a permit from the Mexican government, which are limited. The communities on the island are closed towns for fishermen. Guadalupe Island is an efficient refuge because of the distance between it and the coast, making it less accessible to people.

Protections established in the early 20<sup>th</sup> century helped to recover the species after population numbers drastically declined after sealing activities. On March 1, 1933, a presidential order was established for the permanent closure (i.e., complete protection) of Guadalupe fur seals (and elephant seals) set in all federal waters of the Mexican Republic (Official Journal of Federation, 1933). Today, although the Guadalupe fur seal is protected, there is some interaction or access to these animals by humans; however, it is unclear as to the magnitude of this pressure.

Guadalupe fur seals are currently listed as endangered under Mexican Ecology Law and the General Wildlife Law, as well as CITES, to which Mexico is a party. These laws provide additional protections to the species from human activities, including regulations on import and export, and special permits and list of requirements for the use and development of rare, threatened, and endangered species.

#### *5.3.4.9 Conclusion for Factor D*

After weighing these findings, which are based on the best available science, NMFS finds that the Guadalupe fur seal does not face an extinction threat due to the inadequacy of existing regulatory mechanisms under Factor D. Numerous laws and regulations at both state and federal levels in the U.S. and Mexico afford protections for Guadalupe fur seals. Even though we have identified threats (e.g., Sections 4.3.1-4.3.4, above) to the continued survival



and expansion of the Guadalupe fur seal population at present and within the foreseeable future, the protections afforded by existing regulatory mechanisms help to ensure that the Guadalupe fur seal will continue to be protected. However, unpredictable events (e.g., disease outbreak, hurricane) could be catastrophic to the population, which may not be prevented with the current regulatory mechanisms.

### 5.3.5 Factor E: Other Natural or Anthropogenic Factors Affecting Its Continued Existence

#### 5.3.5.1 *Recreational Fisheries/Commercial Fisheries Interactions*

##### 5.3.5.1.1 *Recreational Fisheries Interactions*

Guadalupe fur seals (non-pups) primarily use habitats far from shore with feeding taking place almost exclusively at night with little time (feeding, transiting, or resting) in continental shelf waters (Section 4.3). The time of day and distance from shore would exclude many West Coast recreational fisheries from having significant overlap with Guadalupe fur seal foraging habitat because most recreational fishing occurs during the day and closer to shore (in continental shelf waters). Based on 2020 tagging results, pups tended to use the continental shelf and shelf break waters, so this specific age group may be more vulnerable to recreational fisheries operating during night-time hours, which in general does not occur regularly.

The Stranding Network data indicates that netting is the most common gear type (n=38) observed in all fishery-related stranding cases of Guadalupe fur seals from 1984 to 2018 (n= 73). Because no recreational net fisheries exist in U.S. west coast waters, these strandings are likely the result of interactions with commercial fisheries. There are some allowances in Washington State for recreational netting, including the use of a dip net (maximum mesh size of  $\frac{5}{8}$  inch stretched, distended by a rigid frame not exceeding 36 inches) for the capture of forage fish and squid; and a cast net (maximum mesh size is 1 inch stretched, no larger than 10 feet in diameter), which can be used for sardine and anchovy. While netting for squid, fishermen may encounter Guadalupe fur seals more frequently because this is the preferred prey item of this species (see Section 4.3 for more information about foraging ecology). However, the fishing methods and gear dimensions suggest that entanglements in these nets are an unlikely occurrence.

Most U.S. recreational pot/trap fisheries are found in nearshore waters up to 730 m deep depending on the target species but may overlap with some Guadalupe fur seal foraging grounds. The Stranding Network database contains only four cases of Guadalupe fur seal entanglement with rope/line/twine but none of these cases refer to the type of rope or suspected fishery (Stranding Network data).

The most plausible recreational fishery threat on the U.S. west coast would be from hook and line fisheries. These fisheries are very popular and operate in a variety of depths and distances from shore. Hook and line fishermen may also fish at night, taking advantage of the diurnal migration of their target fish species, much in the same way Guadalupe fur seals do for their target prey, squid. Squid are also a common bait used in recreational hook and line fisheries; therefore, depredation of bait may be a factor in these interactions.

In Mexico, the target prey species from local fishermen are lobster and abalone. These fisheries do not pose a threat to Guadalupe fur seals because both prey species are caught by hand when diving. Large nets are not involved, and therefore, entanglement in gear is not a threat. However, the sport fishery occurs often around Guadalupe Island (<500 m from shore), and on occasion, it is possible to see fur seals on the island with hooks (e.g., in the mouth) from this kind of fishery, as well as other individuals with net material on their bodies, especially around the neck (Elorriaga-Verplancken, CICIMAR-IPN, personal communication, 2019). Often patrons or vessels are from the U.S. and could have direct impacts to Guadalupe fur seals.

*5.3.5.1.2 Commercial Fisheries Interactions*

The MMPA prohibits intentional take of Guadalupe fur seals and other marine mammals by United States commercial fishing operations in all waters, including within the U.S. EEZ and in international waters. The MMPA does include limited exceptions that allow for the incidental take of marine mammals and for intentional non-lethal take of marine mammals that interfere with gear or catch in limited circumstances. A more detailed discussion of the protections and exemptions under the MMPA can be found below.

Section 118 of the MMPA requires NMFS to annually evaluate the potential for interaction between commercial fisheries and marine mammals (16 U.S.C. 1387(c)(1)). Observer programs and “self-reported” data are reviewed annually to estimate the number of marine mammals incidentally caught in commercial fisheries. Annual Stock Assessment Reports prepared for each species include a summary of human-related serious injury and mortality data (e.g., Carretta *et al.*, 2017). The summary includes data from observer and Stranding Network reports (e.g., animals hooked and entangled in fishing nets and debris).

NMFS publishes an annual List of Fisheries that places all U.S. commercial fisheries into one of three categories based on the level of incidental serious injury and mortality of marine mammals associated with each specific fishery (Table 1). In classifying fisheries, NMFS compares the numbers of marine mammals that are incidentally killed or seriously injured by commercial fishing operations to a stock’s potential biological removal (PBR) level. The PBR level is defined in 50 CFR 229.2 as the maximum number of animals that can be removed from a marine mammal stock—not including natural deaths—while allowing that stock to reach or maintain its optimum sustainable population. If total incidental take of a marine mammal stock from all commercial fisheries is greater than 10 percent of that stock’s PBR, all fisheries that take from that stock are evaluated individually.

**Table 1. List of Fisheries Categories for annual mortality and serious injury as a proportion of Potential Biological Removal (PBR).**

<i>List of Fisheries Categories</i>	<i>Annual mortality &amp; serious injury as a proportion of PBR</i>	<i>Incidental mortality descriptive term</i>
Category I	≥ 50%	“frequent”
Category II	>1% & < 50%	“occasional”

<i>List of Fisheries Categories</i>	<i>Annual mortality &amp; serious injury as a proportion of PBR</i>	<i>Incidental mortality descriptive term</i>
Category III	≤ 1%	“remote”

Category III fisheries are considered to have met the “zero mortality rate goal” (ZMRG), a primary goal of the MMPA. If total incidental take of a marine mammal stock from all commercial fisheries is less than or equal to 10 percent of that stock’s PBR, then all commercial fisheries are considered to be in Category III for that stock, thereby meeting ZMRG.

Drift and set gillnet fisheries may cause incidental mortality of Guadalupe fur seals in the United States. These fisheries are considered Category II on the 2019 List of Fisheries (84 FR 22051; May 16, 2019) due to the annual mortality and serious injury of a few listed or strategic marine mammal species with relatively low PBRs. In addition, NMFS Pacific Islands Regional Office observer program has four reports of incidental mortalities or injuries of Guadalupe fur seals in the Hawaii shallow-set longline fishery (listed as Category II), based on fishery observer data from 1990–2017 (Carretta *et al.* 2017). Two of these were serious and two were non-serious injuries. From 1988–2017, Stranding Network data revealed 26 cases that involved some type of netting material on Guadalupe fur seals. It is unknown how many of these nets were active fishing gear when the animal became entangled or if the nets were derelict and encountered as marine debris. Descriptions of the gear often make note of the presence of barnacles and marine growth, which may suggest that these may be derelict, or that the nets acquired the barnacles after the entanglement occurred with active gear. Juvenile female and male Guadalupe fur seals have stranded in central and northern California and into Washington with net abrasions around the neck, fish hooks and monofilament line, and polyfilament string (Hanni *et al.* 1997; Moore *et al.* 2009; Lambourn *et al.* 2012; D’Agnese *et al.* 2020). During a recent five-year period (2013–17), stranding data included 13 cases of strandings with entanglements in marine debris and shootings (Carretta *et al.* 2019), which could be fisheries-related. During the current ongoing UME off the coast of California, 2 of 98 stranded animals (2%) were found entangled in fishing gear in 2015, and 9 of 26 animals (35%) were found entangled in 2016 (NMFS, unpublished data, 2019). A summary of the available interactions between Guadalupe fur seals and commercial fisheries is available in Table 2.

In a recent review of human-related injury and mortality data from stranding reports from 2013–17, there were 13 records of human-related deaths and/or serious injuries to Guadalupe fur seals, an average of 2.6 animals annually (Carretta *et al.* 2019). Observed human-caused mortality and serious injury for this stock are likely an under-representation of the true impacts because not all cases are documented.

**Table 2. Human-caused Mortality and Serious Injury: Fisheries Information.**

Fishery Name	Year(s)	Data Type	Percent Observer Coverage	Observed Mortality Serious Injury and (non-serious injury)	Estimated Mortality and Serious Injury (CV)	Mean Annual Takes (CV)
CA driftnet fishery for sharks and swordfish	2013-2017	observer	12%-37%	0	0	0
CA set gillnet fishery for halibut/white seabass and other species	2013-2017	observer	<10%	0	0	0
Hawaii Shallow Set Longline Fishery	2013-2017	observer	100%	2(2)	2(0)	0.4(0)
Unidentified fishery interactions, including generic gillnets of unknown origin	2013-2017	strandings	n/a	4(1)	>4	>0.8
<b>Minimum total annual takes</b>						>1.2

From Carretta *et al.*, 2019.

In 2018, an exempted fishing permit (EFP) was issued for the use of longline gear in the U.S. EEZ off California and Oregon (two vessels). A Biological Opinion was published as part of a consultation under section 7 of the ESA on the issuance of the EFP, which provided an analysis of the action and the effects on listed species. In the Biological Opinion, NMFS concluded that they anticipate that the gear used in the proposed action may capture Guadalupe fur seals, with up to one individual interaction anticipated over two years; however, this interaction was determined not likely to jeopardize their continued existence (NMFS 2018).

Interactions with fishing gear have also been reported in Mexico. Gillnets have been documented to entangle marine mammals off Baja California (Sosa-Nishizaki *et al.* 1993); however, no information is available for human-caused mortalities or injuries in Mexico that may be eventually sighted and reported off the U.S. west coast. Drift gillnet fisheries for swordfish and sharks exist along the entire Pacific coast of Baja California, Mexico, and may take animals from the population. A Humboldt squid fishery operates off the west coast of Baja California, Mexico. The fishery operates primarily in three fleets: two made up of pangas, which exclusively use jigs as their catch method, thereby resulting in virtually no bycatch, and one made of shrimp trawlers (Rosen 2014). Humboldt squid are landed monthly by the Magdalena Bay Fishery (Aurioles-Gamboa *et al.* 2017). Squid abundance may influence the distribution of Guadalupe fur seals. There may also be interactions with the squid fishery; however, the effects of this are unknown.

Interactions with fisheries pose a threat to Guadalupe fur seals. With increasing numbers and wide-ranging distribution, the fur seals may come into contact more often with fishing gear. Of the total number of all stranded pinnipeds, stranded Guadalupe fur seals have a much greater

proportion of entanglements in the U.S. west coast region (Moore *et al.* 2009). However, these interactions are still relatively uncommon.

### 5.3.5.2 Oil Spills

The Pinniped and Cetacean Oil Spill Response Guidelines (Ziccardi *et al.* 2015) offer a thorough introduction to marine mammals and their sensitivity to spilled oil. This section will focus on impacts and concerns involving Guadalupe fur seals and their habitat.

Oil spills could negatively impact Guadalupe fur seals. Guadalupe fur seals have a subcutaneous blubber layer and a thick pelage that thermally insulates these animals, and they can easily undergo thermoregulatory problems if they are externally exposed to oil. The dependence on their fur to maintain body temperature in the marine environment makes these animals more vulnerable to oil exposure than many pinnipeds. Northern fur seals are a similar species to Guadalupe fur seals. Kooyman *et al.* (1976) estimated that light oiling of 30 percent of the pelt surface results in a 1.5 fold increase in the metabolic rate of northern fur seals. Due to the similarities in these species, we expect similar effects for Guadalupe fur seals. If their pelage comes into contact with oil, the health or survival of the seals could be impacted (Seagars 1984). For example, if the animal tries to clean itself, it may ingest the toxic petroleum product, which could cause health and reproductive problems. Due to the severity of the effects of oil spills, and the recognition that oil spills are a major threat for the population (Aurióles-Gamboa 2015), a catastrophic oil spill event could have detrimental or lethal impacts to Guadalupe fur seals.

Guadalupe fur seals are pelagic and spend a majority of their time in the open ocean, and almost exclusively come ashore at Guadalupe Island, 250 km offshore of the Baja California Peninsula. The Stranding Network has responded to four oiled Guadalupe fur seals in the past 30+ years. All cases were in California and involved the animal having tar patches on their fur. It is unknown whether this tar came from natural seeps, which are common to the coast of southern California, or from anthropogenic sources. The risk of a Guadalupe fur seal getting oiled is relatively low (Norris 2017). Oil sources in southern California include shale gas basins and associated shale gas plays, oil and gas pipelines, wells, natural seeps, and spill incidents. Norris (2017) compared Guadalupe fur seal distribution, based on satellite-tagged data from 20 juvenile seals, and oil sources in southern California. Juvenile Guadalupe fur seals spent the majority of their time in epipelagic waters, offshore of the continental shelf, whereas oil sources all occur within the continental shelf waters. There was little spatial overlap (<3%) between Guadalupe fur seal habitat use and areas of oil sources, allowing the authors to conclude that potential nearshore oil spill incidents that are restricted to continental-shelf waters pose minimal risk to Guadalupe fur seals off the California coast (Norris 2017). Ultimately, the extent of the risk is dependent on the location of the spill in relation to areas used for transit, foraging, breeding, and hauling out, which is an area of future research (T. Norris, TMMC, personal communication, 2019). Guadalupe fur seals have a larger offshore distribution compared to other pinnipeds, which may reduce their exposure to oil spills that occur closer to shore. However, shipping and vessel traffic is a source of oil in the offshore environment, and any nearshore oil activities along the Pacific coast of Mexico may impact Guadalupe fur seals. Current oil and gas activities in Mexico occur on the eastern coast in the Gulf of Mexico. Therefore, the greatest oil exposure risk for

Guadalupe fur seals likely would occur if there was a large oil spill from a vessel transiting in oceanic waters.

While considered rare, catastrophic oil spills have occurred. In 1969, a platform offshore of Santa Barbara, California experienced a blowout and an estimated 80,000 barrels of oil were released into the ocean. After this incident, new safety requirements were developed for offshore operations. Since the oil spill off Santa Barbara, there was another oil spill off Refugio State Beach, California when a corroded on-land pipeline ruptured and over 3,400 barrels (over 100,000 gallons) of crude oil were spilled, much of which entered the ocean through storm drains and ravines (DARRP 2018). The pipeline has been closed permanently, and Federal agencies are currently analyzing restoration options. Refugio State Beach lies just 25 miles north of the California Channel Islands and is near Point Conception and some submarine canyons that are important upwelling centers in the southern California Current System. While no Guadalupe fur seals were encountered during spill response, wildlife experts responded to many oiled California sea lions and northern elephant seals. In addition to potential oil spills, the California Channel Islands have a low level of chronic oil from natural oil seeps (Seagers 1984); however other areas within the Guadalupe fur seal's range have natural seeps, as well as oil in some shipwrecks (T. Norris, TMMC, personal communication, 2019).

NMFS and other organizations have developed guidelines used to respond to oiled marine mammals, including Guadalupe fur seals. These guidelines include considerations for rescue and rehabilitation, capture and handling techniques, and dead seal considerations. The Marine Mammal Oil Spill Response Guidelines can be found online at <https://www.fisheries.noaa.gov/resource/document/pinniped-and-cetacean-oil-spill-response-guidelines>. Additional information about response to dead marine mammals during a spill can be found in the California State Oil Spill Contingency Plan (CDFW 2017).

### 5.3.5.3 Genetic Variability/Bottleneck

A genetic bottleneck is a reduction in the number of individuals in a population that results in the loss of genetic variability within the population. This loss is caused by genetic drift (chance disappearance of particular genes as individuals die or do not reproduce), inbreeding depression (reduced biological fitness, which is the ability to survive and pass down genes, due to inbreeding), or the founder effect (results when a population is descended from a small number of colonizing ancestors). The individuals that survive possess only a fraction of the total genetic variability of the population. Genetic variation is essential for a population's vitality, resilience, and persistence; when genetic variation is reduced, the probability that a species will go extinct increases.

Guadalupe fur seals went through two genetic bottlenecks during the hunts in the 19<sup>th</sup> century; one in 1894 and one in 1928 (Hubbs 1956 in Bernardi *et al.* 1998). Despite this, extant Guadalupe fur seals show higher levels of genetic variability than expected (Bernardi *et al.* 1998). In one study, 36 tissue samples from 29 Guadalupe fur seals in Mexico from 1991 and 1992 (post-bottleneck) were used to probe nuclear and mitochondrial genomes using multilocus nuclear DNA profiling and mitochondrial DNA (mtDNA) sequencing to estimate the population's level of genetic variability. The DNA fingerprint analysis resulted in 56 different

DNA fingerprint characters, which is considered moderate genetic variation and does not support the hypothesis that Guadalupe fur seals lack genetic variation relative to other species, including northern elephant seals that also went through a severe bottleneck (Bernardi *et al.* 1998). The authors hypothesize that because of the behavior of Guadalupe fur seals on the haulouts (concealed in caves versus laying out on the beach), perhaps more individuals, and thus, more haplotypes, survived. The authors also noted that it is important to understand the level of genetic diversity in the pre-bottleneck population to compare to the current population's genetic diversity (Bernardi *et al.*, 1998).

Because of the severity and duration of the hunts, Weber *et al.* (2004) assumed that some loss in genetic variability occurred between the pre- and post-bottleneck populations. In this study, genetic variation was determined from mtDNA sequences of 313 base pairs (bp) from 26 seals from the pre-bottleneck population, and tissue samples obtained from a small sample size of seven seals found injured or dead along the southern California coast from the 1980s and 1990s. The study found that of the 25 genotypes from the pre-bottleneck population, only one was found in the extant population, and from the three genotypes found in the extant population, all matched the pre-bottleneck population. Lineages from only two mtDNA clades survived the bottleneck, resulting in a substantial loss of genetic variability from a recent bottleneck (Weber *et al.*, 2004). Low levels of genetic variation may increase the probability that a species may go extinct; however, the success of the population and the likelihood of persistence may be determined more by the patterns of recovery, such as breeding success and pup growth and survival, than by the magnitude of the bottleneck alone. The current population of Guadalupe fur seals is growing, and the results of Weber *et al.*'s (2004) study also indicated that the pre-bottleneck population had been growing. One reason that the genetic variability in the population is greater than expected may be because the population has continued to grow after the bottleneck, and is currently growing at a steady pace.

Guadalupe fur seals may sometimes breed with other otariid species, and the two different species create hybrids in the wild. In the wild, hybrids have been observed between Guadalupe fur seal females and suspected California sea lion males on the Channel Islands, California (J. Harris, NMFS, personal communication, 2019). These hybrids have a combination of the physical characteristics of Guadalupe fur seal and California sea lion, but they have not been genetically tested to confirm the hybridization. In the northern portion of San Miguel Island, Guadalupe fur seals may overlap with the range of northern fur seals; however, no hybrids have been reported. On Guadalupe Island and San Benito Archipelago, even though three other species of pinnipeds (California sea lion, northern elephant seal, Pacific harbor seal) share the islands with Guadalupe fur seals, they have little terrestrial overlap with the other species because Guadalupe fur seals prefer rocky substrate with boulders and crevices that these other species do not use as much, reducing the chances of hybridization (Garcia-Aguilar *et al.* 2013; Hambrecht *et al.* 2016).

Although Guadalupe fur seals were thought to be extinct multiple times in the past and went through two genetic bottlenecks, genetic variability in the modern population is higher than expected, and is higher than species with similar bottlenecks (e.g., northern elephant seals). Because of this, Guadalupe fur seals' probability of going extinct due to low genetic variability

may be low. Other factors in their environment are more likely to affect their survival and persistence.

#### 5.3.5.4 *Competition for Resources with other Pinnipeds*

Guadalupe fur seals are found mainly hauled out on Guadalupe Island, and also are common at San Benito Archipelago in Mexico and infrequently found on the Channel Islands (San Nicolas and San Miguel Islands) and Farallon Islands in California and broadly within the California Current System. Other species that may occur or haul out at these same locations are three otariid species – the California sea lion, northern fur seal, and Steller sea lion – and two phocid species – the northern elephant seal and Pacific harbor seal. Guadalupe fur seals likely compete with the other otariids for prey and suitable habitat for hauling out and foraging. Competition with non-pinniped species (e.g., birds, some cetaceans, terrestrial carnivores) would be considered negligible/discountable. Guadalupe fur seals may also compete for prey with humans associated with the California purse and drum seine, and dip net fisheries, which target squid species.

Guadalupe fur seals are mainly squid specialists but may feed on other marine species, including other cephalopods and some fish species (Gallo-Reynoso 1994; Gallo-Reynoso *et al.* 2005; Pablo-Rodriguez *et al.* 2016; Juarez-Ruiz *et al.* 2018). They forage in the pelagic environment and at depths generally less than 30 m during the night and out to great distances from shore (Gallo-Reynoso *et al.* 2005; Gallo-Reynoso and Esperon 2013; Norris 2017; Norris and Elorriaga-Verplancken 2019). In comparison, California sea lions are opportunistic foragers and feed on Pacific sardines, northern anchovies, rockfish, Pacific hake market squid, and other prey items (Gallo-Reynoso 1994; Hanni *et al.* 1997; Auriolles-Gamboa and Camacho-Rios 2007). California sea lions use a variety of feeding strategies, including benthic feeding, and have a higher dive capacity, allowing them to forage on prey at greater depths than Guadalupe fur seal, showing a difference in feeding habitat (Gallo-Reynoso *et al.* 2005; Auriolles-Gamboa and Camacho-Rios 2007; Gallo-Reynoso and Esperon 2013; Pablo-Rodriguez *et al.* 2016). They also forage closer to shore, except during years with anomalously warm waters (Weise *et al.* 2006; Auriolles-Gamboa and Camacho-Rios 2007; Melin *et al.* 2008; Kuhn and Costa 2014). Thus, resource competition may be occurring between Guadalupe fur seals and the more abundant California sea lion, particularly when sea lions switch to consuming more squid, as has occurred in recent years (McClatchie *et al.*, 2016). Under warm sea surface temperature anomalies like those in 2015, a stable isotope analysis showed that California sea lions from San Benito, Mexico, exhibited more offshore foraging habits (resulting in increased effort) relative to 2014, similar to the Guadalupe fur seal that also inhabits that archipelago (Elorriaga-Verplancken *et al.* 2016a).

Harbor seals are opportunistic foragers, which is largely dependent on their habitat, and feed mainly on fish, shellfish, and crustaceans. They dive deeper than Guadalupe fur seals, diving to depths as deep as 481 m. They mainly feed on benthic species, but will switch to more pelagic species when oceanic conditions favor pelagic species (Eguchi and Harvey 2005). The overlap between harbor seals and Guadalupe fur seal prey is thought to be minimal due to the differences in prey species and foraging habitat.



Northern elephant seals feed mainly on squid and fish, but also rays and sharks. They have more plasticity in their diet and do not use the same foraging habitat as Guadalupe fur seals, diving to much greater depths and ranging much more broadly over the North Pacific Ocean (Le Boeuf *et al.* 1988) than Guadalupe fur seals.

Northern fur seals feed mainly on a variety of fish species and cephalopods (Melin *et al.* 2012). Sinclair *et al.* (1994) found that northern fur seals focused on only a few species during foraging bouts, despite the large variety of available prey species. Guadalupe fur seals have a more specialized diet (mainly squid species) than other pinnipeds that inhabit the California Current System, potentially putting this species at greater risk if there is a reduction in those prey species or other predators switch to consume more squid.

Competition for terrestrial habitat may be determined by several factors. For example, the breeding season will determine when certain species are hauled out in greater numbers: Guadalupe fur seals and California fur seals breed in the summer, northern elephant seals breed in the winter, and harbor seals breed from late spring to fall. The characteristics of the species' life history also may influence resource use. When Guadalupe fur seals haul out, they tend to stay in rock crevices and caves, possibly for protection from the natural elements (sun, wind, and waves) and for males to be shielded from view of each other during the breeding season (Gallo-Reynoso 1994; Gallo-Reynoso *et al.* 2013). Other species use sandy or pebbled beaches. For example, harbor seals prefer to haul out close to the water's edge so they have quick access to escape into the water away from a perceived threat on land. Off the coast of Baja California, harbor seals were found on all islands except Guadalupe Island, where most Guadalupe fur seals are found (Arias-Del Razo *et al.* 2017). Northern elephant seals prefer sandy beaches, although some individuals may use pebble beaches with some boulders on Guadalupe Island (Gallo-Reynoso *et al.* 2005). At San Benito Archipelago, northern elephant seals use the northeast coast, which was not used by Guadalupe fur seals at the time of the study (Garcia-Aguilar *et al.* 2013). California sea lions prefer to be in areas of solid stone protruding islets or pebble beaches and have low abundance at Guadalupe Island (Gallo-Reynoso *et al.* 2005). They prefer open flat beaches at San Benito Archipelago (Garcia-Aguilar *et al.* 2013) and sandy beaches or pebble beaches with some boulders in the California Channel Islands. Of the three islands in the San Benito Archipelago, Garcia-Aguilar *et al.* (2013) found an inverse relationship between sightings of the two species: most Guadalupe fur seals (68%) were found on San Benito del Oeste and the least were found on San Benito del Centro (0.32%), while the opposite was true for California sea lions (15% and 60%, respectively). Garcia-Aguilar *et al.* (2013) also found that of the different habitat types they described, the two species did not prefer the same habitat and where they did overlap, the substrate was not the preferred habitat type of either species.

The range of Guadalupe fur seals overlaps with many other species, including at least four pinniped species. Guadalupe fur seals and other pinnipeds are spatially segregated at most of the haulouts, limiting the chances for competition for terrestrial habitat. The foraging habits of Guadalupe fur seals overlap with California sea lions, northern elephant seals, and northern fur seals, and this competition may have population-level effects, but this is an area that needs further study. Changes to their prey distribution or abundance and/or increased prey resource competition in the future may have detrimental effects on the Guadalupe fur seal population because they are prey specialists and shallow divers and may not be able to adapt to changes in

prey availability as well as pinniped species with more diverse diets or greater diving capabilities.

#### *5.3.5.5 Trampling/Molestation/Drowning of Pups*

Guadalupe fur seals are known to utilize the same islands (i.e., Guadalupe Island, San Benito Archipelago, San Miguel Island) to breed as other pinniped species (California sea lions, northern fur seals, Pacific harbor seals, and northern elephant seals). However, Guadalupe fur seals generally use rugged rocky coastlines as opposed to the large sandy beaches primarily used by other pinniped species on these islands. Due to their cryptic nature, nursing females are usually segregated from other species and other female Guadalupe fur seals. This is especially true on the California Channel Islands where the numbers of nursing Guadalupe fur seals are very low (e.g., approximately five animals). However, on Guadalupe Island, where the numbers are much higher, Guadalupe fur seals are found in closer proximity to conspecifics, but most often still maintain their distance, unlike the more social California sea lion.

The threat of trampling or molestation from sea lions, harbor seals, or elephant seals or conspecifics is thought to be low. It would be difficult for harbor seals to trample other pinnipeds, given their smaller size and lack of ability to move fast on land compared to the Guadalupe fur seal. Elephant seals are large and would be a potential trampling threat to Guadalupe fur seals given the aggressive and dangerous behaviors males exhibit during mating, but because of the spatial separation of these two species, the threat is highly unlikely. In addition to being cryptic, Guadalupe fur seals have been observed exhibiting aggressive behaviors and displacing sea lions from an area.

Despite the low level of threat to pups from other species, due to their preference for elevated rocky haulouts, Guadalupe fur seal pups have been found dead after presumably falling off the rocks (J. Harris, NMFS, personal communication, 2019). In addition, neonate mortality rate was calculated on Guadalupe Island and was reported to be lower than other fur seals, at 8.2 percent in 2013 and 5.2 percent in 2014 (Gálvez 2015). Many of these mortalities were due to trauma, which is related to limited movement capacity after birth, topography, aggregation, and aggressive behavior by males (Gálvez 2015), which is similar to most pinnipeds.

In summary, given the overlapping habitat with other pinniped species, trampling and molestation may be a threat to Guadalupe fur seals. However, they are spatially separated from other species within these habitats and will display aggressive behaviors towards other species, reducing the likelihood of these threats. Intraspecific trampling, while it does occur, is relatively low.

#### *5.3.5.6 Outreach/Education*

NMFS is responsible for the protection and conservation of marine mammals, including Guadalupe fur seals. Part of that responsibility is to provide education and outreach materials and resources to the public. This factor may affect the existence of Guadalupe fur seals, but in a positive way. The West Coast Regional Office of NMFS has several outreach initiatives to educate the public on protecting and conserving this species and other pinnipeds. These include

the Share the Shore program, which encourages responsible wildlife viewing practices, particularly with pinnipeds hauled out onshore. More information about this program can be found online (<https://www.fisheries.noaa.gov/west-coast/marine-life-viewing-guidelines/share-shore-watch-marine-mammals-responsibly>). The regional office also has specific information regarding Guadalupe fur seals, including species identification cards and a fact sheet to distinguish between Guadalupe fur seals and the northern fur seal, which is a morphologically similar species that may be seen in the same habitat as Guadalupe fur seals. In general, the regional office provides educational materials to the public, including brochures, signage, posters, postcards, FAQs, and games and activities that can be used to learn more about the local marine mammal species. The regional office also engages in public outreach events including partnering with local schools, aquaria, and other organizations and presenting information at a variety of fora. More information about the education and outreach materials can be found online (<https://www.fisheries.noaa.gov/outreach-and-education>). Members of the regional Stranding Network have similar education and outreach programs and material (e.g., California Academy of Sciences and TMMC in the San Francisco Bay Area).

NMFS West Coast Region maintains a stranding program webpage, which provides information to educate the public about the causes of strandings, the purpose of the network, and the diversity of biological, environmental, and health parameters that are obtained from live and dead marine mammals. In addition, the website emphasizes that the public cannot pick up stranded marine mammals without authorization, but encourages assistance in both reporting and incident documentation to allow Stranding Network members to respond. This information can be given to NMFS online via the Marine Mammal Stranding Event Report Form or by phone via the NMFS West Coast Region 24-hour Stranding Hotline.

These outreach and education initiatives are intended to educate the general public about Guadalupe fur seals. These efforts are indirectly beneficial to Guadalupe fur seals and help with their protection and conservation throughout their range along the U.S. west coast. Education and outreach efforts are not a threat to Guadalupe fur seals, but rather a factor we considered that may benefit the fur seals.

#### *5.3.5.7 Stranding Data*

##### *5.3.5.7.1 U.S. West Coast Stranding Program*

NMFS has a well-developed national stranding program (<https://www.fisheries.noaa.gov/national/marine-life-distress/marine-mammal-health-and-stranding-response-program>) and regional stranding networks that were established in the early 1980s. This program may positively affect the status of Guadalupe fur seals. There is one West Coast Region marine mammal stranding network within the U.S. range of the Guadalupe fur seal. The West Coast Marine Mammal Stranding Network (Stranding Network) was created to provide a consistent framework in which to collect and compile data about marine mammal strandings region-wide. This regional Stranding Network is comprised of 30 organizations and covers the states of Washington, Oregon, and California and includes state, university, other federal, tribal, research, aquarium, and private partners. State networks exist within this framework (e.g., California Marine Mammal Stranding Network). These Marine Mammal

Stranding Networks provide considerable information to the public, such as summaries and causes of death and stranding.

Through the West Coast Stranding Network, NMFS receives Guadalupe fur seal stranding reports from various locations throughout their range on an annual basis (Figure 5). Reports include the number and location of Guadalupe fur seal stranding events and information about causes of stranding or overall health, including those with signs of human interaction. Sources of human interactions with Guadalupe fur seals include entanglements in fishing gear and/or marine debris, ingestion of marine debris, shooting, and harassment by humans (e.g., the public feeding, petting, or picking up a stranded seal; Figure 6). Reports may include individuals that strand alive, are ashore and have signs of ill health, or carcasses that are beach-cast or floating.

When possible, examinations are performed to determine the cause of stranding and/or death. Such response and examination enable the collection of samples for disease, contaminant, and biotoxin surveillance; basic biological information; information about diet and human interactions, such as entanglements, shooting, ship strikes, etc. Data on human interactions inform conservation actions and management decisions for the species. Information on disease and other parameters from these cases contributes to further understanding of Guadalupe fur seal biology and ecosystem health.

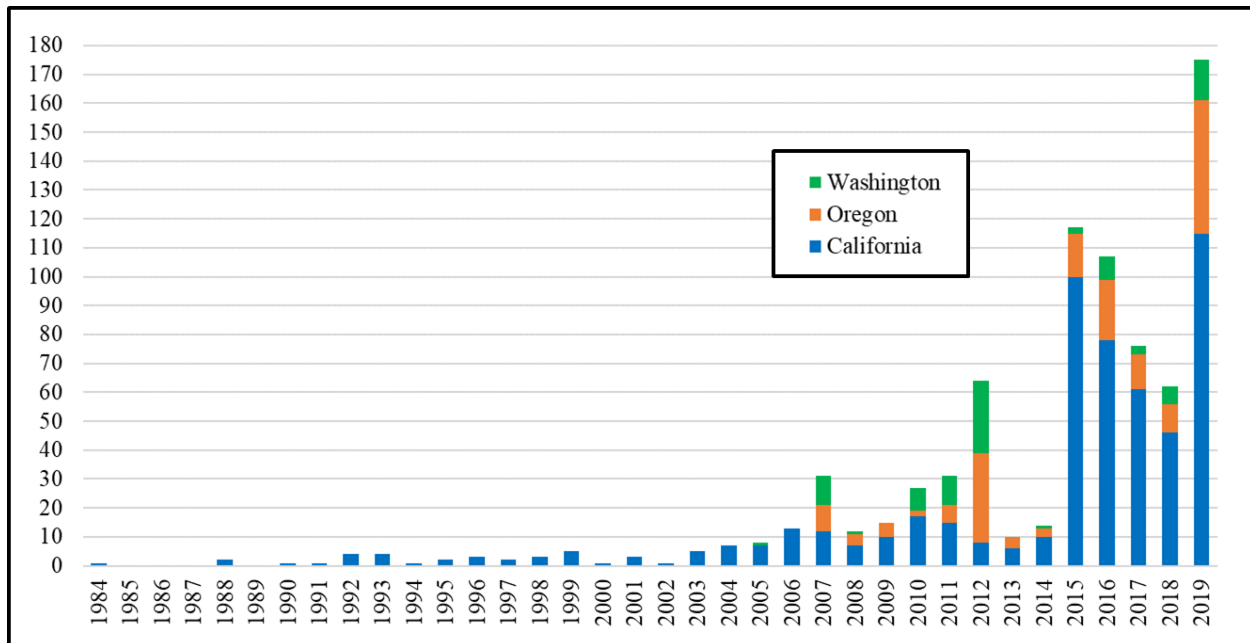


Figure 4. The number of Guadalupe fur seal strandings along the U.S. west coast from 1984-2019, n=808).

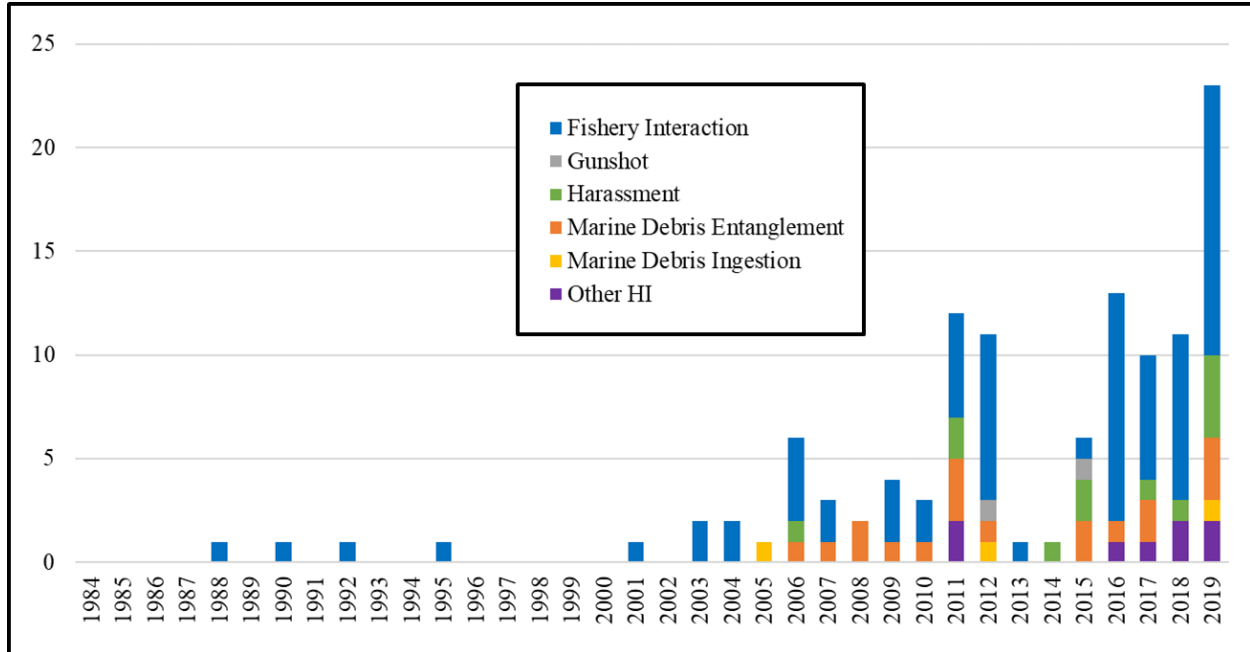


Figure 5. West Coast Guadalupe fur seal strandings associated with human interaction (HI) type from 1984-2019 (n=116). HI may have been the primary cause of death or an incidental finding in the report.

### 5.3.5.7.2 Strandings in Mexico

Records of Guadalupe fur seals stranding in Mexico suggest that there have been increasing numbers of strandings (especially juveniles) within La Paz Bay in the Gulf of California (Elorriaga-Verplancken *et al.* 2016b) and along the northwest side of Magdalena Island off the Pacific coast of the Baja California Peninsula. Aurióles-Gamboa *et al.* (2017) analyzed stranding data from this area from 2003–15 relative to sea surface temperature and chlorophyll a concentration anomalies around San Benito Archipelago, and annual landings from squid fisheries in Magdalena Bay. Strandings increased from January to August each year (2003–15), and then decreased by December, with a peak in August and September (Aurióles-Gamboa *et al.* 2017). The increase during the summer months correlated with the decrease in prey availability in that area, but it was concluded that the stranding trend was influenced by all variables measured and was more closely related to the seals’ breeding cycle. The increase of strandings immediately following the breeding season (June - August) corresponded with the time when males move out of the rookery. The majority of the strandings were male (78%), and most were adult males (60%), which aligns with the post-breeding male migration from Magdalena Island (Aurióles-Gamboa *et al.* 2017).

Strandings in other parts of Mexico also occur, but rates and trends are less well known. The National Mexican Stranding Network of the Mexican Society for Marine Mammalogy-Mexican Society of Marine Mastozoology (SOMEMMA), as well as local response organizations, exist within the country and respond to live and dead marine mammals. This network is made up of governmental institutions, non-government organizations, and private organizations. More

information about this network is available online (<http://www.marinemammalcenter.org/science/crc-marine-stranding-network/mexico.html>). These efforts have allowed for the increase of communication around these events, including Guadalupe fur seal rare records in some cases, which are needed to understand more about this species dispersal patterns, under normal or abnormal (e.g., El Niño or La Niña) oceanographic conditions (e.g., Villegas *et al.* 2015; Elorriaga-Verplancken *et al.* 2016b; Aurioles-Gamboa *et al.* 2017; Ortega-Ruiz *et al.* 2019; La Paz Stranding Network unpublished data).

#### 5.3.5.7.3 Unusual Mortality Events

If an unusual pattern of Guadalupe fur seal strandings is reported through the U.S. Stranding Network, the relevant information is provided to the Working Group on Marine Mammal Unusual Mortality Events. This working group, comprised of marine mammal scientists across a variety of disciplines, evaluates the relevant facts using seven predetermined criteria, and decides whether the pattern qualifies for a marine mammal unusual mortality event (UME) under the MMPA: “a stranding that is unexpected; involves a significant die-off of any marine mammal population; and demands immediate response.” The seven criteria determine if an event is “unusual” and may include morbidity (not just mortality) as a reason for the UME designation.

These criteria are:

1. A marked increase in the magnitude or a marked change in the nature of morbidity, mortality, or strandings when compared with prior records.
2. A temporal change in morbidity, mortality, or strandings is occurring.
3. A spatial change in morbidity, mortality, or strandings is occurring.
4. The species, age, or sex composition of the affected animals is different than that of animals that are normally affected.
5. Affected animals exhibit similar or unusual pathologic findings, behavior patterns, clinical signs, or general physical condition (e.g., blubber thickness).
6. Potentially significant morbidity, mortality, or stranding is observed in species, stocks, or populations that are particularly vulnerable (e.g., listed as depleted, threatened, or endangered or declining). For example, stranding of three or four right whales may be cause for great concern whereas stranding of a similar number of fin whales may not.
7. Morbidity is observed concurrent with or as part of an unexplained continual decline of a marine mammal population, stock, or species.

As part of the Guadalupe fur seal UME investigation process, NMFS assembled an independent team of local scientists to coordinate with the Working Group on Marine Mammal Unusual Mortality Events to review data, sample stranded Guadalupe fur seals, and determine the next steps for the investigation. Further details are provided about the UME process at: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-unusual-mortality-events>.

There have been two UMEs declared for Guadalupe fur seals, one from 2007–09, and one from 2015–present. The first UME was located along the Oregon and Washington outer coast. In 2007, 19 Guadalupe fur seals stranded, which was a marked increase from previous years and triggered the declaration of a UME. A total of 29 Guadalupe fur seal strandings occurred over three years, most of which were yearlings (Lambourn *et al.* 2012).

In January 2015, the Stranding Network began receiving reports of increased numbers of Guadalupe fur seal strandings occurring along the entire coast of California. By September 2015, the total number of Guadalupe fur seal strandings were more than eight times higher than the historical average. In response, NMFS declared a UME that overlapped with the 2013–2017 California sea lion UME in California (<https://www.fisheries.noaa.gov/national/marine-life-distress/2013-2017-california-sea-lion-unusual-mortality-event-california>). It is concerning that, while the unusual mortality event of California sea lions ceased in California (2013–17), this event involving Guadalupe fur seals has persisted since 2015 and expanded to include Oregon and Washington beginning in 2019. As of May 2021, 649 Guadalupe fur seals have stranded as part of this event.

Increased Guadalupe fur seal strandings have continued since 2015 and have remained well above average through 2019. Strandings are seasonal and peak from April through June each year, which coincides with the months immediately following weaning (February–April) in this species. During this UME, Guadalupe fur seals were stranding both alive and dead. The stranded animals have mostly been weaned pups and yearlings 9–15 months old (Figure 7). Most pups stranded in California, while most yearlings stranded in Oregon and Washington (Figure 8). All live stranded Guadalupe fur seals are rescued by local marine mammal stranding network members and undergo long-term rehabilitation at TMMC in Sausalito, California, or SeaWorld in San Diego, California. Upon successful rehabilitation, the rescued Guadalupe fur seals are released back into the wild. At least 30 of these released fur seals were tagged with satellite tracking tags to monitor the post-release movements of these individuals and learn more about their at-sea habitat use.

For this UME, the primary findings of causes of stranded Guadalupe fur seal pups/yearlings were malnutrition/emaciation, with secondary causes from bacterial and parasitic infections. The emaciation of newly weaned animals suggests that these fur seal pups were dealing with decreased prey availability (primarily squid). This lack of prey may have been impacting nursing mothers, causing them to wean their pups at lower weights, and for pups post-weaning, which left the pups unable to find enough food during the difficult transition to independent foraging. Other findings of interest included several cases with severe anemia (Field *et al.* 2019) and alopecia or guard hair loss, which is especially concerning for an animal that depends on its fur for thermoregulation. The UME investigation team also examined the role that biotoxins might have played in this UME. Domoic acid was detected in feces and fluids collected for a large proportion of animals. In addition to these causes for strandings, many Guadalupe fur seals stranded alive and dead with fishing or marine debris entanglements. More information on this UME can be found in the Disease section of Factor C in this document.

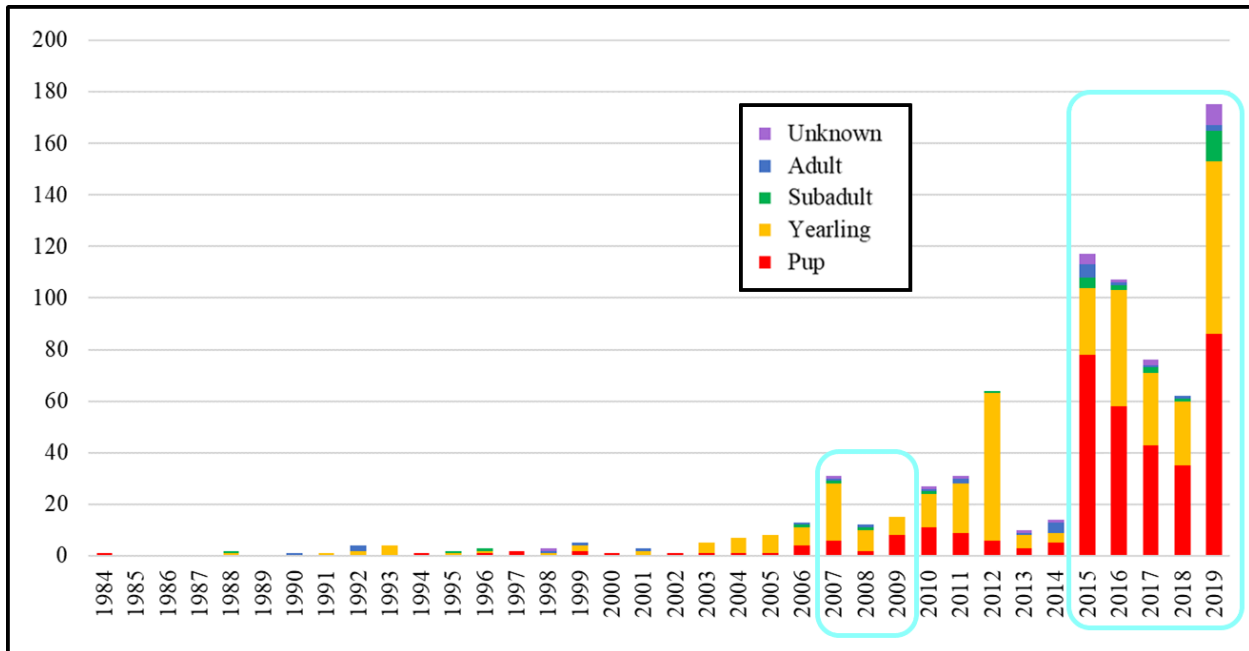


Figure 6. Guadalupe fur seal strandings along the U.S. west coast by age class from 1984-2019. Light blue boxes denote years with UME (2007-2009 in OR and WA and 2015-2019 in CA, OR, and WA).

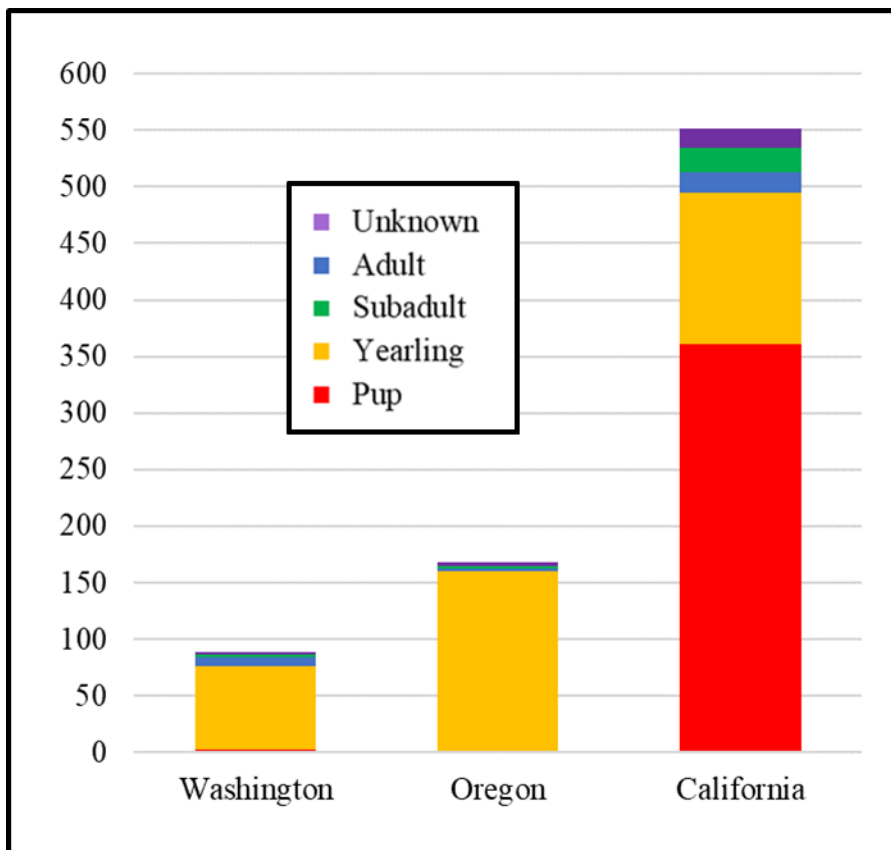


Figure 7. Guadalupe fur seal strandings along the U.S. west coast by age class by state from 1984-2019.



Data from the Stranding Network, including UME declarations, and the Mexican Marine Mammal Stranding Network informs conservation actions and management decisions for marine mammals, including Guadalupe fur seals, and contributes to further understanding of the animals' biology and ecosystem health. As such, the Stranding Network provides an essential monitoring tool that will help identify threats to Guadalupe fur seals as they emerge, and potentially address or mitigate those threats.

#### 5.3.5.8 *Conclusion for Factor E*

After weighing these findings, which are based on the best available science, NMFS finds that the Guadalupe fur seal faces an ongoing risk of extinction due to threats related to the other natural or anthropogenic factors affecting its continued existence under Factor E, in the form of oil spills. Oil spills are particularly concerning to Guadalupe fur seals because this species has only one rookery. Should an oil spill occur near their rookery, it could be catastrophic for the population. In addition, the ongoing UME has provided information regarding the threats to Guadalupe fur seals within their range. The species seemed to rebound after the UME from 2007–09; however, the effects of the current ongoing UME may not be realized for several years, and may have population-level impacts to Guadalupe fur seals that are currently not observable.

#### 5.3.6 Final Conclusion of the Review of the Five ESA Listing Factors

Based on information in our review of new information, NMFS finds:

Several of the existing individual factors evaluated under the five ESA listing factors contribute to an ongoing elevated risk of extinction for Guadalupe fur seals. Because this species has only one rookery, certain threats could be catastrophic to the population. These are extreme natural events, disease outbreak, and oil spill. In addition, climate change-driven threats, including warm water events, sea-level rise, and ocean acidification, may negatively affect the population and/or its habitat and the ecosystem upon which it depends in the future directly, or indirectly through trophic cascade. We acknowledge that there is uncertainty for some of these threats, and although the best available science does not allow us to predict the magnitude, frequency, or timing of these threats, we do know that climate-related events are stronger and more frequent than in the past. Further, with the occurrence of anomalously warm waters increasing, the range of this species may expand, bringing the Guadalupe fur seal into contact with new species or individuals and potentially exposing them to novel pathogens. It is unknown whether this exposure will lead to a possible disease outbreak, but if it were to occur, it could be catastrophic to the population. Similarly, warm water events, including El Niño events, may change the distribution and range of Guadalupe fur seals' prey species. Because Guadalupe fur seals are more specialized foragers, changes in the distribution and/or abundance of their prey could have impacts on their health and survival.

## **6 RESULTS OF THE STATUS REVIEW**

### **6.1 Conclusion**

In many respects, the Guadalupe fur seal population has significantly improved since it was

originally protected under the ESA in 1985. Existing legal protections and environmental conditions have supported the species' growth and productivity at the primary rookery at Guadalupe Island and the species has become increasingly common throughout their historical range. However, despite these increases, the population continues to face threats to its survival, and without scientifically reliable population estimates to help evaluate the species' current status and trends, protections for this species should continue.

Based on our review of the demographic criteria, the five ESA listing factors and associated criteria in this Status Review, and after a detailed review of the best available information since completion of the listing decision, NMFS finds that the Guadalupe fur seal continues to face an elevated risk of extinction from several demographic and anthropogenic threats. We recognize that as a single population unit with only one rookery and one small re-colonization site that has also been impacted by warm water events – combined with the cumulative impacts of potential threats due to climate change and disease outbreaks that may occur within the foreseeable future – the species faces an ongoing and future threat that could be catastrophic to population survival. Current protections for this species should continue as researchers are just starting to get a better sense of the status of the population, and as the Guadalupe fur seal continues to recolonize in its historical range while facing new pressures such as climate change, and potential exposure to novel diseases.

## **6.2 Recommended Recovery Actions: Continued and Increasing Research**

NMFS recommends continuing to support current research of the Guadalupe fur seal population throughout its range along the west coast of Mexico and the United States and expanding these studies to continue to learn about the population. These activities include tagging and tracking of individuals to monitor movements, habitat use, and range expansion; health assessments, trophic ecology, and population estimates to increase our knowledge of population health and status trends of the population; genetic analysis to detect hybridization and improve species identification; stranding response to continue the rescue and rehabilitation of sick or stranded individuals; and continued monitoring to identify anthropogenic threats to individuals and the population. NMFS also recommends forming a recovery team of species experts to develop a recovery plan, including delisting criteria, to determine when the species has recovered and may be removed from the list of threatened and endangered species under the ESA.

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