ANNUAL MEETING OF THE MARINE MAMMAL COMMISSION

14-15 November 2023
Washington, DC.

CLIMATE CHANGE AND THE GUADALUPE FUR SEAL

Fernando Elorriaga-Verplancken
(CICIMAR-IPN)


Commercially Extinct
(1894)

HISTORICAL GFS DISTRIBUTION

Washington X

PACIFIC OCEAN

Overall population size
Pre-exploitation
Ca. 200,000
(Hubbs,1979)

Farallon Islands X

Channel Islands X

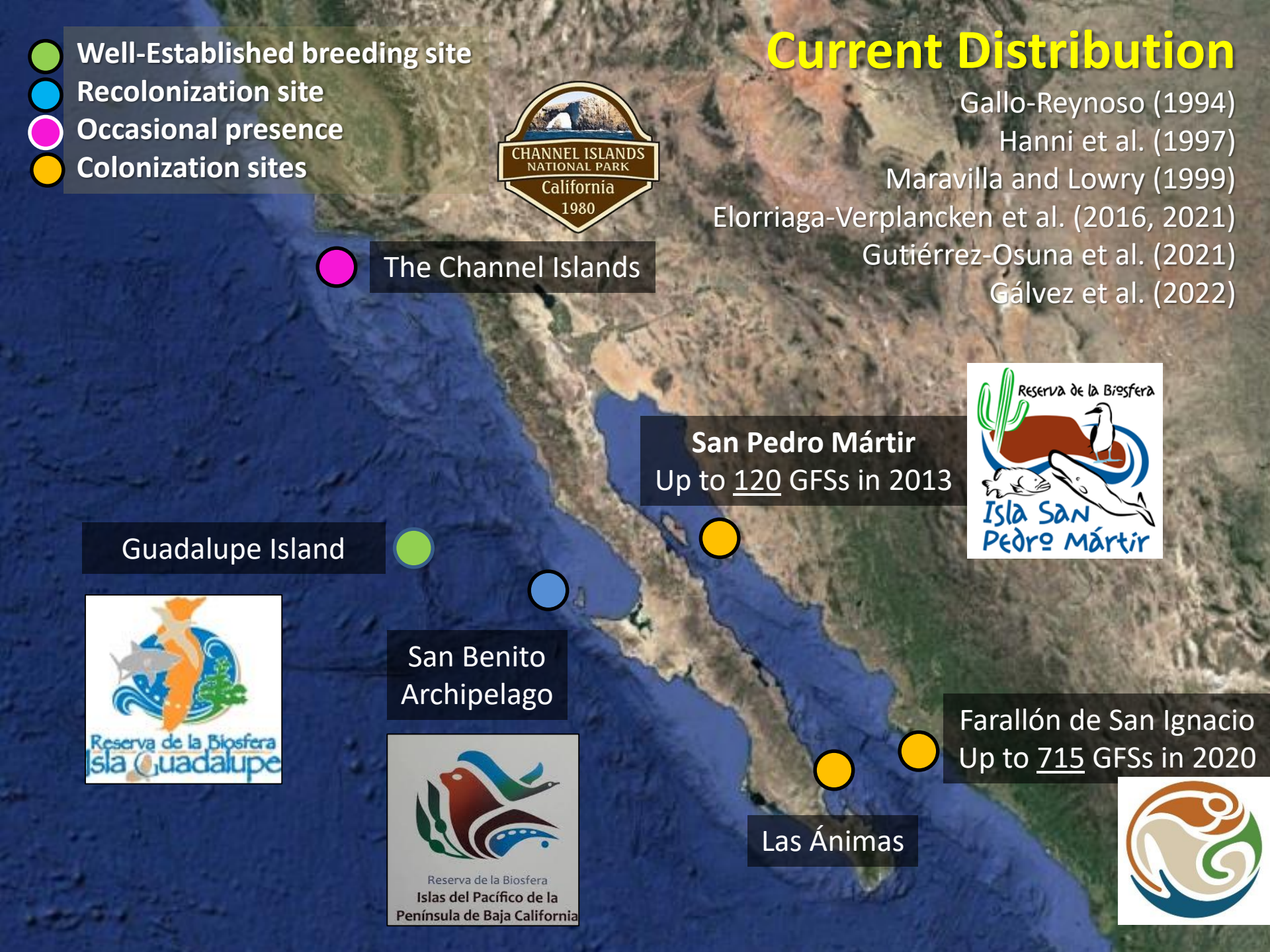
MEXICO

Guadalupe Island X

San Benito Archipelago X X

Cedros Isla

Socorro Island
(Revillagigedo Archipelago) X


Well-Established breeding site
Recolonization site
Occasional presence
Colonization sites
Current Distribution
Gallo-Reynoso (1994)
Hanni et al. (1997)
Maravilla and Lowry (1999)
Elorriaga-Verplancken et al. (2016, 2021)
Gutiérrez-Osuna et al. (2021)
Gálvez et al. (2022)
CHANNEL ISLANDS
NATIONAL PARK
California
1980
The Channel Islands
San Pedro Mártir
Up to 120 GFSs in 2013
Reserva de la Biosfera
Isla San Pedro Mártir
Guadalupe Island
Reserva de la Biosfera
Isla Guadalupe
San Benito Archipelago
Reserva de la Biosfera
Islas del Pacífico de la Península de Baja California
Farallón de San Ignacio
Up to 715 GFSs in 2020
Las Ánimas

GFS CONSERVATION STATUS

International Union for the Conservation of Nature (IUCN) Red List

LEAST CONCERN

SEMARNAT

SECRETARÍA DE MEDIO AMBIENTE Y RECURSOS NATURALES

MEXICAN LAW

NOM-059-SEMARNAT-2010

ENDANGERED

Endangered Species Act of 1973

THREATENEAD

Celebrating 50 Years of the Marine Mammal Protection Act

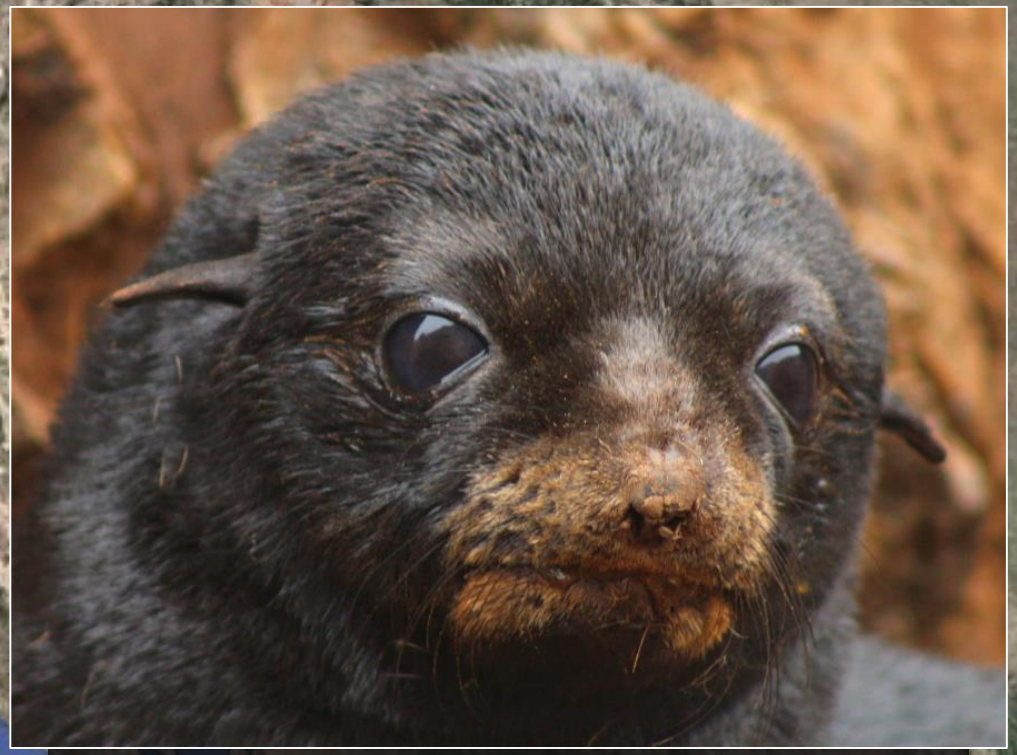
MARINE MAMMAL COMMISSION

Marine Mammal Protection Act of 1972

DEPLETED

Guadalupe Island

14 GFSs in 1954
(Hubbs, 1956)

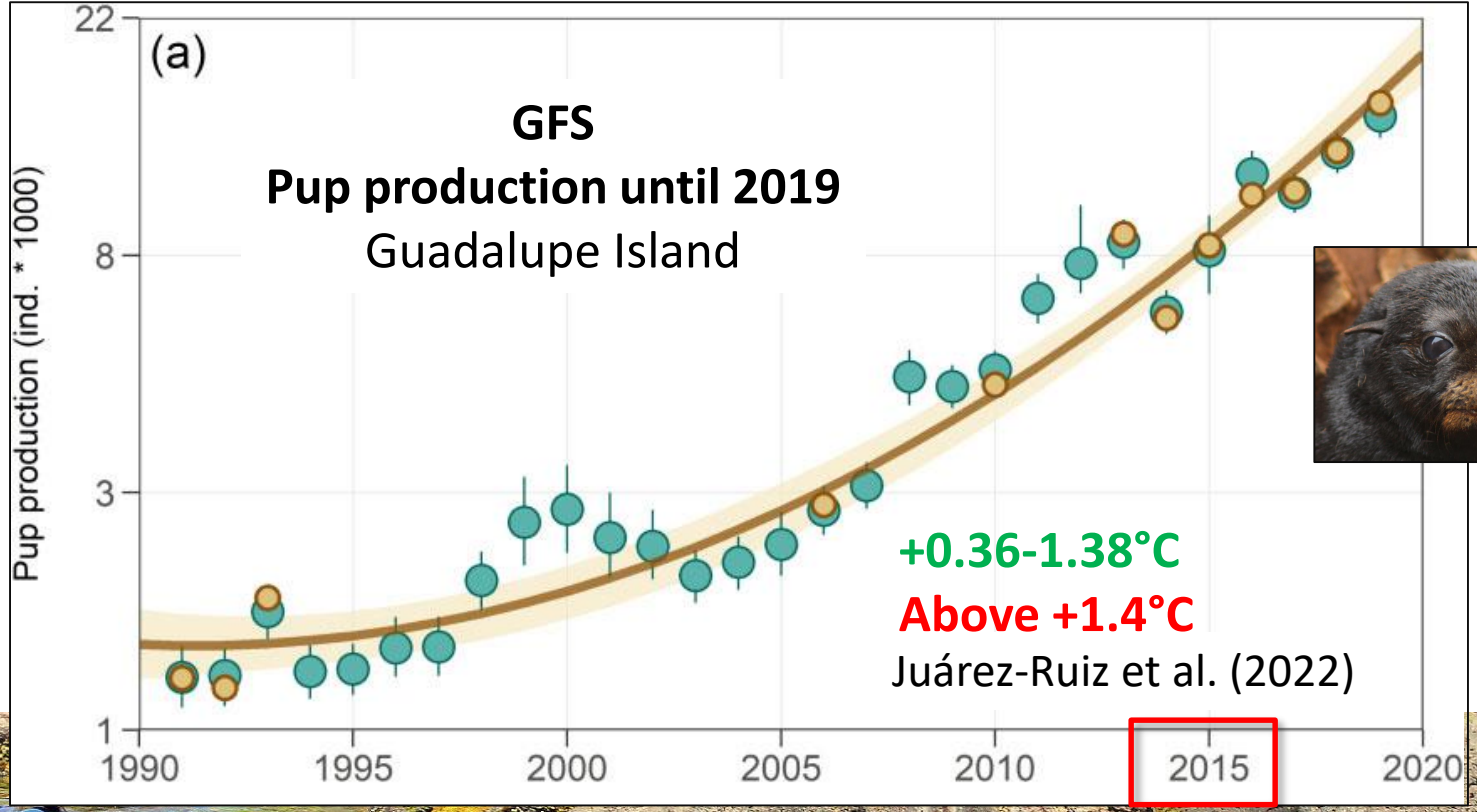


Only well-established GFS breeding site

Overall population size
Ca. 86,000 in 2023
(unpublished)

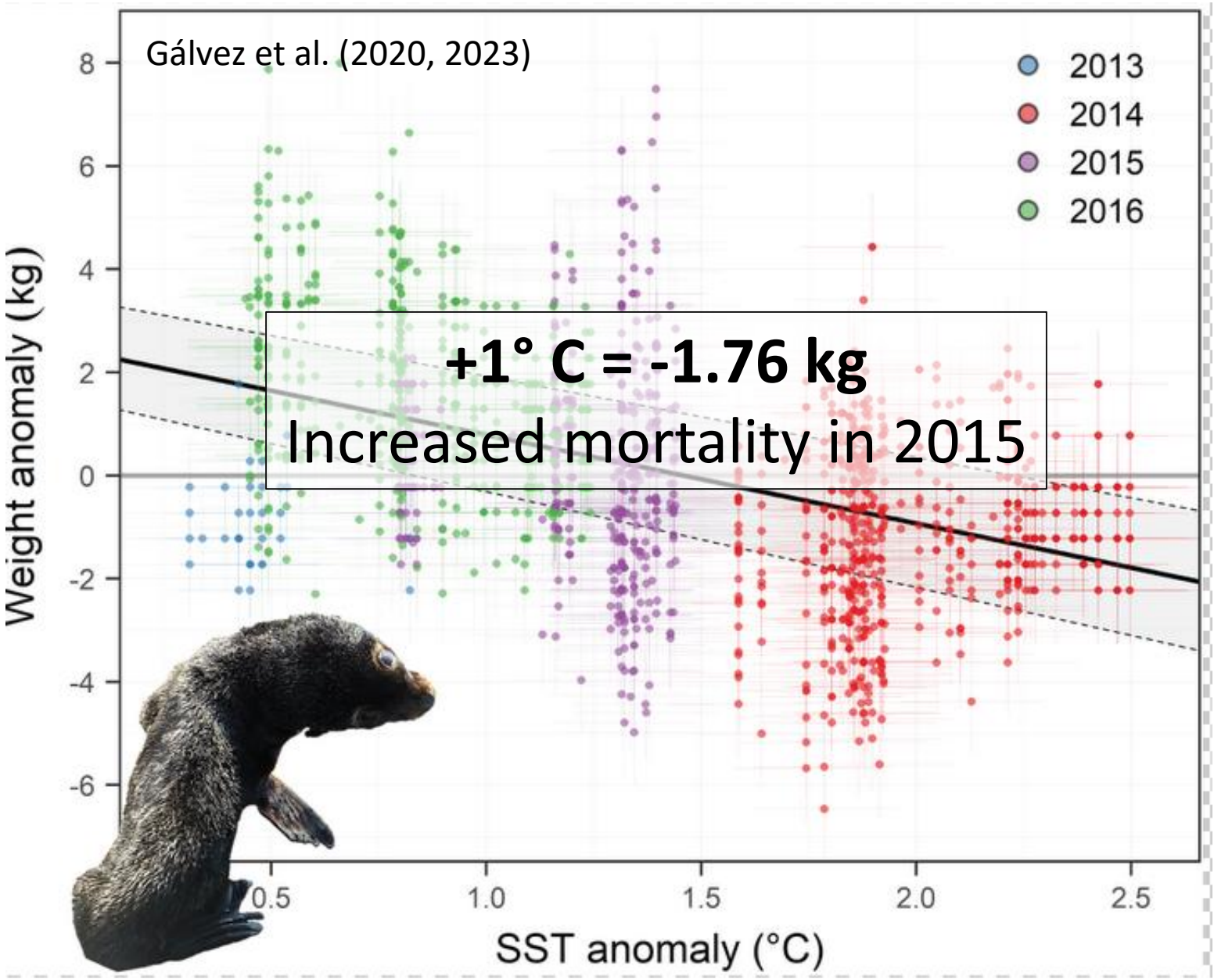
GFS POPULATION SIZE

2018	**82,052** (71,795 - 92,308)
2019	**70,008** (61,257 – 78,759)
2022	**81,124** (70,983 – 91,264)
2023	**86,328** (75,537 – 97,119)



Ariadna Juárez

WARM ANOMALIES AND BODY MASS: GFS NEONATES



Casandra Gálvez

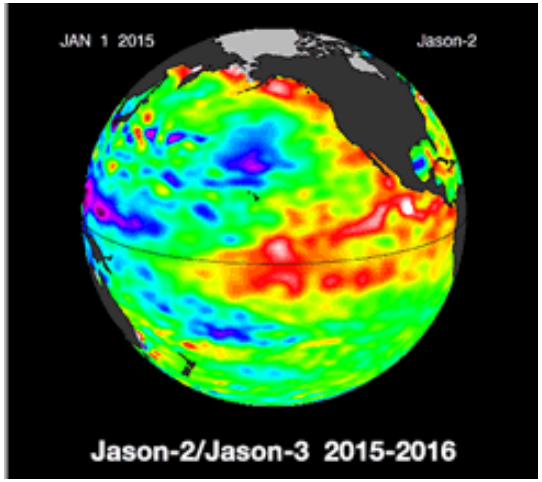
San Benito Archipelago

Recolonization in 1997

Maravilla and Lowry (1999)

SAN BENITO ARCHIPELAGO IN THE SUMMER

MOSTLY JUVENILES AND MALE SUBADULTS

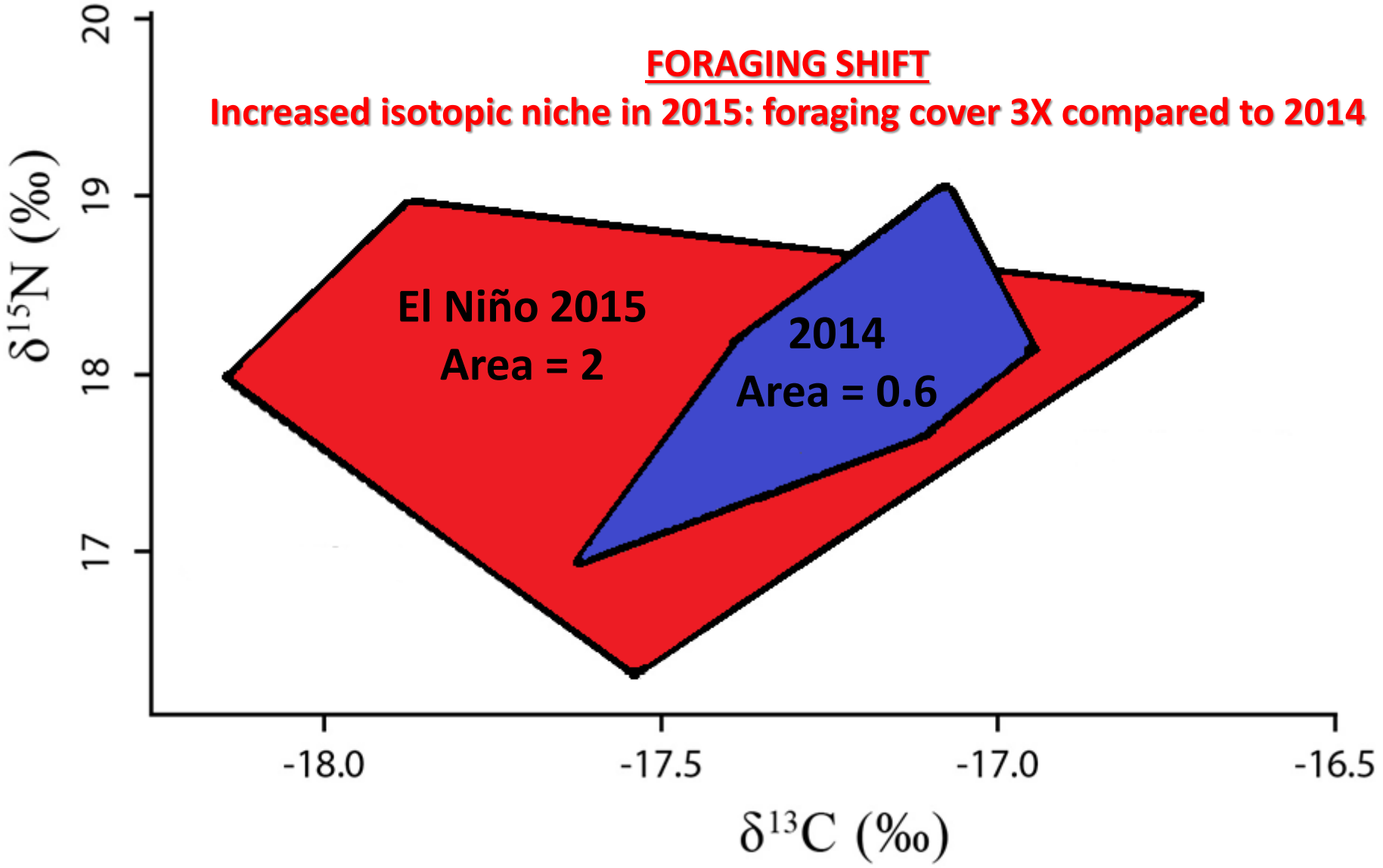


García-Capitanachi et al. (2017), Elorriaga-Verplancken et al. (2016), Serrano-Rodríguez (2023)

GFSs IN THEIR RECOLONIZATION SITE
(2014 vs. 2015)

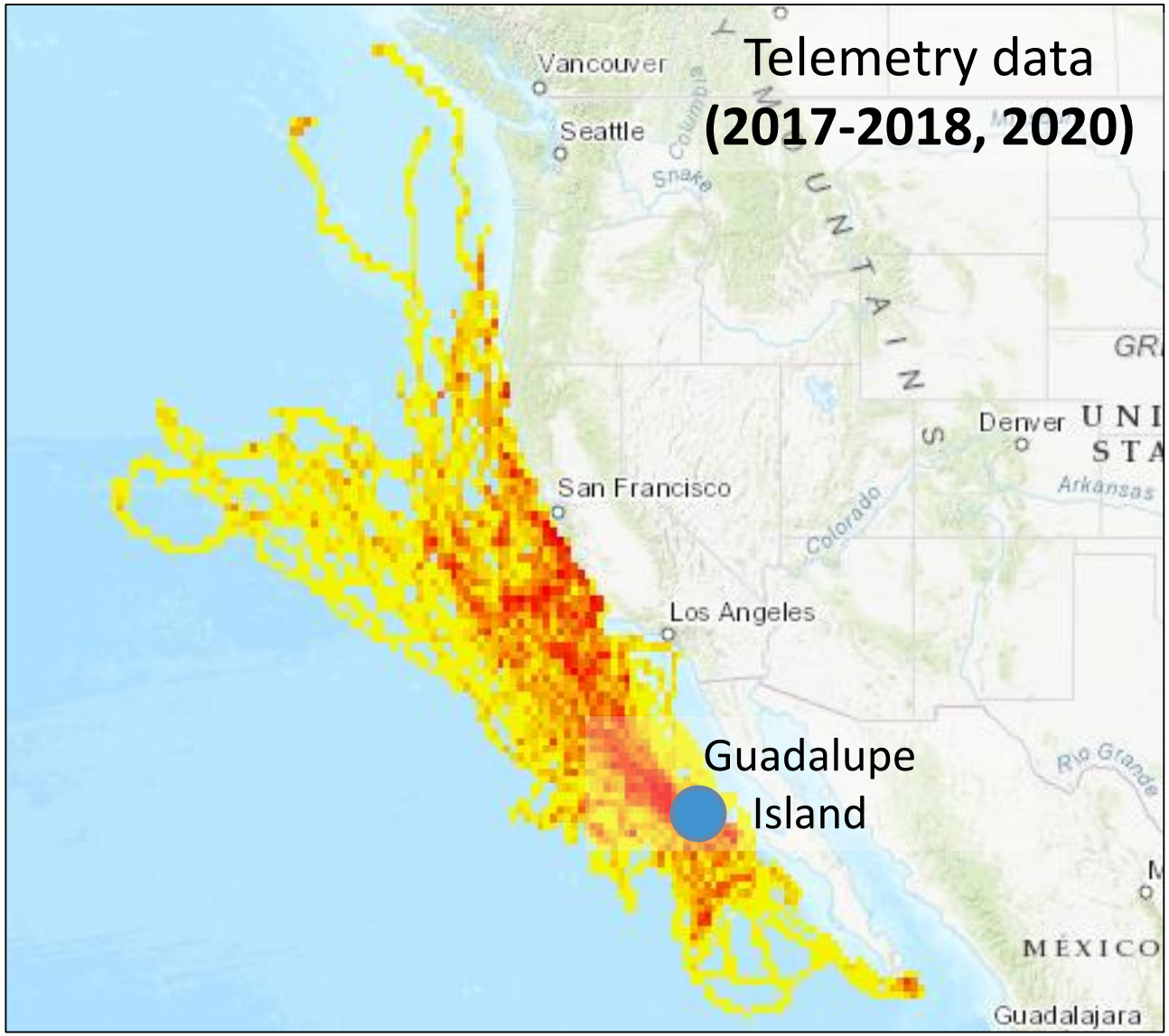
FORAGING SHIFT

Increased isotopic niche in 2015: foraging cover 3X compared to 2014



Elorriaga-Verplancken et al. (2016)

This is a large dispersal capacity by the GFS



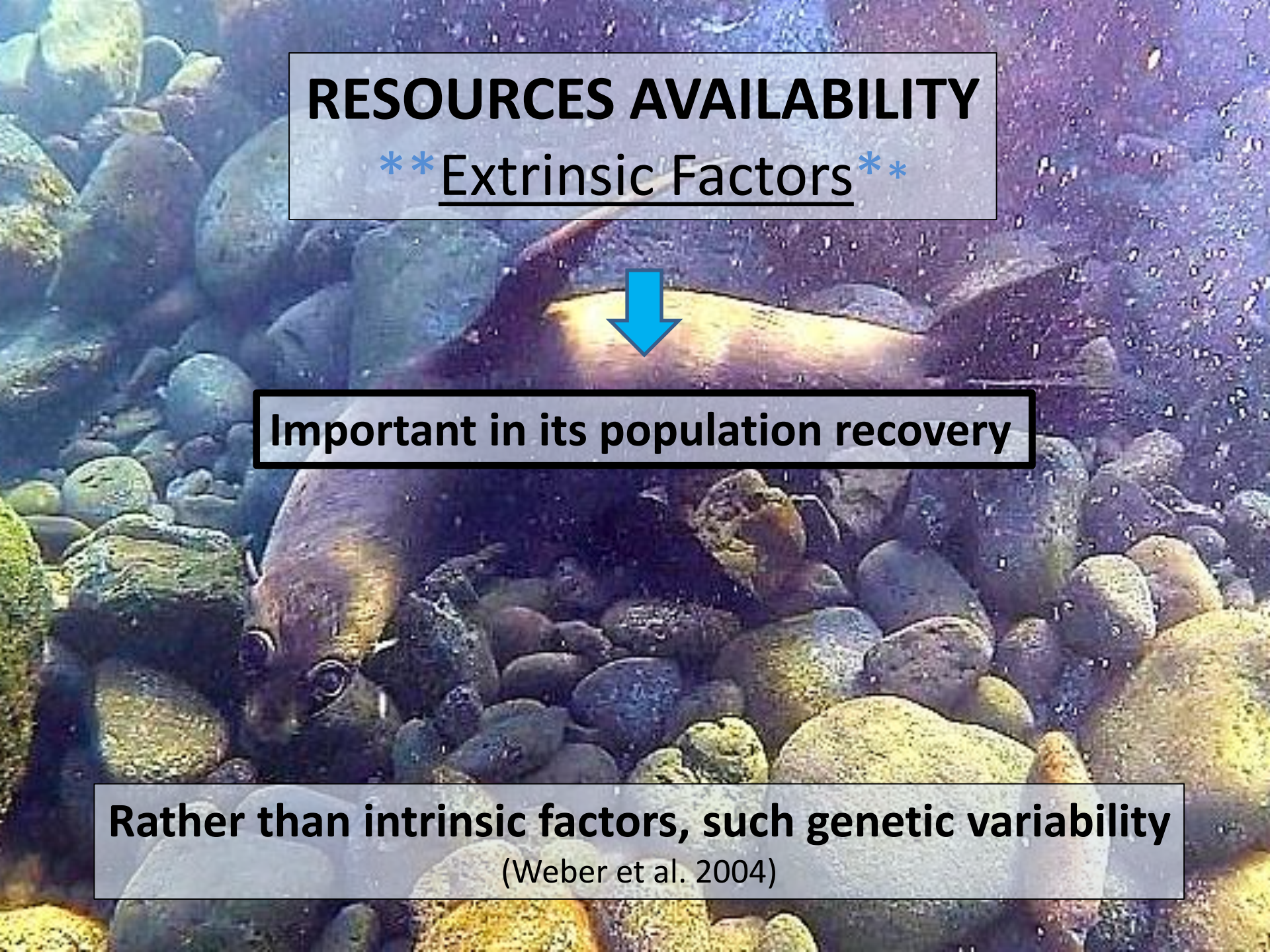
The Marine Mammal Center

Tenaya Norris

Majo Amador

Roxanne Beltran (UCSC)

Norris and Elorriaga-Verplancken (2020)
Amador-Capitanachi et al. (PhD in process)



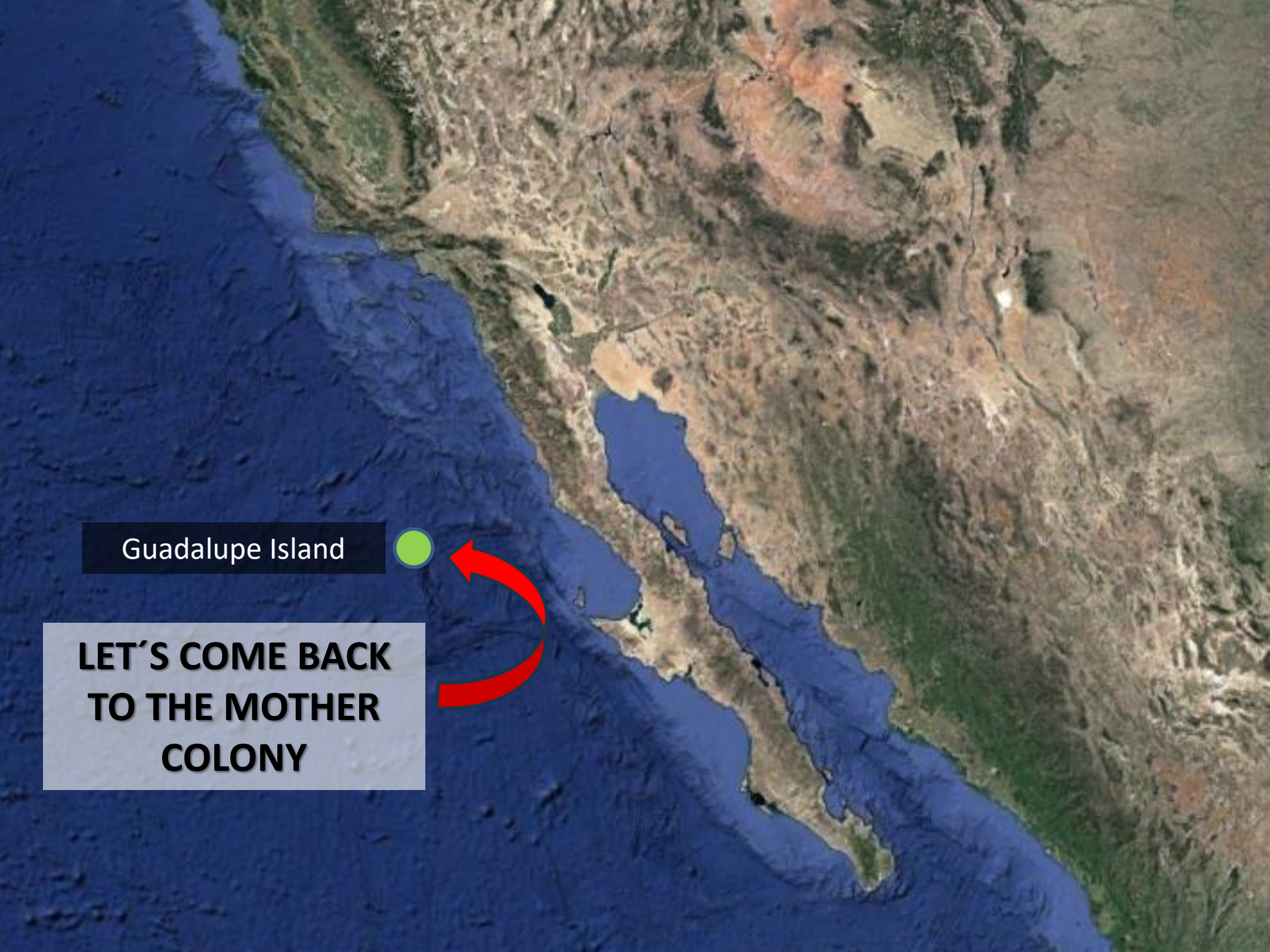
RESOURCES AVAILABILITY

Extrinsic Factors

Important in its population recovery

Rather than intrinsic factors, such genetic variability

(Weber et al. 2004)


Guadalupe Island
LET´S COME BACK TO THE MOTHER COLONY

DIET OF THE GUADALUPE FUR SEAL (2013-2020)

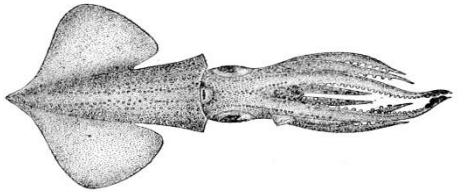
Jumbo squid
(*Dosidicus gigas*)
>50%

Hooked squid
(*Onychoteuthis* spp)

Crystal squid
(*Hyaloteuthis pelagica*)

Flying squid
(*Ommastrephes bartramii*)

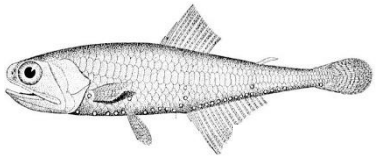
Opalescent squid
(*Doryteuthis opalescens*)



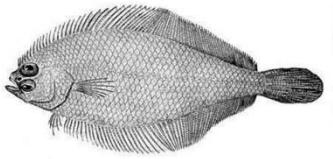
Enope squid
(*Abraliopsis* spp)

MICTOPHIDS

Symbolophorus spp



Tarletonbeania spp



Citharichthys spp

Strongylura exilis

Juárez-Ruiz et al. (2018);
Amador-Capitanachi et al. (2017, 2020)

LARGE-TIME SCALE GFS DIET

Most dominant prey item: **JUMBO SQUID**

abscent or non-significant in the past

(Hernández 2009; Gallo-Reynoso 1994; Gallo-Reynoso et al., 2013)

Invasive range expansion by the Humboldt squid, *Dosidicus gigas*, in the eastern North Pacific

Louis D. Zeidberg* and Bruce H. Robison†

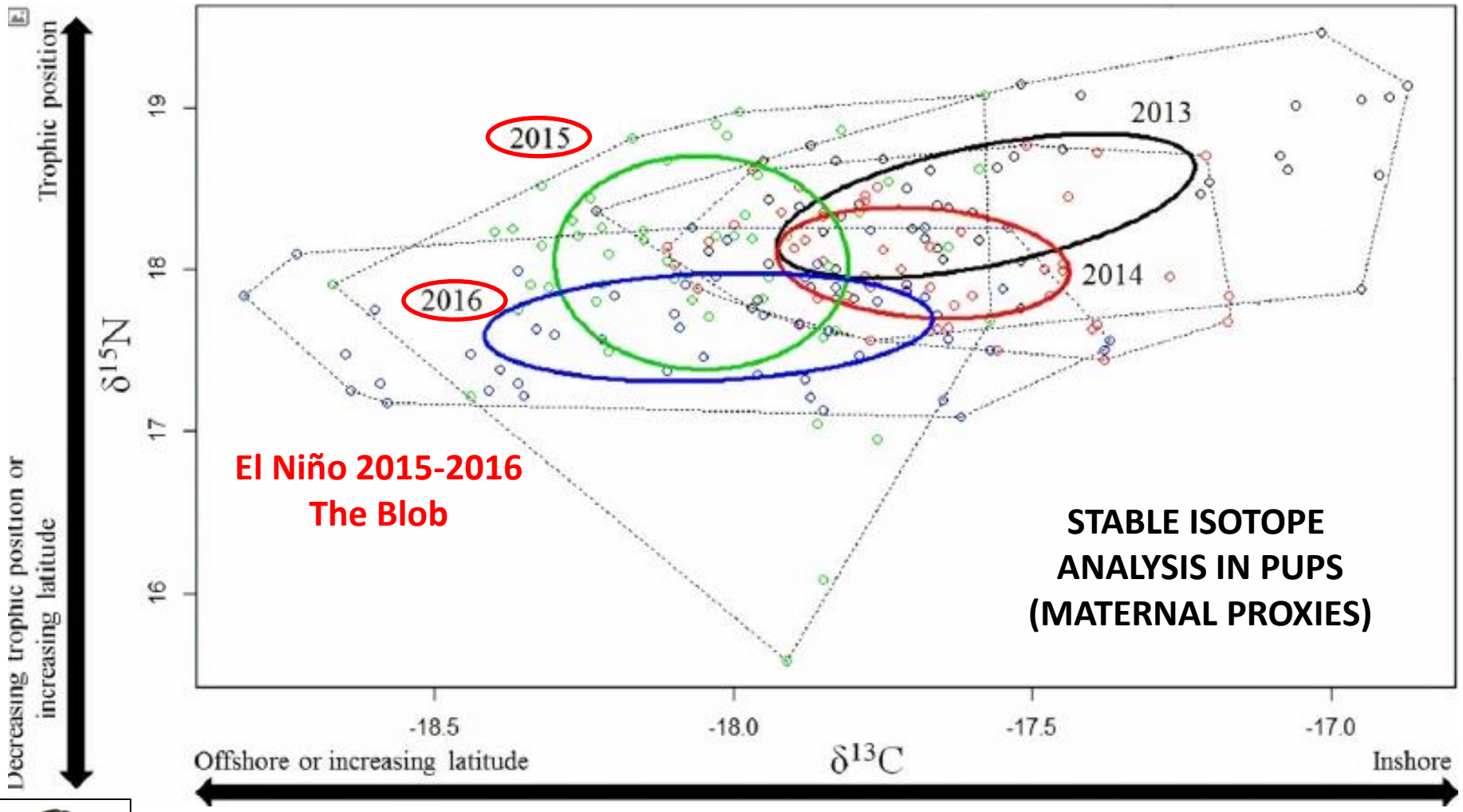
2007

RANGE EXPANSION AND TROPHIC INTERACTIONS OF THE JUMBO SQUID, *DOSIDICUS GIGAS*, IN THE CALIFORNIA CURRENT

2008

JOHN C. FIELD AND KEN BALTZ WILLIAM A. WALKER A. JASON PHILLIPS

INTERANUAL GFS FORAGING HABITS
GUADALUPE ISLAND



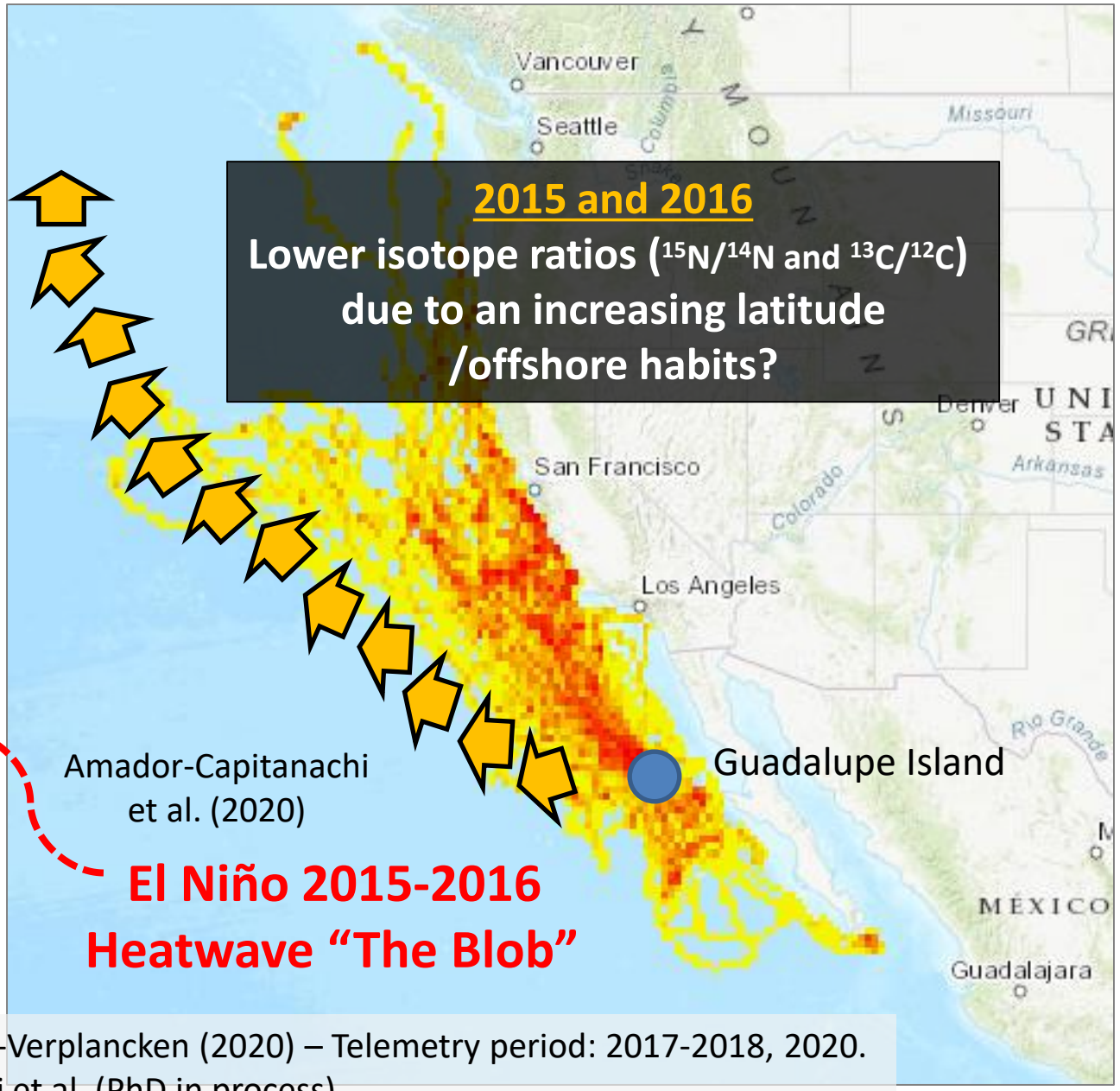
Majo Amador

Amador-Capitanachi et al. (2020)

INTERANUAL GFS FORAGING HABITS: GUADALUPE ISLAND

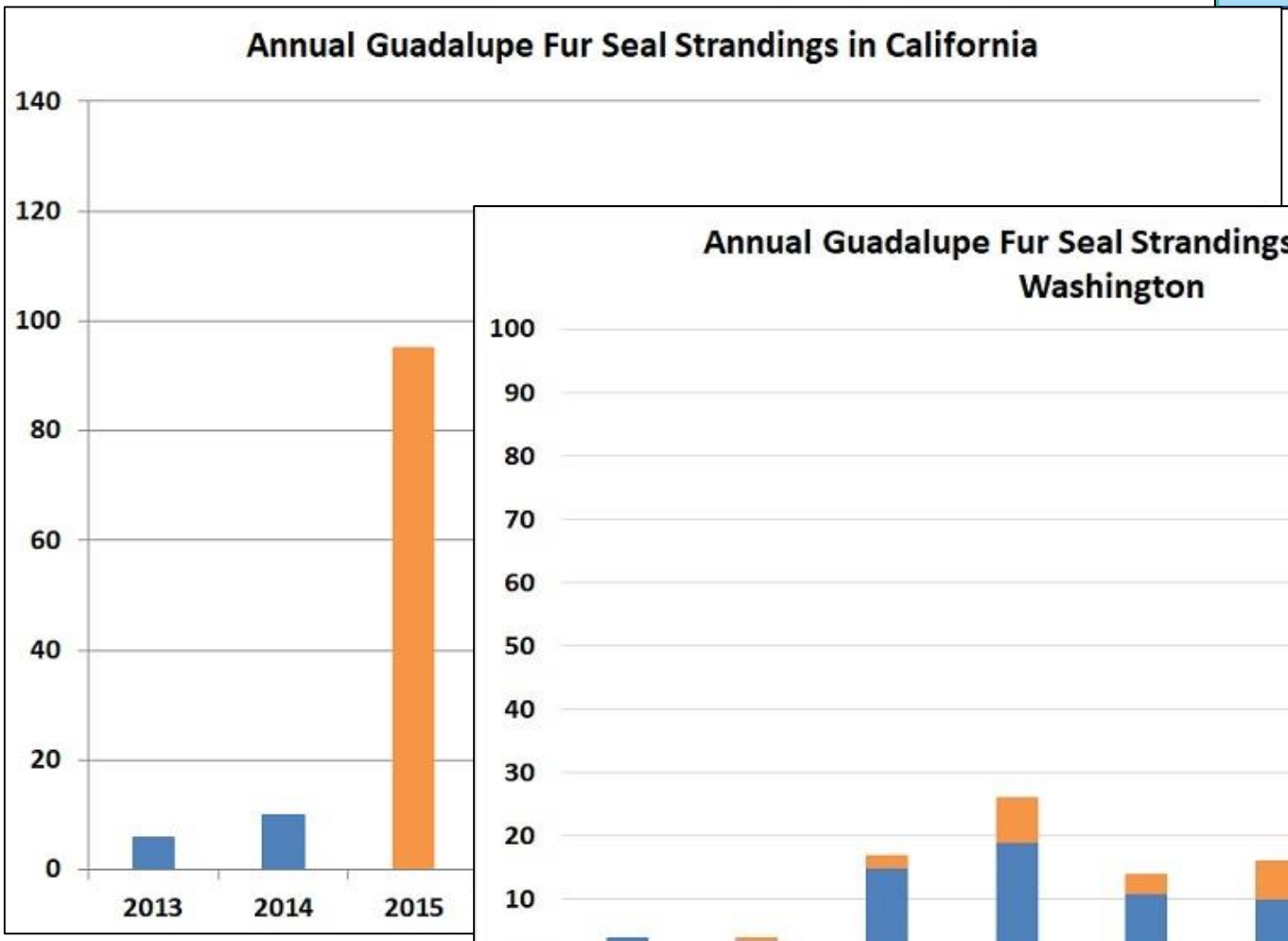
Jumbo squid

Neon flying squid



Norris and Elorriaga-Verplancken (2020) – Telemetry period: 2017-2018, 2020.
Amador-Capitanachi et al. (PhD in process)

The GFS Unusual Mortality Event

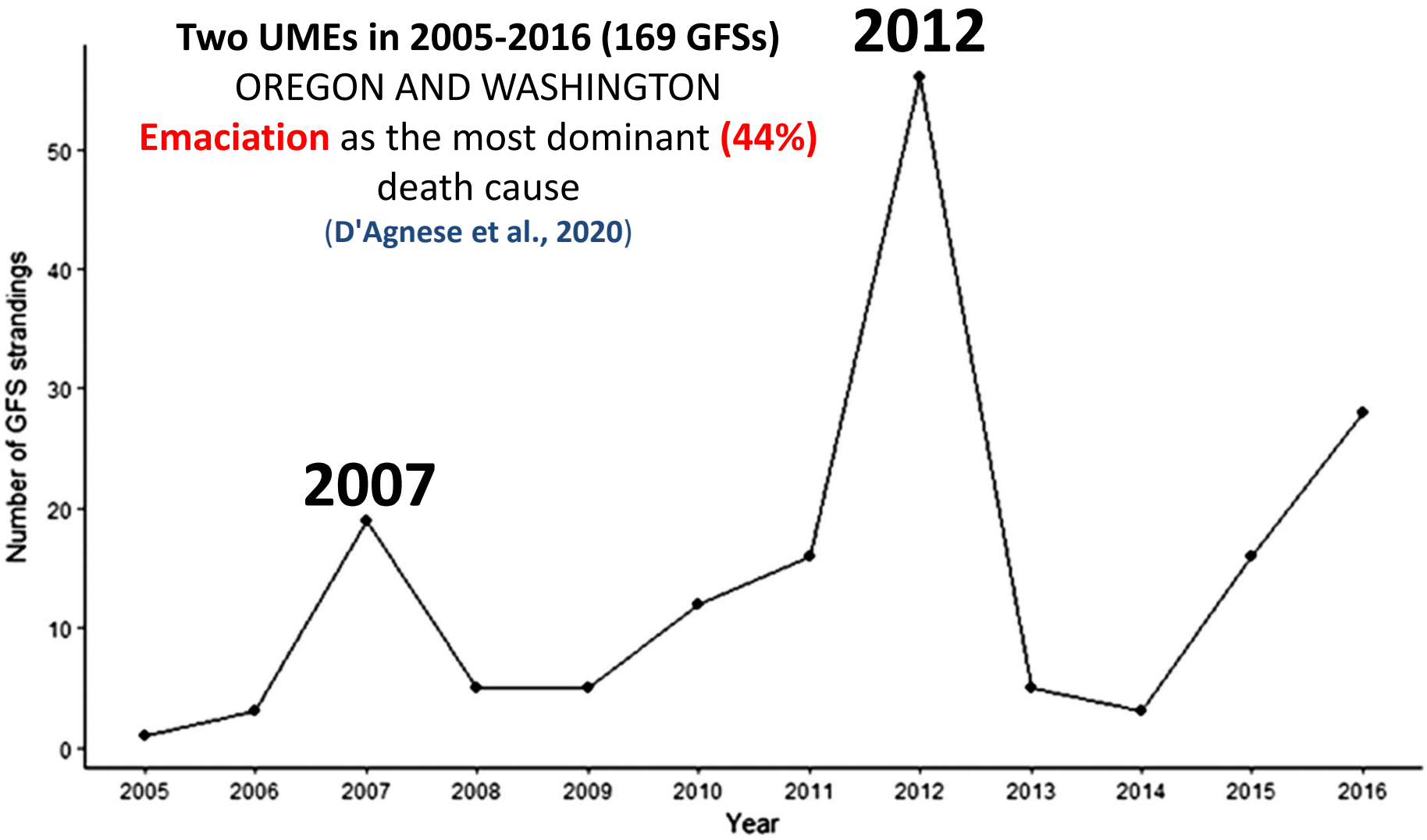


Source: https://www.fisheries.noaa.gov/national/marine-life-distress/2015-2021-guadalupe-fur-seal-and-2015-northern-fur-seal-unusual

D'Agnese et al. (2020)

The GFS Unusual Mortality Event

Two UMEs in 2005-2016 (169 GFSs)
OREGON AND WASHINGTON
Emaciation as the most dominant **(44%)** death cause
(D'Agnese et al., 2020)



Taken from D'Agnese et al. (2020)

The GFS Unusual Mortality Event

UME 2015-2021 (715 GFSs)

Malnourished/emaciated weaned pups and yearlings (<2-y old) linked to the "Warm Water The Blob", El Niño, and several ocean heatwaves (NOAA).

Source:

https://www.fisheries.noaa.gov/national/marine-life-distress/2015-2021-guadalupe-fur-seal-and-2015-northern-fur-seal-unusual

In presence of extreme warm anomalies:

Decline in pup production- Guadalupe Island
(Juárez-Ruiz et al., 2022)

Abundance decline at the recolonization site - San Benito
(Elorriaga-Verplancken et al., 2016)

Shifts in foraging grounds or increase of their cover extension, as well as prey composition variation – Guadalupe and San Benito
(Elorriaga-Verplancken et al., 2016; Amador-Capitanachi et al., 2020)

The GFS is recovering
75,000 – 97,000 in 2023
+8.4% until 2019 (Juárez-Ruiz et al. 2022)

Guadalupe Island keeps being The only well-established breeding site

Decrease of neonate body mass and an increase in their mortality due to emaciation – Guadalupe
(Gálvez et al., 2020, 2023)

Unusual mortality event of GFSs (2015-2021 and previous) – California, Washington, and Oregon
(NOAA-Fisheries; D'Agnese et al., 2020)


The GFS is under a recovery process and it is also a bio-monitor of climate change in the Northeastern Pacific

ACKNOWLEDGEMENTS

Tenaya Norris

The Marine Mammal Center®

MARINE MAMMAL COMMISSION

IPN

CICIMAR-IPN

PACIFIC MARINE MAMMAL CENTER

CONACYT

S.C.P.P. PESCADORES NACIONALES DE ABULÓN

Reserva de la Biosfera Isla Guadalupe

Reserva de la Biosfera Islas del Pacífico de la Península de Baja California

Islas del Golfo de California ÁREA DE PROTECCIÓN DE FLORA Y FAUNA

To all students and volunteers over the years