Vloga kitov in delfinov pri blaženju podnebnih sprememb

doc. dr. Tilen Genov

1) Morigenos – slovensko društvo za morske sesalce

2) Oddelek za biodiverziteto, FAMNIT, Univerza na Primorskem

Laško, 16. in 17. april 2025

8. konferenca učiteljev/-ic naravoslovnih predmetov – NAK 2025

REPUBLIKA SLOVENIJA
MINISTRSTVO ZA VZGOJO IN IZOBRAŽEVANJE

I FEEL SLOVENIA

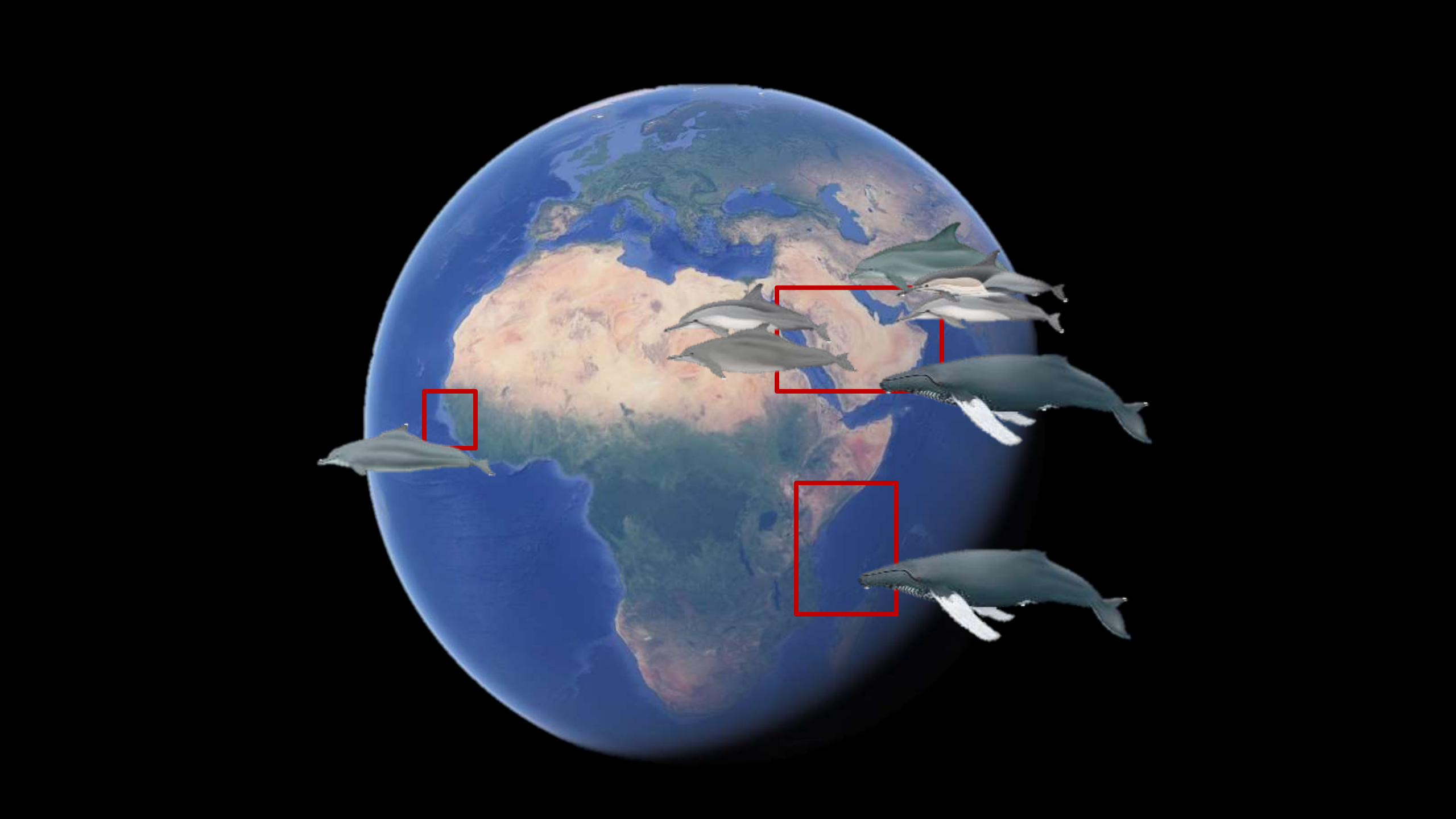
Sofinancira Evropska unija

Vloga kitov in delfinov pri blaženju podnebnih sprememb

doc. dr. Tilen Genov

1. Morigenos – slovensko društvo za morske sesalce
2. Oddelek za biodiverziteto, UP FAMNIT


MORIGENOS



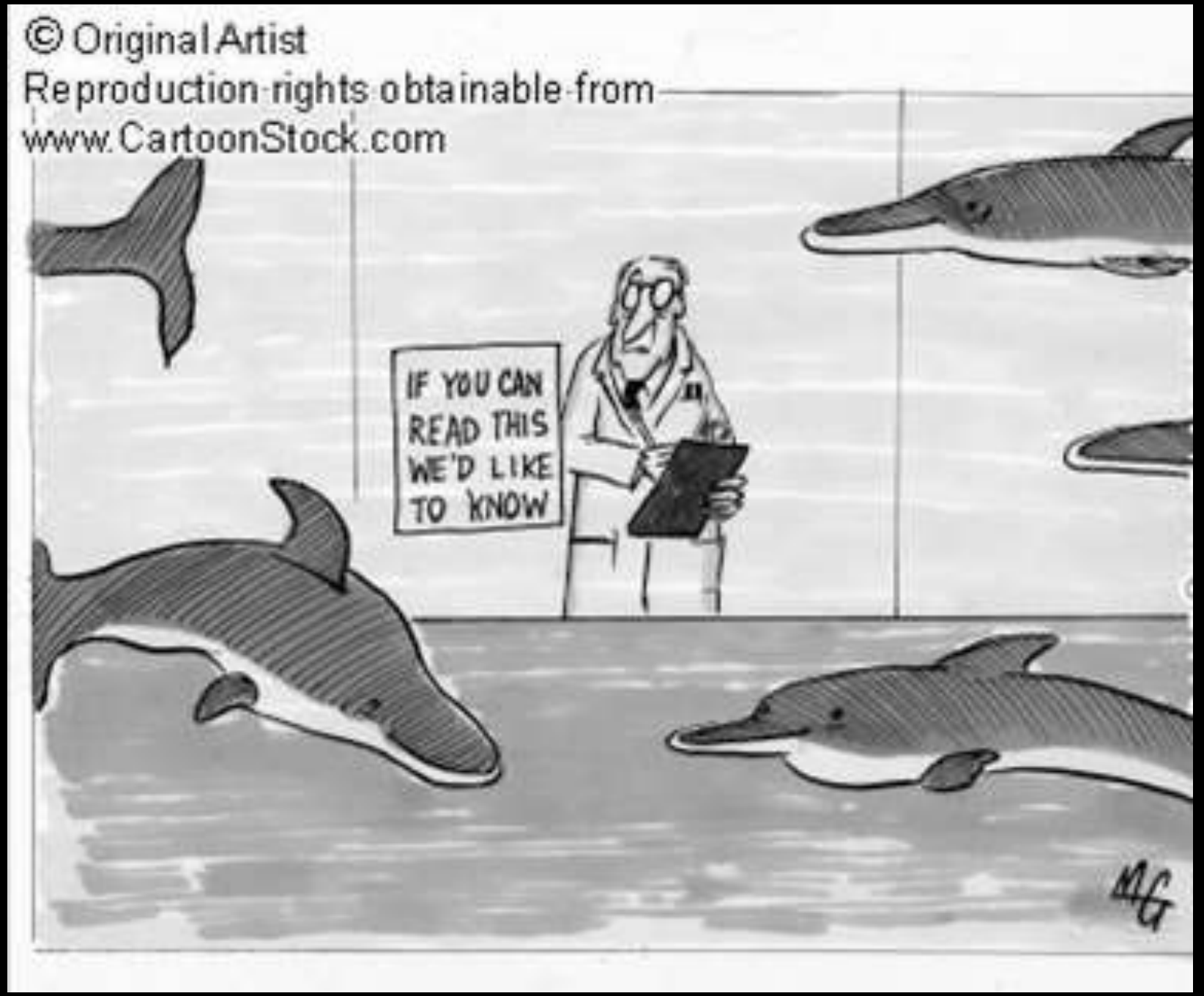
Kiti (Cetacea)

zakaj preučevati

KITE IN DELFINE?


MORIGENOS


foto: Tilen Genov




MORIGENOS

RIBIŠTVO

TURIZEM

PROMET

AKVAKULTURA


MORIGENOS


KP 576
MORIGENOS


foto: Tilen Genov

SAVE THE PLANET

PLANT TREES

Nature's Solution
TO CLIMATE CHANGE

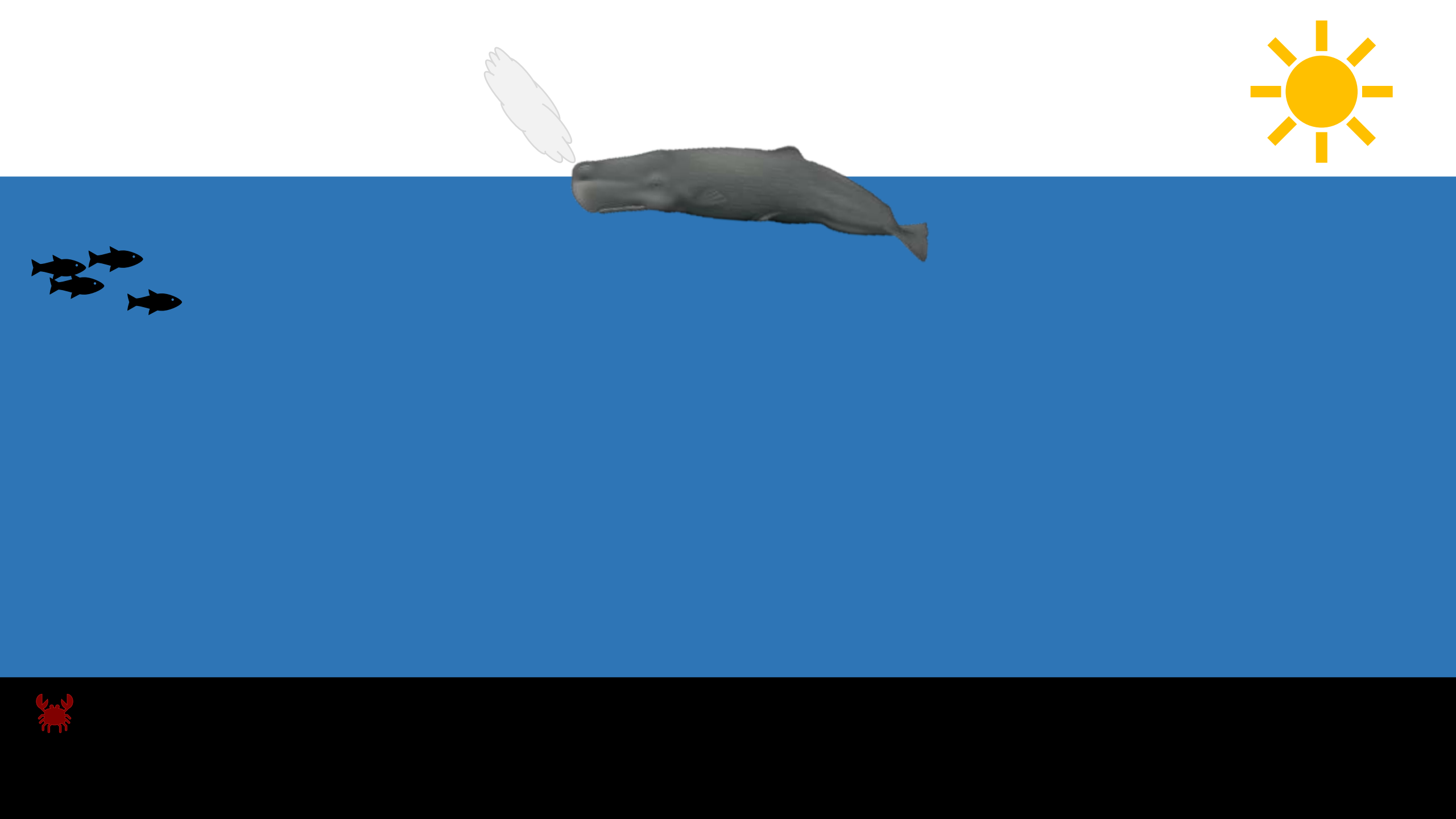
A strategy to protect whales can limit greenhouse gases and global warming

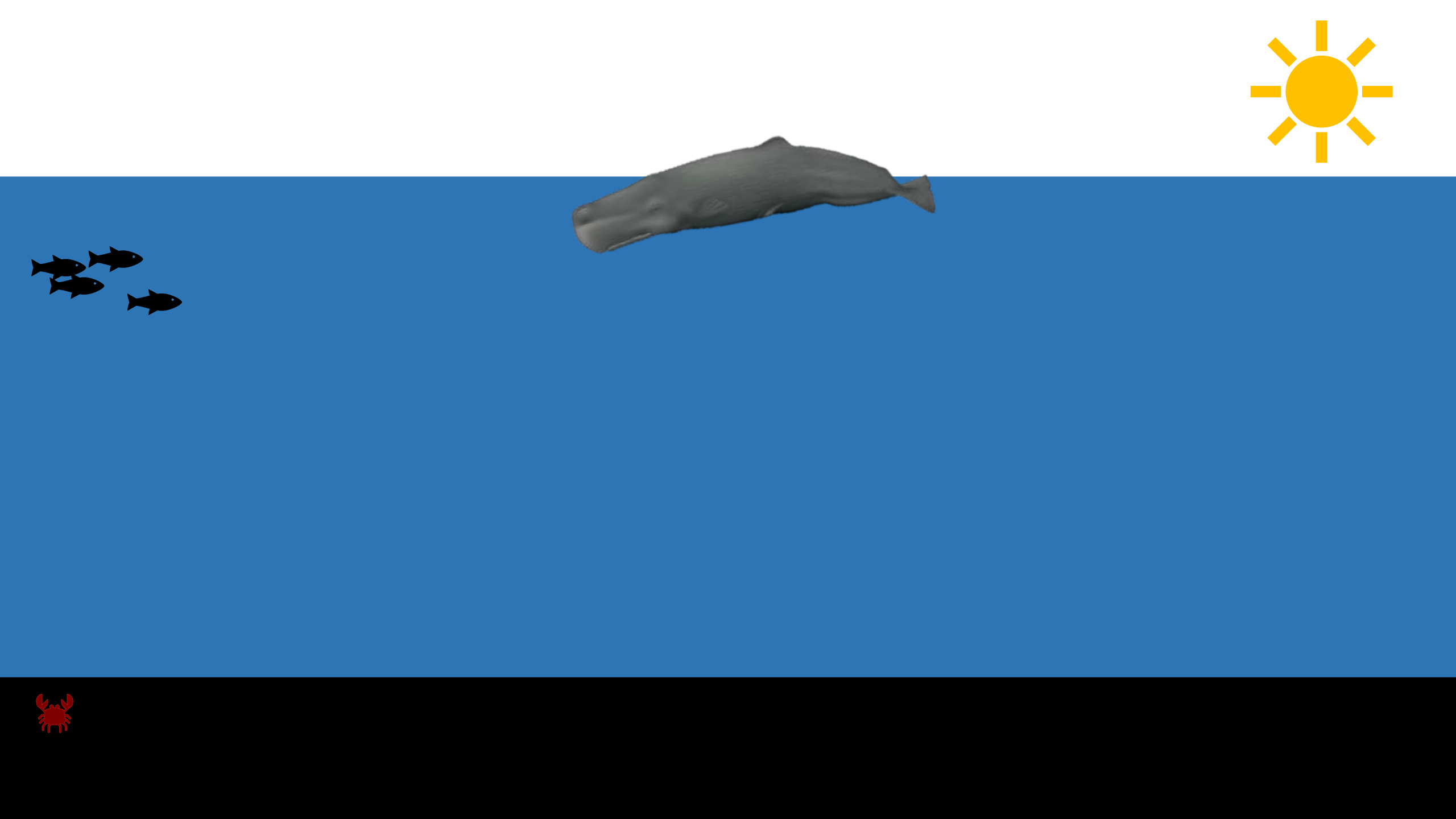
Ralph Chami, Thomas Cosimano, Connel Fullenkamp, and Sena Oztosun

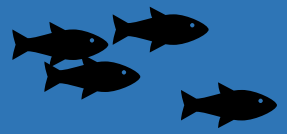
Kit glavač

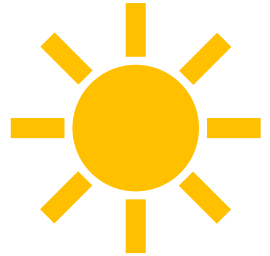
Physeter macrocephalus

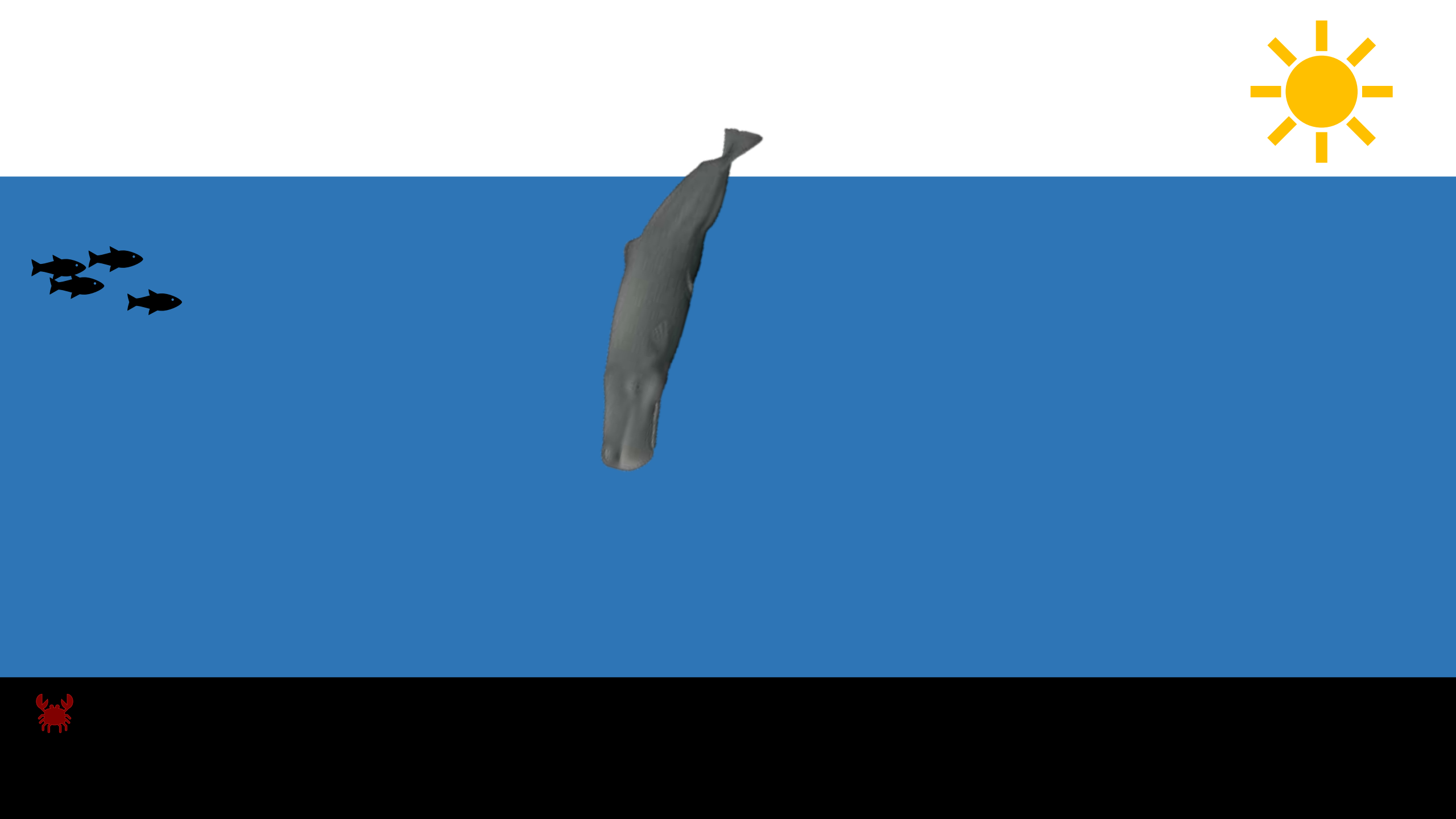
foto: Tilen Genov

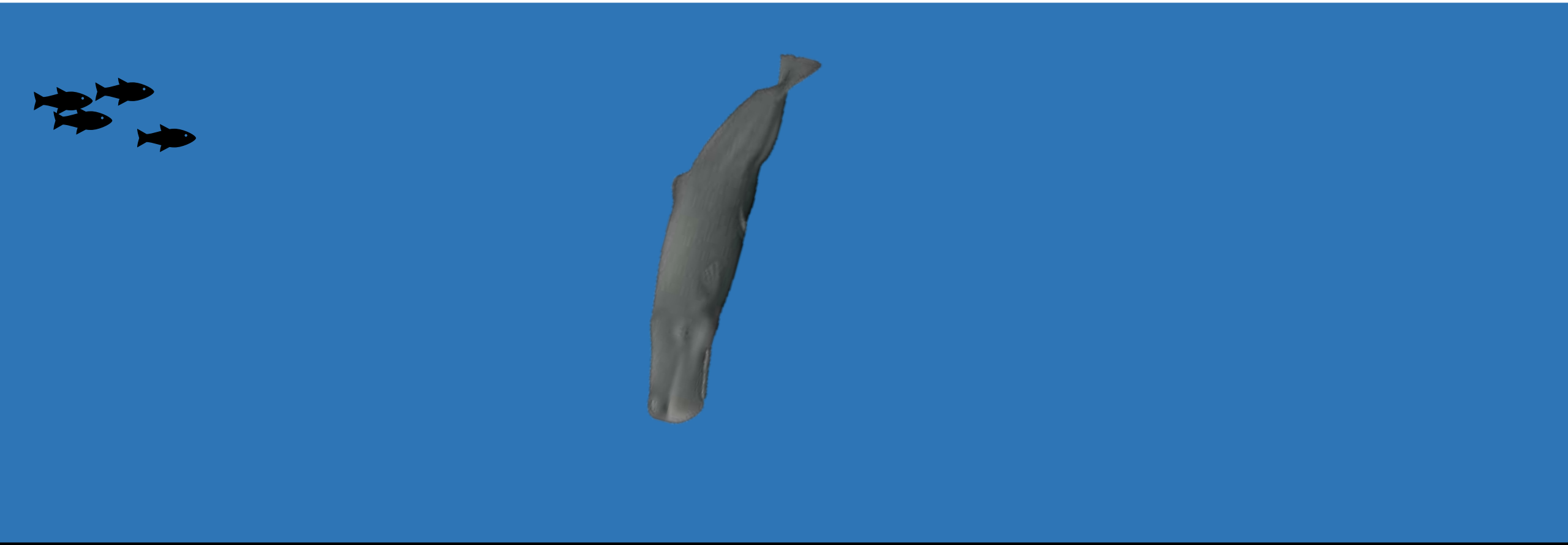


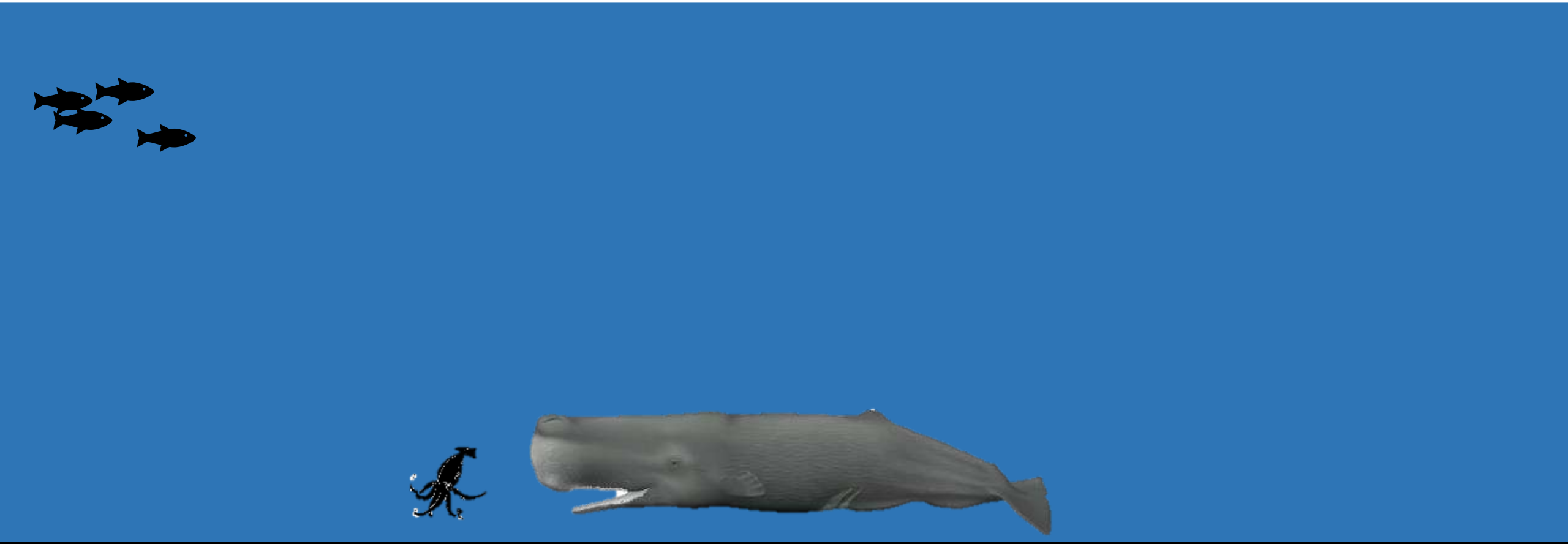


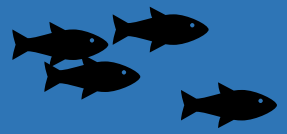


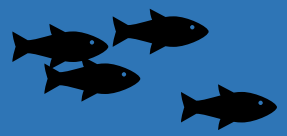


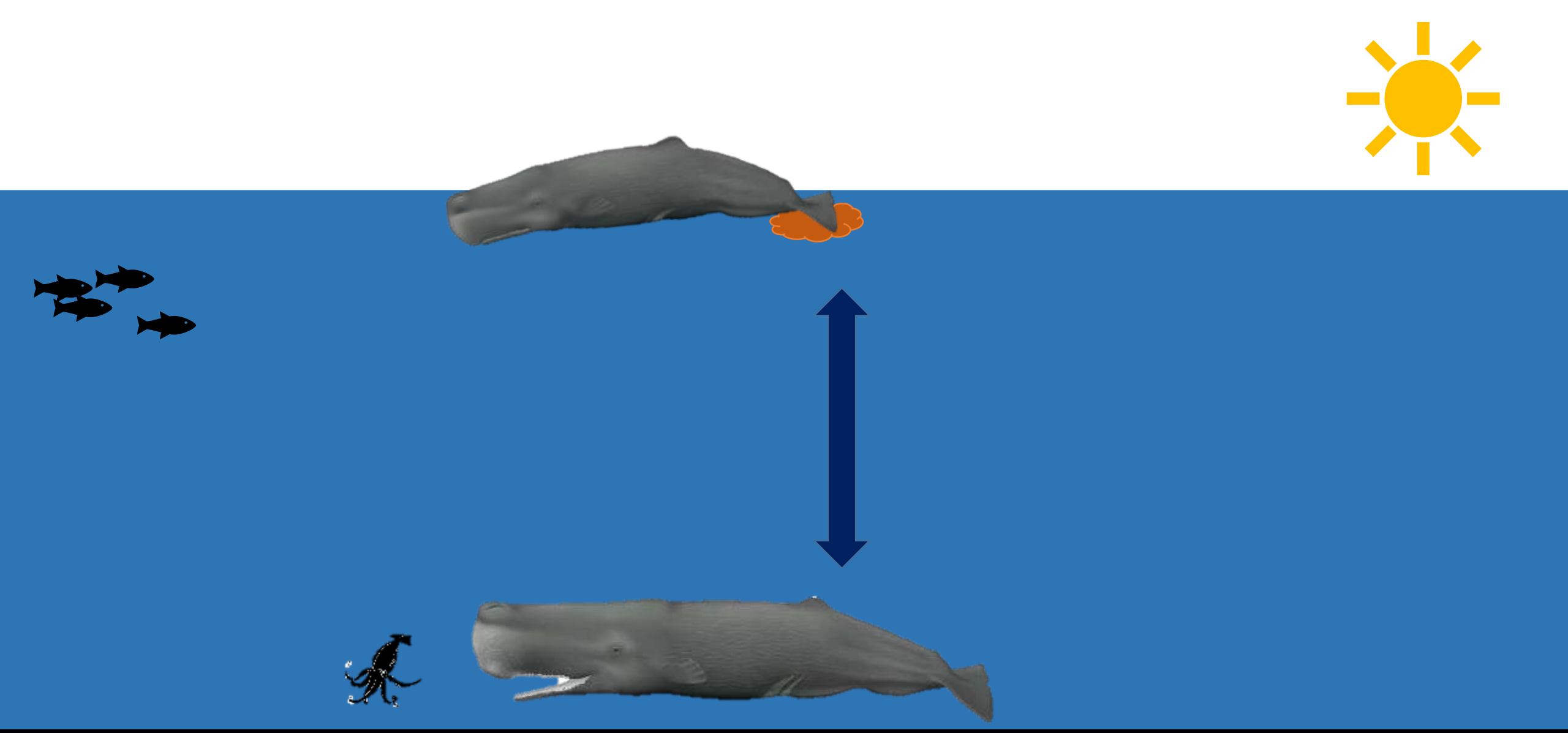


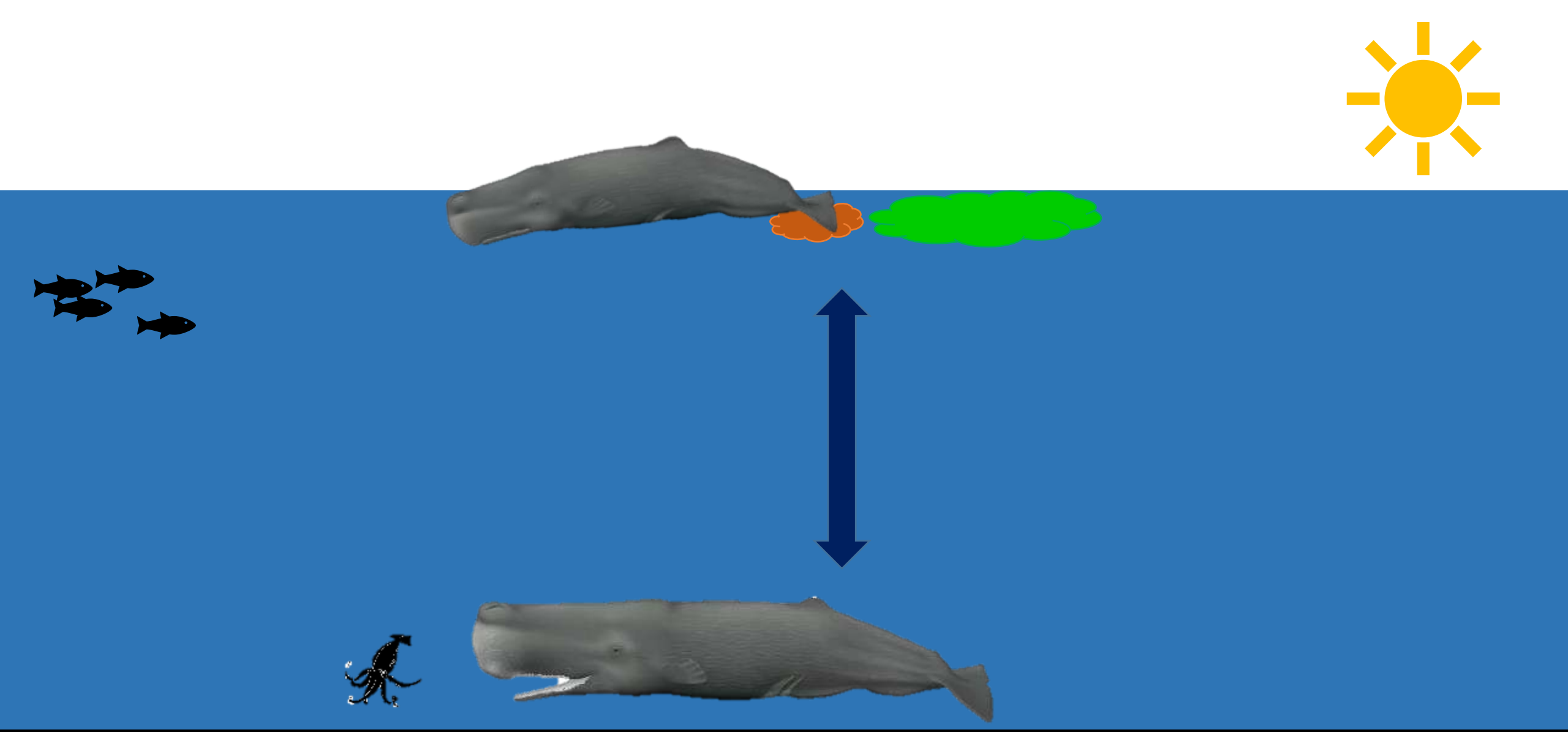


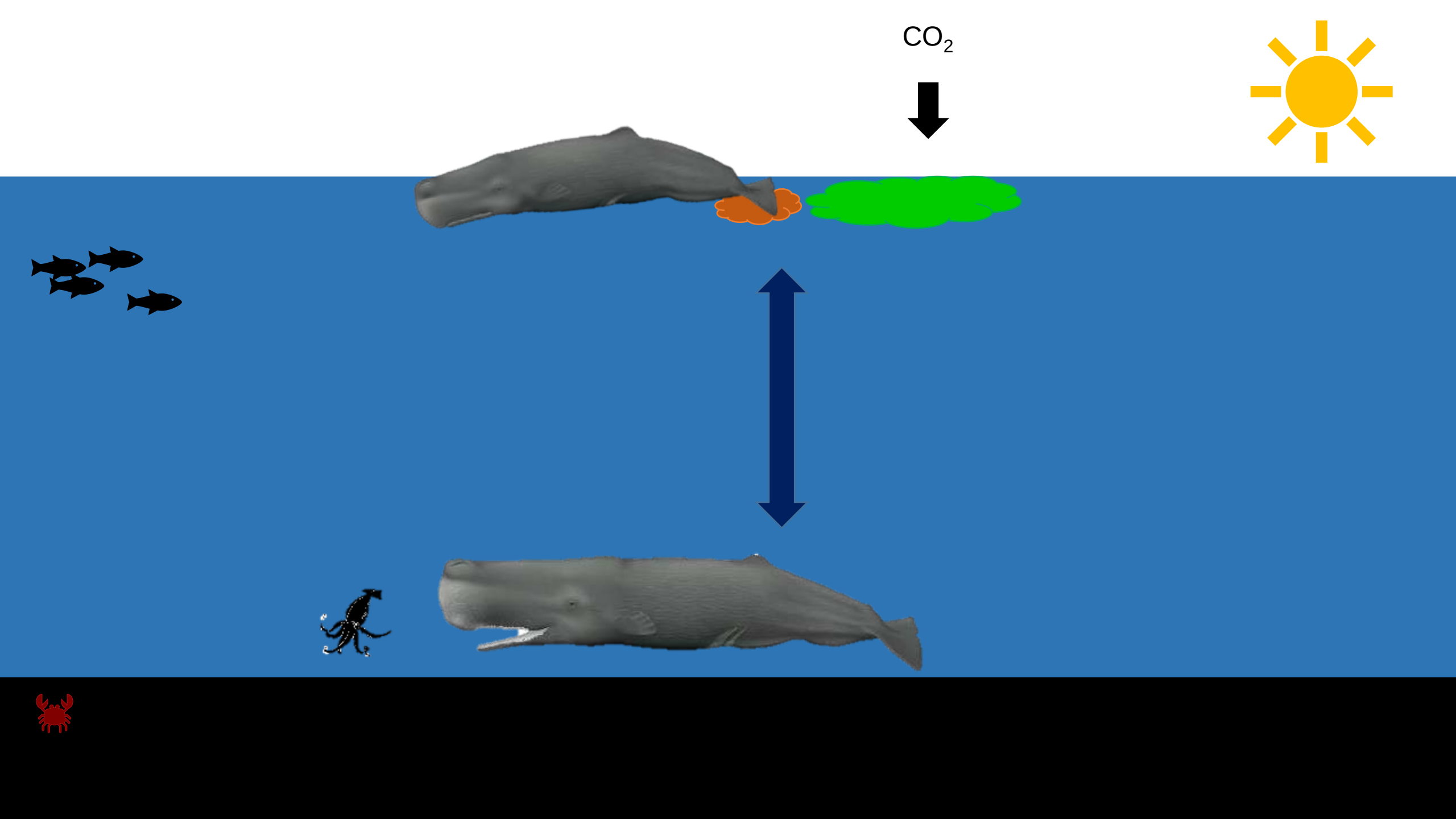











CO_2

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PLoS one

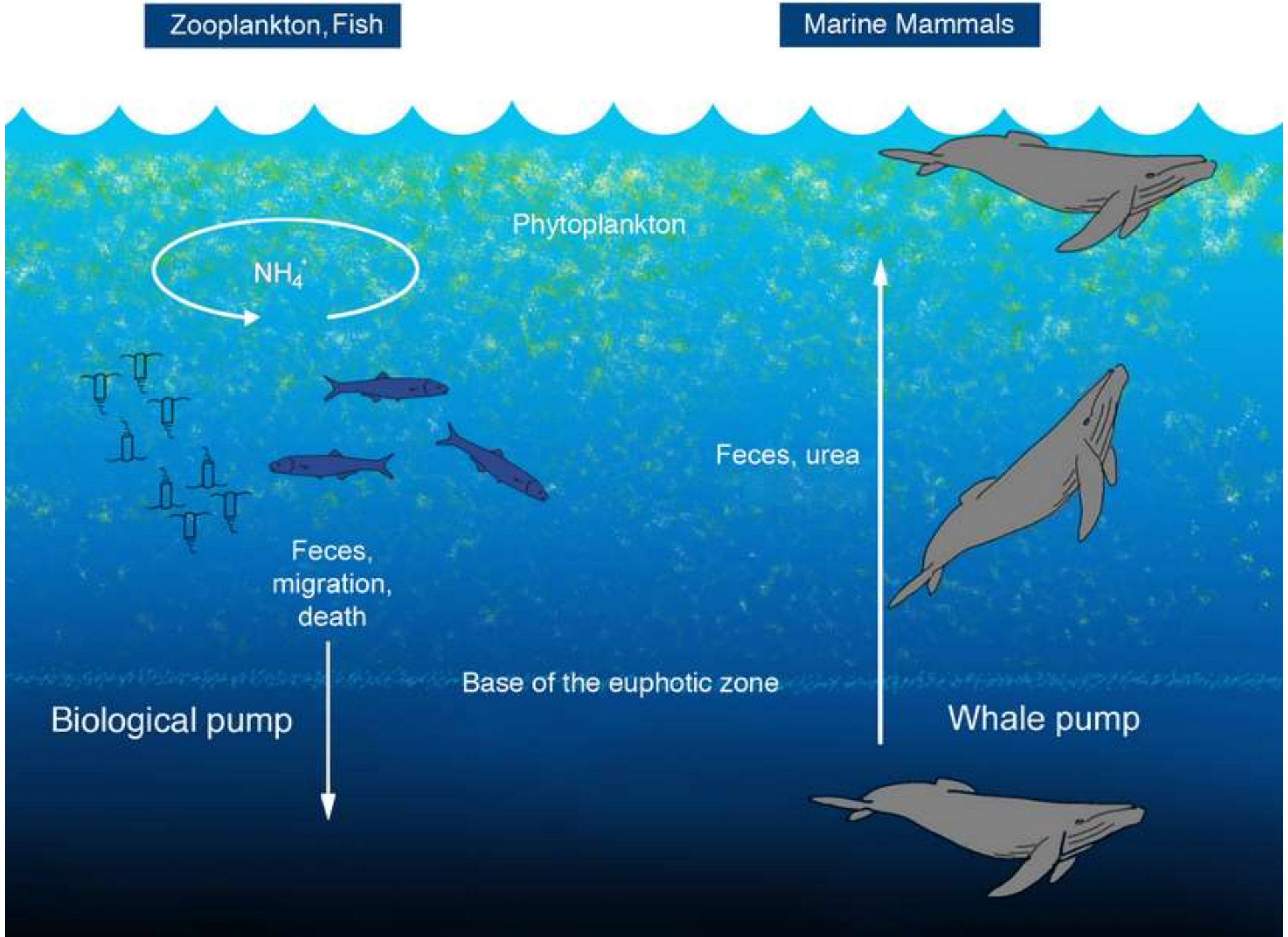
The Whale Pump: Marine Mammals Enhance Primary Productivity in a Coastal Basin

Joe Roman[1]*, James J. McCarthy[2]

1 Gund Institute for Ecological Economics, University of Vermont, Burlington, Vermont, United States of America, **2** Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, United States of America

Abstract

It is well known that microbes, zooplankton, and fish are important sources of recycled nitrogen in coastal waters, yet marine mammals have largely been ignored or dismissed in this cycle. Using field measurements and population data, we find that marine mammals can enhance primary productivity in their feeding areas by concentrating nitrogen near the surface through the release of flocculent fecal plumes. Whales and seals may be responsible for replenishing 2.3×10^4 metric tons of N per year in the Gulf of Maine's euphotic zone, more than the input of all rivers combined. This upward "whale pump" played a much larger role before commercial harvest, when marine mammal recycling of nitrogen was likely more than three times atmospheric N input. Even with reduced populations, marine mammals provide an important ecosystem service by sustaining productivity in regions where they occur in high densities.


Zooplankton, Fish
Marine Mammals
Phytoplankton
NH_4^+
Feces, urea
Feces, migration, death
Base of the euphotic zone
Biological pump
Whale pump

OPEN ACCESS Freely available online

PLoS one

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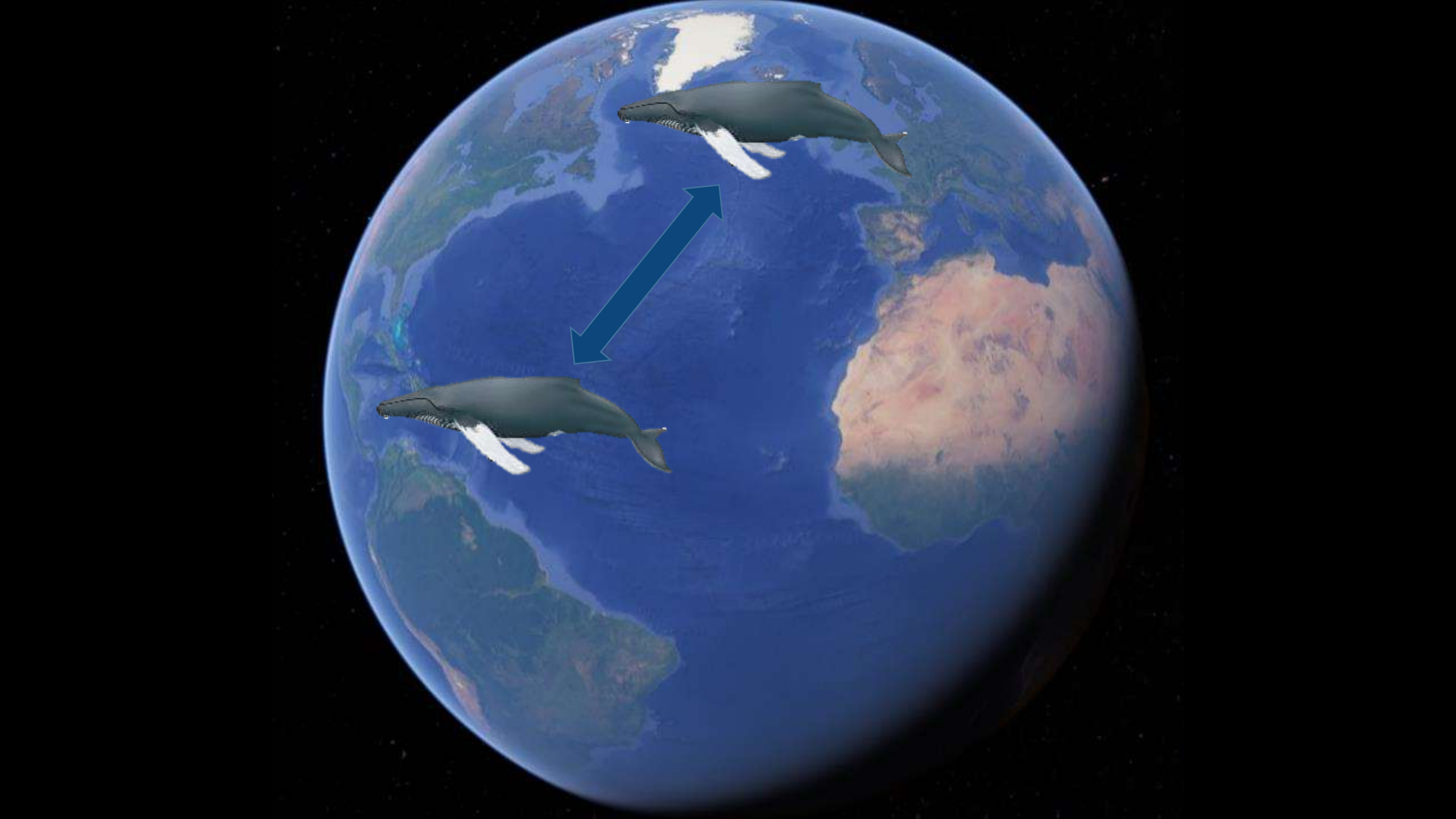
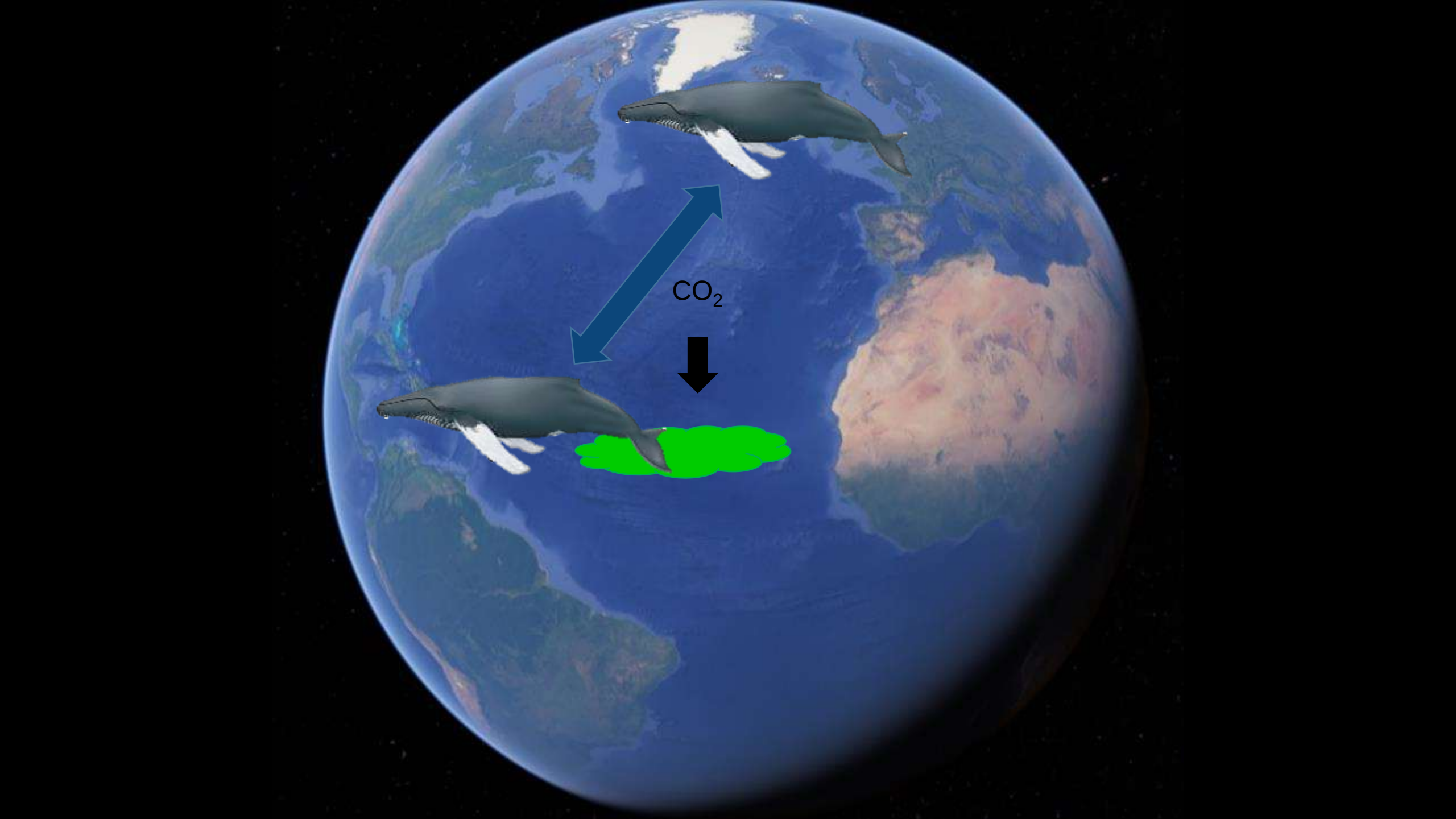
It is well known that microbes, zooplankton, and fish are important sources of recycled nitrogen in coastal waters, yet marine mammals have largely been ignored or dismissed in this cycle. Using field measurements and population data, we find that marine mammals can enhance primary productivity in their feeding areas by concentrating nitrogen near the surface through the release of flocculent fecal plumes. Whales and seals may be responsible for replenishing 2.3×10^4 metric tons of N per year in the Gulf of Maine's euphotic zone, more than the input of all rivers combined. This upward "whale pump" played a much larger role before commercial harvest, when marine mammal recycling of nitrogen was likely more than three times atmospheric N input. Even with reduced populations, marine mammals provide an important ecosystem service by sustaining productivity in regions where they occur in high densities.

Kit grbavec

Megaptera novaeangliae

foto: Tilen Genov




CO_2

nature communications

Article

https://doi.org/10.1038/s41467-025-56123-2

Migrating baleen whales transport high-latitude nutrients to tropical and subtropical ecosystems

Received: 3 June 2023

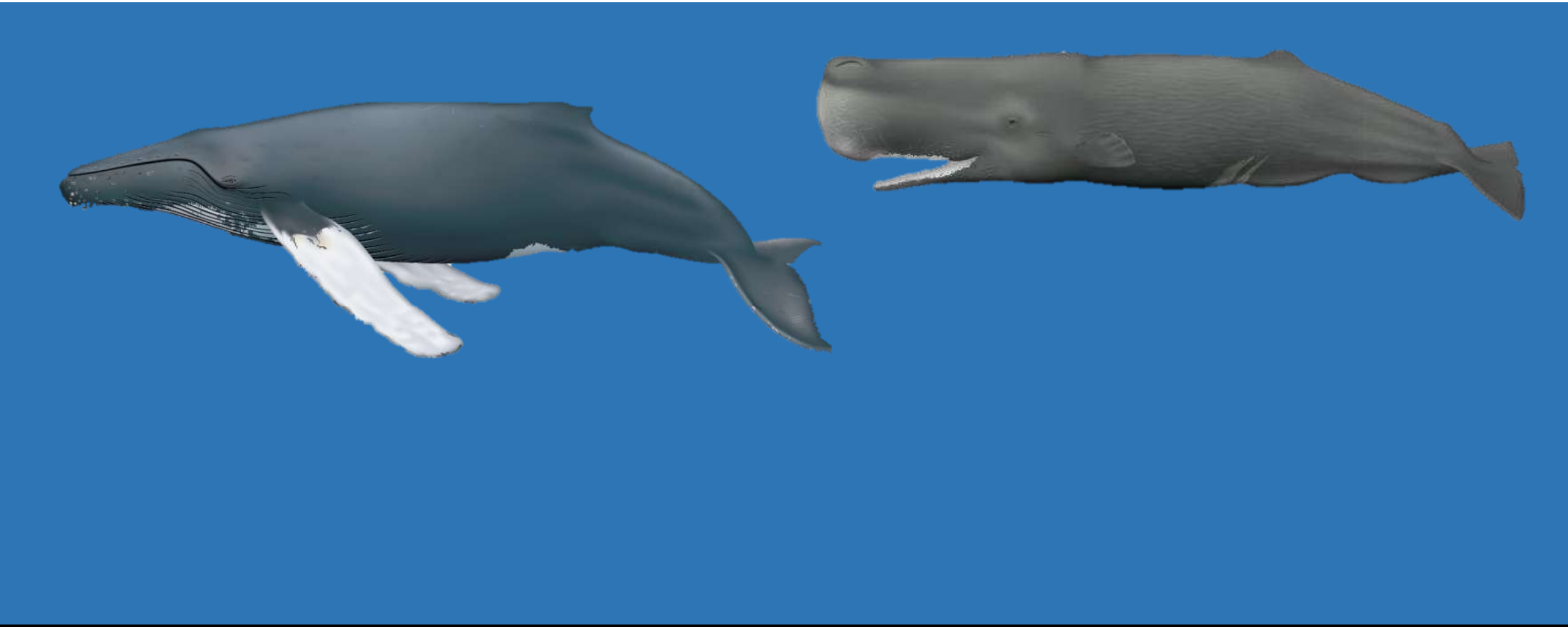
Accepted: 9 January 2025

Published online: 10 March 2025

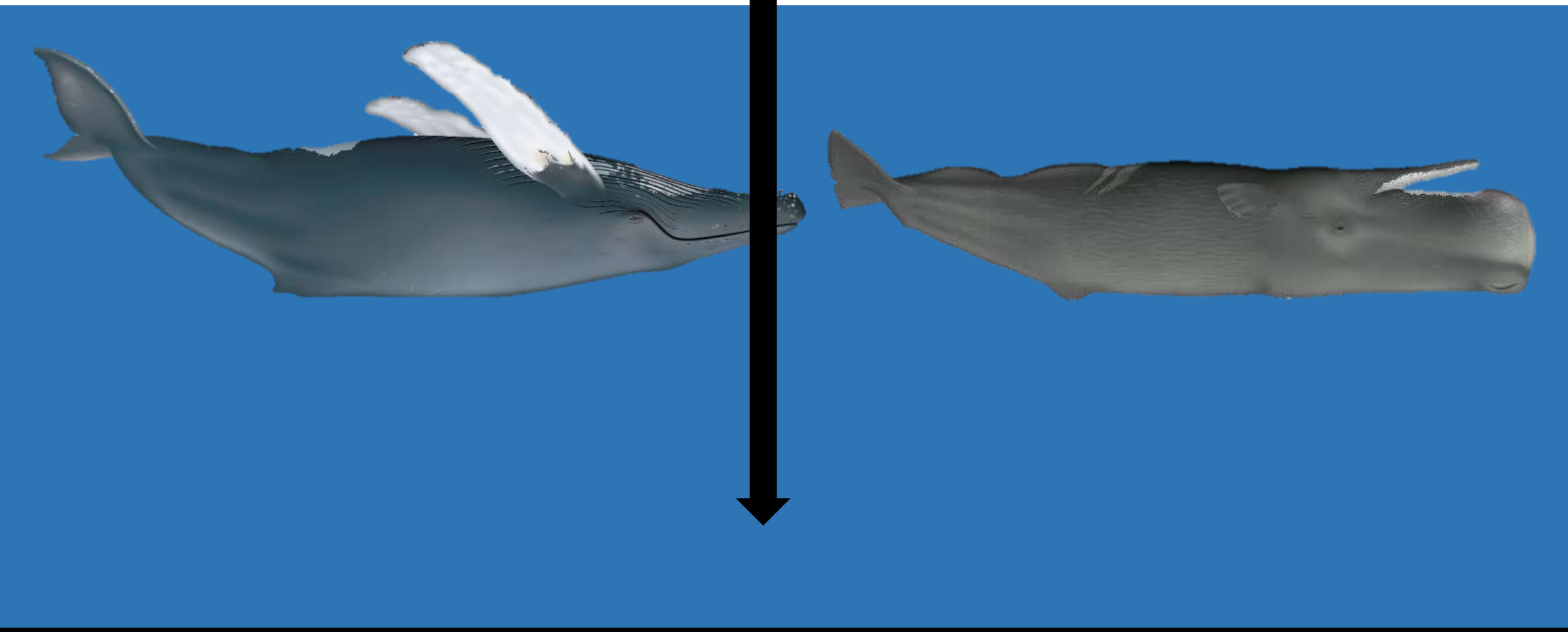
Check for updates

Joe Roman[1], Andrew J. Abraham[2], Jeremy J. Kiszka[3], Daniel P. Costa[4], Christopher E. Doughty[5], Ari Friedlaender[4], Luis A. Hückstädt[6], Milton Marcondes[7], Emma Wetsel[8] & Andrew J. Pershing[9]

Baleen whales migrate from productive high-latitude feeding grounds to usually oligotrophic tropical and subtropical reproductive winter grounds, translocating limiting nutrients across ecosystem boundaries in their bodies. Here, we estimate the latitudinal movement of nutrients through carcasses, placentas, and urea for four species of baleen whales that exhibit clear annual migration, relying on spatial data from publicly available databases, present and past populations, and measurements of protein catabolism and other sources of nitrogen from baleen whales and other marine mammals. Migrating gray, humpback, and North Atlantic and southern right whales convey an estimated 3784 tons N yr^{-1} and 46,512 tons of biomass yr^{-1} to winter grounds, a flux also known as the "great whale conveyor belt"; these numbers might have been three times higher before commercial whaling. We discuss how species recovery might help restore nutrient movement by whales in global oceans and increase the resilience and adaptative capacity of recipient ecosystems.



CO_2



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Trends in
Ecology & Evolution

Opinion

Whales in the carbon cycle: can recovery remove carbon dioxide?

Heidi C. Pearson [1,*,@] Matthew S. Savoca,[2,@] Daniel P. Costa,[3] Michael W. Lomas,[4] Renato Molina,[5] Andrew J. Pershing,[6,@] Craig R. Smith,[7] Juan Carlos Villaseñor-Derbez,[2,8] Stephen R. Wing,[9] and Joe Roman[10]

!

frontiers | Frontiers in Marine Science

Do whales really increase the oceanic removal of atmospheric carbon?

Jan-Olaf Meynecke[1,2,3,4*], Saumik Samanta[5], Jasper de Bie[1,2,3,4], Elisa Seyboth[6], Subhra Prakash Dey[7,8], Giles Fearon[7,8], Marcello Vichi[7,8], Ken Findlay[6], Alakendra Roychoudhury[5] and Brendan Mackey[1,2]

[1]Whales & Climate Research Program, Griffith University, Gold Coast, QLD, Australia, [2]Griffith Climate Change Response Program, Griffith University, Gold Coast, QLD, Australia, [3]Coastal and Marine Research Centre, Griffith University, Gold Coast, QLD, Australia, [4]Cities Research Institute, Griffith University, Gold Coast, QLD, Australia, [5]Department of Earth Sciences, Stellenbosch University, Stellenbosch, South Africa, [6]Mammal Research Institute Whale Unit, Department of Zoology and Entomology, University of Pretoria, Hermanus, South Africa, [7]Marine and Antarctic Research Centre for Innovation and Sustainability (MARIS), University of Cape Town, Cape Town, South Africa, [8]Department of Oceanography, University of Cape Town, Cape Town, South Africa

nature communications

Article

https://doi.org/10.1038/s41467-023-41532-y

Composition of cetacean communities worldwide shapes their contribution to ocean nutrient cycling

Received: 16 February 2023

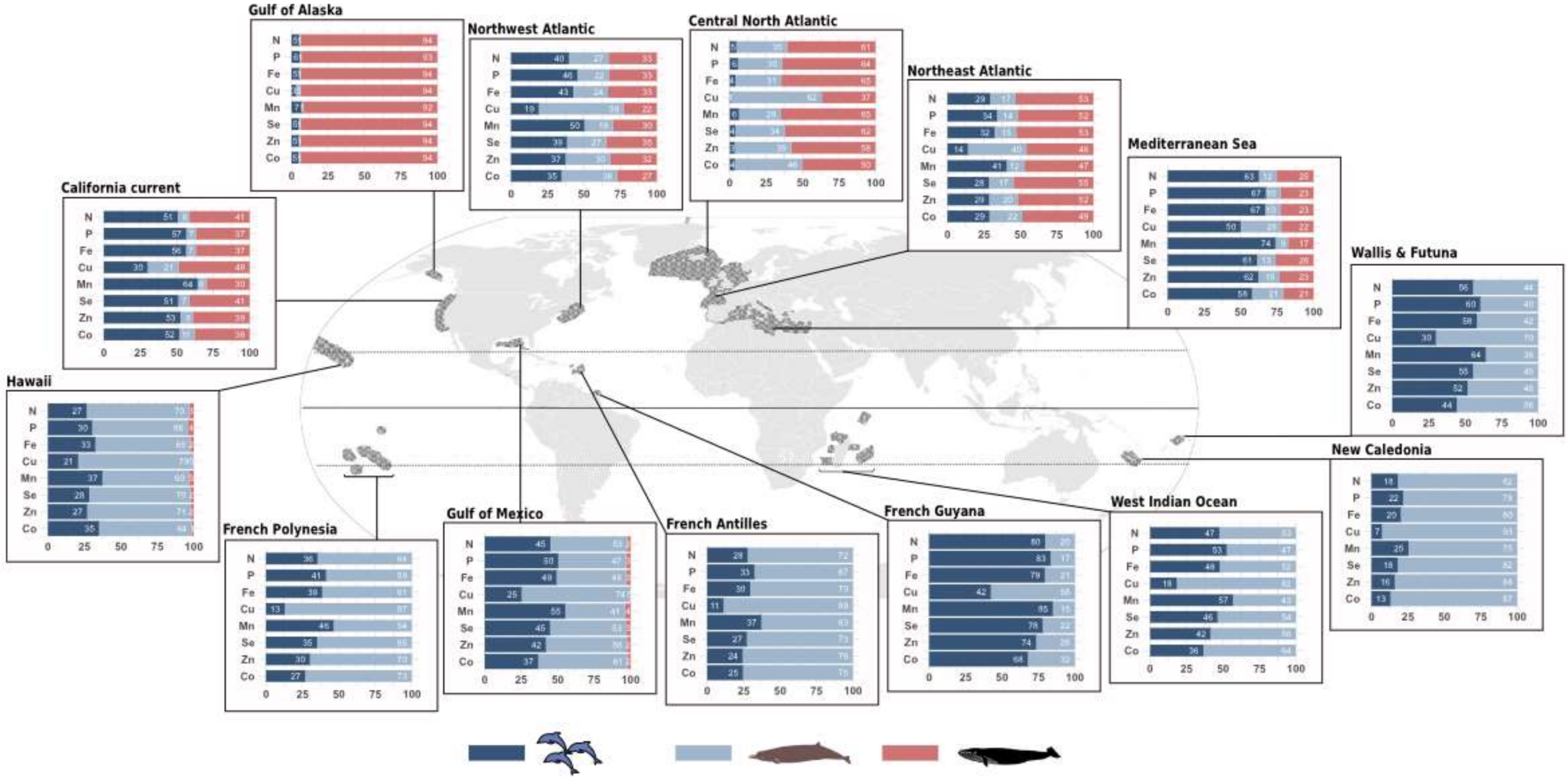
Accepted: 7 September 2023

Published online: 19 September 2023

Check for updates

Lola Gilbert[1,2], Tiphaine Jeanniard-du-Dot[1], Matthieu Authier[2], Tiphaine Chouvelon[2,3] & Jérôme Spitz[1,2]

Defecation by large whales is known to fertilise oceans with nutrients, stimulating phytoplankton and ecosystem productivity. However, our current understanding of these processes is limited to a few species, nutrients and ecosystems. Here, we investigate the role of cetacean communities in the worldwide biological cycling of two major nutrients and six trace nutrients. We show that cetaceans release more nutrients in mesotrophic to eutrophic temperate waters than in oligotrophic tropical waters, mirroring patterns of ecosystem productivity. The released nutrient cocktails also vary geographically, driven by the composition of cetacean communities. The roles of small cetaceans, deep diving cetaceans and baleen whales differ quantitatively and functionally, with contributions of small cetaceans and deep divers exceeding those of large whales in some areas. The functional diversity of cetacean communities expands beyond their role as top predators to include their role as active nutrient vectors, which might be equally important to local ecosystem dynamics.

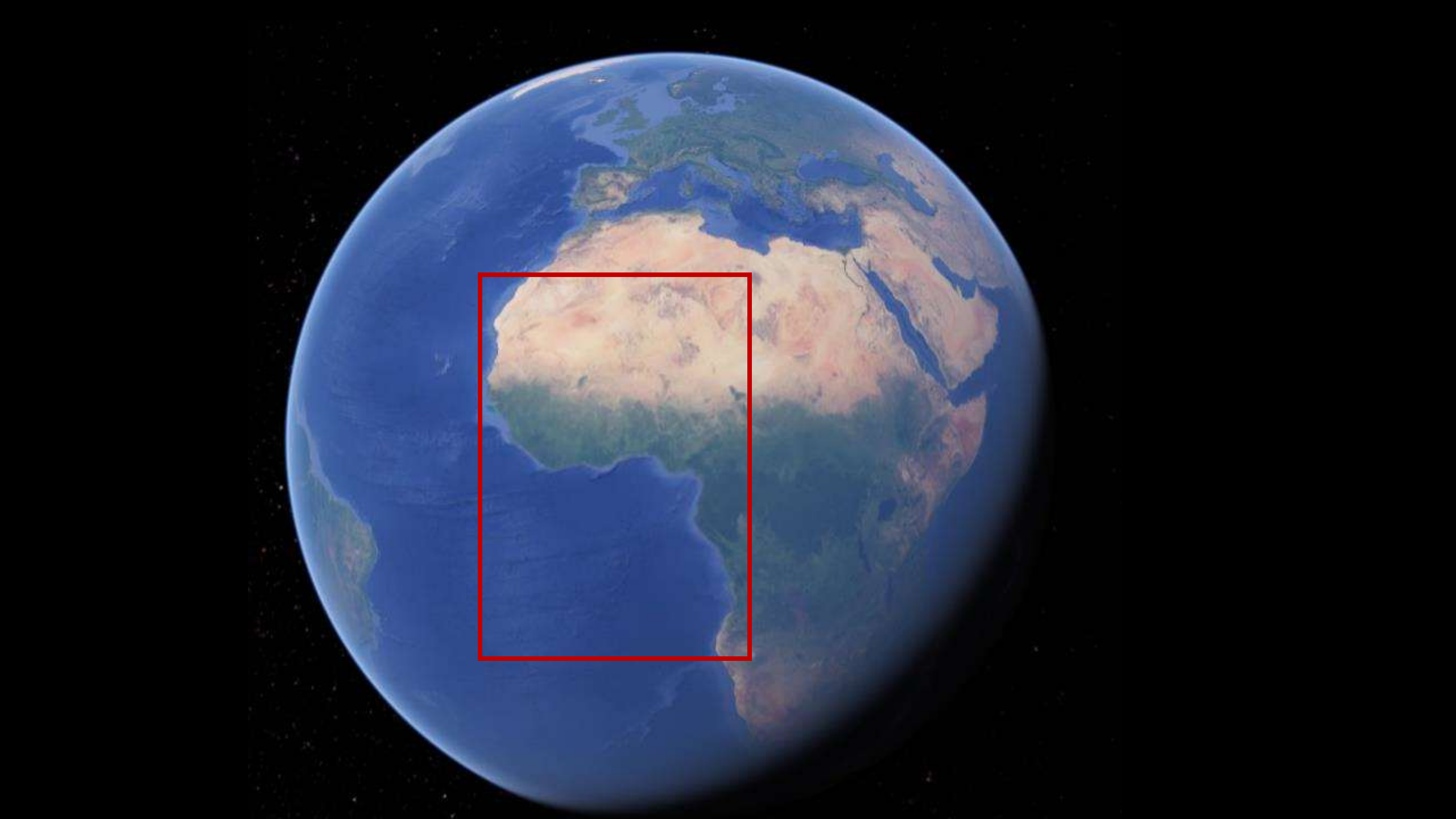

Gulf of Alaska
Northwest Atlantic
Central North Atlantic
Northeast Atlantic
Mediterranean Sea
California current
Wallis & Futuna
Hawaii
New Caledonia
French Polynesia
Gulf of Mexico
French Antilles
French Guyana
West Indian Ocean
N
P
Fe
Cu
Mn
Se
Zn
Co
0
25
50
75
100

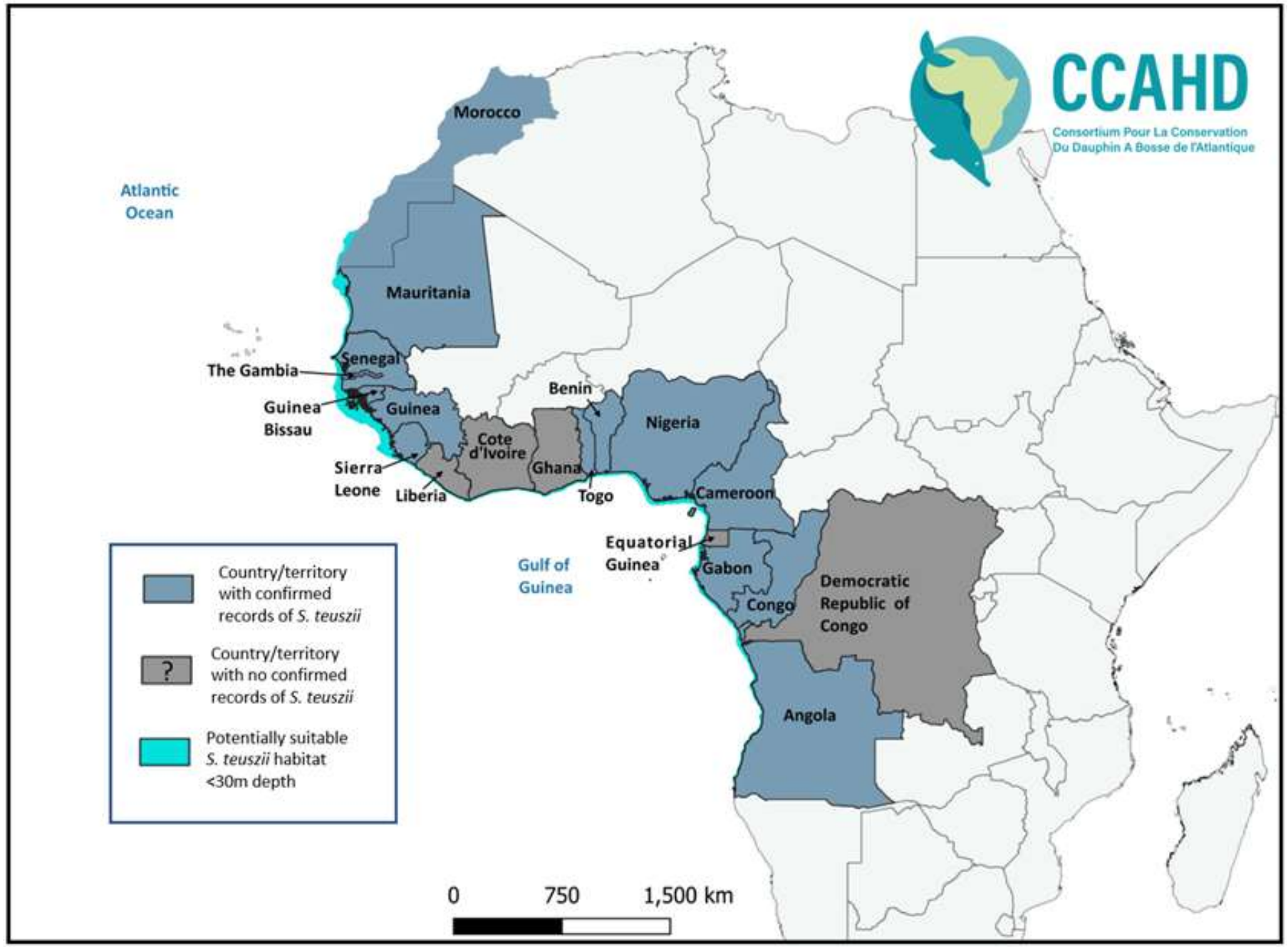
MORIGENOS

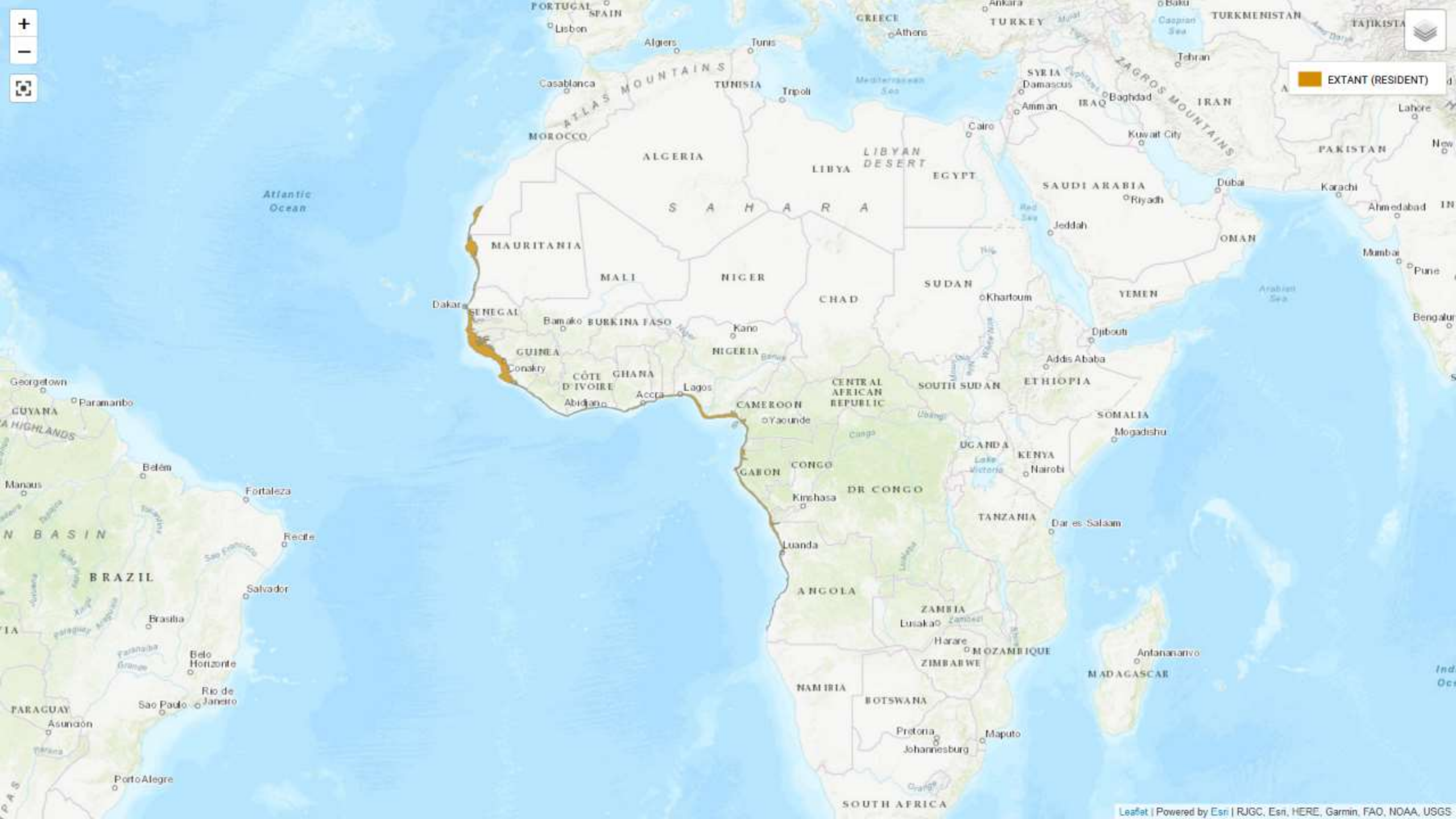
Atlantski beli delfin

Sousa teuszii

foto: Tilen Genov, CCAHD




CCAHD
Consortium Pour La Conservation
Du Dauphin A Bosse de l'Atlantique
Atlantic
Ocean
Morocco
Mauritania
Senegal
The Gambia
Guinea
Bissau
Guinea
Sierra
Leone
Liberia
Cote
d'Ivoire
Ghana
Togo
Benin
Nigeria
Cameroon
Equatorial
Guinea
Gulf of
Guinea
Gabon
Congo
Democratic
Republic of
Congo
Angola
Country/territory
with confirmed
records of S. teuszii
?
Country/territory
with no confirmed
records of S. teuszii
Potentially suitable
S. teuszii habitat
<30m depth
0
750
1,500 km


EXTANT (RESIDENT)
Atlantic Ocean
Mediterranean Sea
Red Sea
Arabian Sea
Caspian Sea
PORTUGAL
SPAIN
Lisbon
Algiers
Tunis
GREECE
Athens
TURKEY
Ankara
Baku
TURKMENISTAN
TAJIKISTA
Tehran
SYRIA
Damascus
Amman
IRAQ
Baghdad
IRAN
ZAGROS MOUNTAINS
Lahore
Casablanca
ATLAS MOUNTAINS
TUNISIA
Tripoli
MOROCCO
ALGERIA
Cairo
LIBYAN DESERT
LIBYA
EGYPT
Kuwait City
PAKISTAN
SAUDI ARABIA
Riyadh
Dubai
Karachi
Ahmedabad
Jeddah
OMAN
Mumbai
Pune
S A H A R A
MAURITANIA
MALI
NIGER
CHAD
SUDAN
Khartoum
YEMEN
Dakar
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BURKINA FASO
Kano
Djibouti
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CAMEROON
Yaounde
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Fortaleza
GABON
CONGO
DR CONGO
Kinshasa
Recife
TANZANIA
Dar es Salaam
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Salvador
Luanda
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Brasília
ZAMBIA
Lusaka
Harare
MOZAMBIQUE
ZIMBABWE
Antananarivo
MADAGASCAR
Belo Horizonte
Rio de Janeiro
NAMIBIA
BOTSWANA
Sao Paulo
PARAGUAY
Asunción
Pretoria
Johannesburg
Maputo
Porto Alegre
SOUTH AFRICA
Leaflet | Powered by Esri | RJGC, Esri, HERE, Garmin, FAO, NOAA, USGS

foto: Tim Collins, WCS


foto: Gianna Minton, CCAHD


foto: Tilen Genov, CCAHD


foto: Tilen Genov, CCAHD

foto: Tilen Genov, CCAHD

foto: Tilen Genov, CCAHD

foto: Tilen Genov, CCAHD

PRILOV

foto: Tim Collins, WCS

Obalni

RAZVOJ

foto: Tilen Genov

Ladijski

PROMET

foto: Aurore Malapert, Biotope

Ladijski

PROMET

foto: Tilen Genov, CCAHD

foto: Tim Collins, WCS


foto: Tilen Genov, CCAHD

IUCN RED LIST

NOT EVALUATED	DATA DEFICIENT	LEAST CONCERN	NEAR THREATENED	VULNERABLE	ENDANGERED	CRITICALLY ENDANGERED	EXTINCT IN THE WILD	EXTINCT
NE	DD	LC	NT	VU	EN	CR	EW	EX

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foto: Tim Collins, WCS


MORIGENOS

VABLJENI V CENTER O DELFINIH


DIHANJE IN SPANJE
Ušesna odprtina je izredno dolžna.


RESEARCH WORK
Research equipment
Photo – ID
Bottlenose dolphin


OGLAŠANJE DELFINOV
VOCALIZZAZIONE DEL DELFINO / DOLPHIN VOCALISATION
KAKO DELFINI PROIZVAJAJO Z
IN CHE MODO I DELFINI PRODUCONO I SUONI
HOW DO DOLPHINS PRODUCE SOUNDS
VSAK ZVOK IMA SVO
EACH SOUND HAS ITS OWN STORY
EHOLO
ECHOLOCATION

IZOBRAŽEVALNI PROGRAMI

Hvala!

www.morigenos.org

MORIGENOS
Slovensko društvo za morske sesalce

CONSORTIUM FOR THE CONSERVATION OF THE ATLANTIC HUMPBACK DOLPHIN

University of
St Andrews

UNIVERSITÀ DEL LITORALE
UNIVERZA NA PRIMORSKEM