From competition to collaboration: Automated identification of right whales

Khan, C.B.[1], Holmberg, J.[2], Hamilton, P.[3], Pettis, H.[3], Cygan, M.[4], Bogucki, R.[5], Mucha, M.[6], Klimek, M.[5], Charlton, C.[7], Rowntree, V.[8,9], Vermeulen, E.[10], Rayment, W.[11], Dawson, S.[11], Johnston, D.[11], Groch, K.[12]

[1]*NOAA Northeast Fisheries Science Center, 166 Water Street, Woods Hole, MA, 02543 USA (christin.khan@noaa.gov)*
[2]*Wild Me, Portland, Oregon, USA*
[3]*Anderson Cabot Center for Ocean Life at the New England Aquarium, Boston, Massachusetts*
[4]*Institute of Informatics, University of Warsaw, Warsaw, Poland*
[5]*deepsense.ai, Warsaw, Poland*
[6]*Institute of Informatics, University of Warsaw, Warsaw, Poland*
[7]*Centre for Marine Science and Technology, Curtin University, Bentley, Western Australia, Australia*
[8]*Department of Biology, University of Utah, Salt Lake City, Utah, USA*
[9]*Instituto de Conservacio´n de Ballenas, Capital Federal, Buenos Aires, Argentina*
[10]*Mammal Research Institute Whale Unit, University of Pretoria, Hatfield, South Africa*
[11]*Marine Science Department, Te Tari Putaiao Taimoana, University of Otago, New Zealand*
[12]*Southern Right Whale Project / Instituto Australis, Imbituba, Santa Catarina, Brazil*

Photo identification plays a major role in endangered species research and conservation and recent developments in artificial intelligence promise to increase the efficiency of matching photographs to known individuals. At the last Society for Marine Mammalogy conference, we presented on the Kaggle data science competition to automate the identification of endangered North Atlantic right whales based on 7,000 aerial images. The winning algorithms developed by deepsense.ai were able to identify individuals with 87% accuracy using a series of convolutional neural networks. Since that time, we have brought in many more collaborators as we move from prototyping to production. Leveraging the existing infrastructure by Wild Me, the developers of Flukebook, we are creating a website platform that allows biologists with no machine learning expertise to automatically identify right whales. New models will be generated using both the winning deepsense.ai algorithms and the Wild Me HotSpotter algorithm (used for humpbacks, jaguar, giraffe, and other species). Given the morphological similarity between the North Atlantic right whale and closely related Southern right whale, our goal is to create an automatic identification system that will benefit right whale researchers worldwide. The updated dataset will incorporate the largest long-term photo-identification catalogs; including over 400,000 images from the United States and Canada curated by the New England Aquarium; 12,311 images from Australia from Curtin University; 8,461 images from South Africa from the University of Pretoria; 8,952 images from Argentina from the University of Utah; 5,473 images from Brazil from Instituto Australis; and 2,913 images from New Zealand from the University of Otago. We hope to encourage researchers to embrace data collaboration and computer vision to increase our understanding of wild populations.

AI

RIGHT WHALES

Christin Khan, Jason Holmberg, Philip Hamilton, Heather Pettis, Marek Cygan, Robert Bogucki, Jason Parham, Drew Blount, Marcin Mucha, Maciek Klimek, Claire Charlton, Vicky Rowntree, Els Vermeulen, Will Rayment, Steve Dawson, Dave Johnston, and Karina Groch

AERIAL SURVEYS

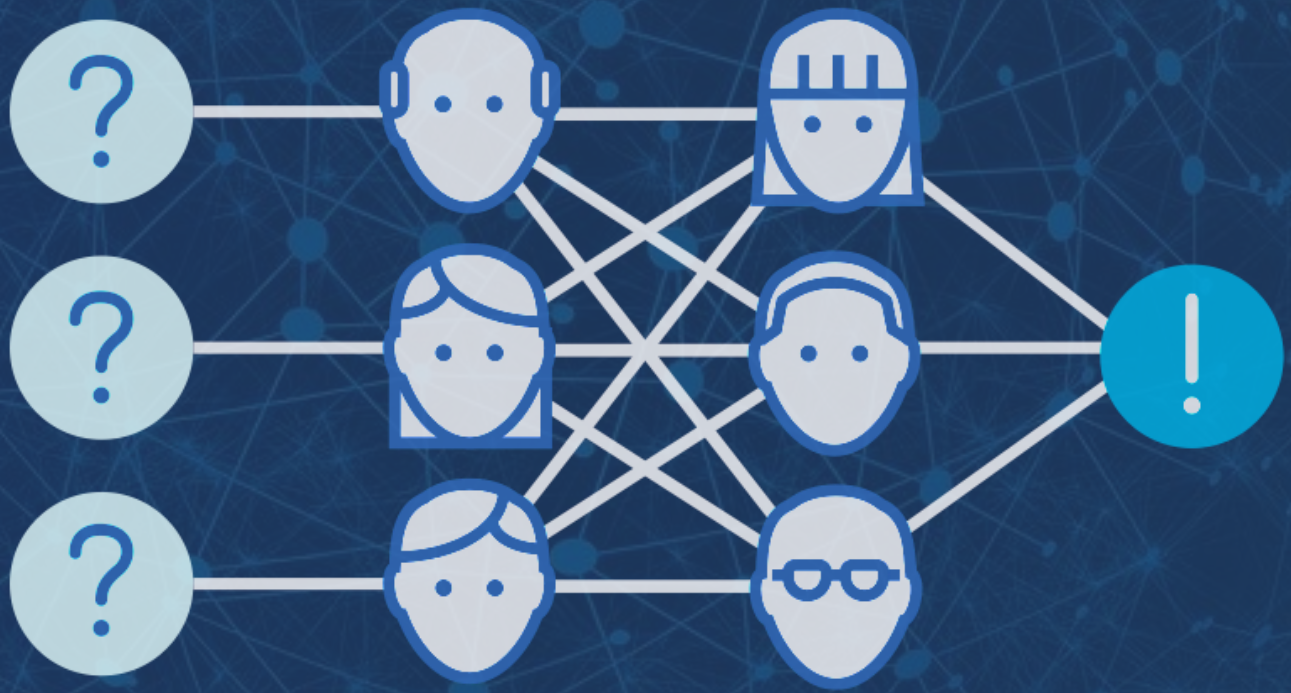
PHOTO IDENTIFICATION

Christin Brangwynne Khan

September 9, 2013 at 2:31 PM ·

anyone know anyone involved in high tech satellite imagery type stuff? If they can read a license plate from a satellite image, then in theory, one could recognize whales that way... how cool would that be? Anyone know someone I could talk to about that?

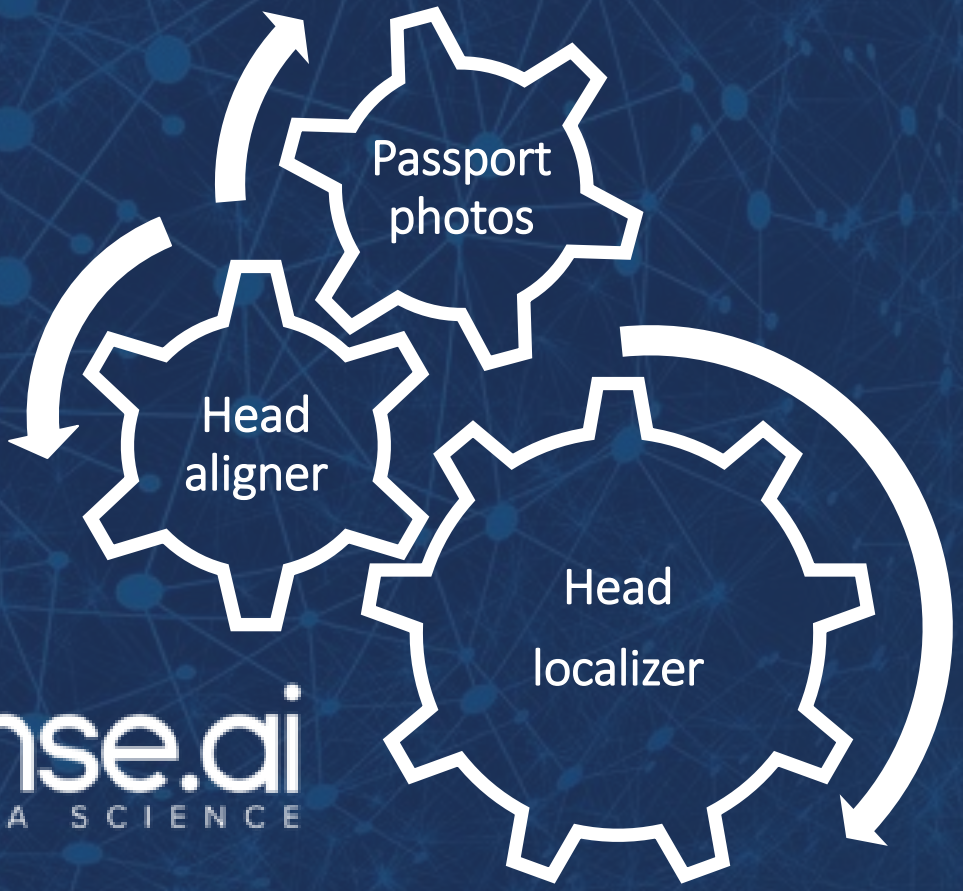
KAGGLE COMPETION



87% CORRECT!

deepsense.ai
BIG DATA SCIENCE

DEEP LEARNING



deepsense.ai
BIG DATA SCIENCE

PUBLICATION

Conservation Biology

Conservation Methods

Applying deep learning to right whale photo identification

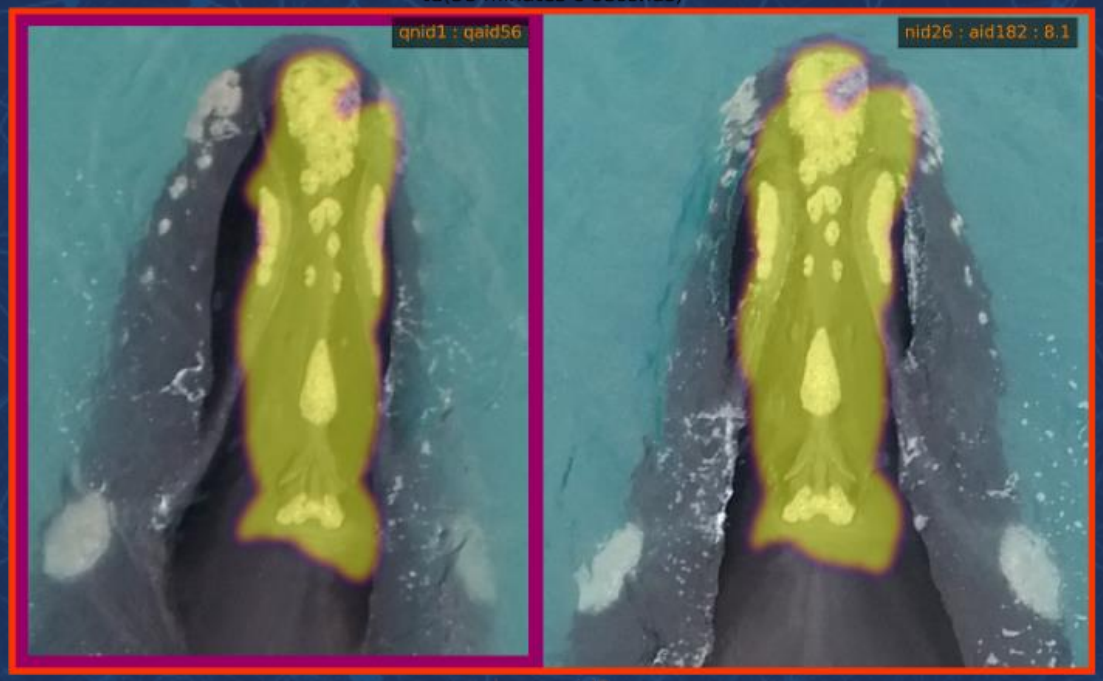
Robert Bogucki,[1] † Marek Cygan,[2] Christin Brangwynne Khan,[3]* Maciej Klimek,[1] Jan Kanty Milczek,[1] and Marcin Mucha[2]

[1]deepsense.ai, Krancowa 5, 02–493, Warsaw, Poland
[2]Institute of Informatics, The University of Warsaw, Banacha 2, 02-097, Warsaw, Poland
[3]National Oceanic and Atmospheric Administration, Northeast Fisheries Science Center, Woods Hole, MA 02543, U.S.A.

PROTOTYPE TO PRODUCTION

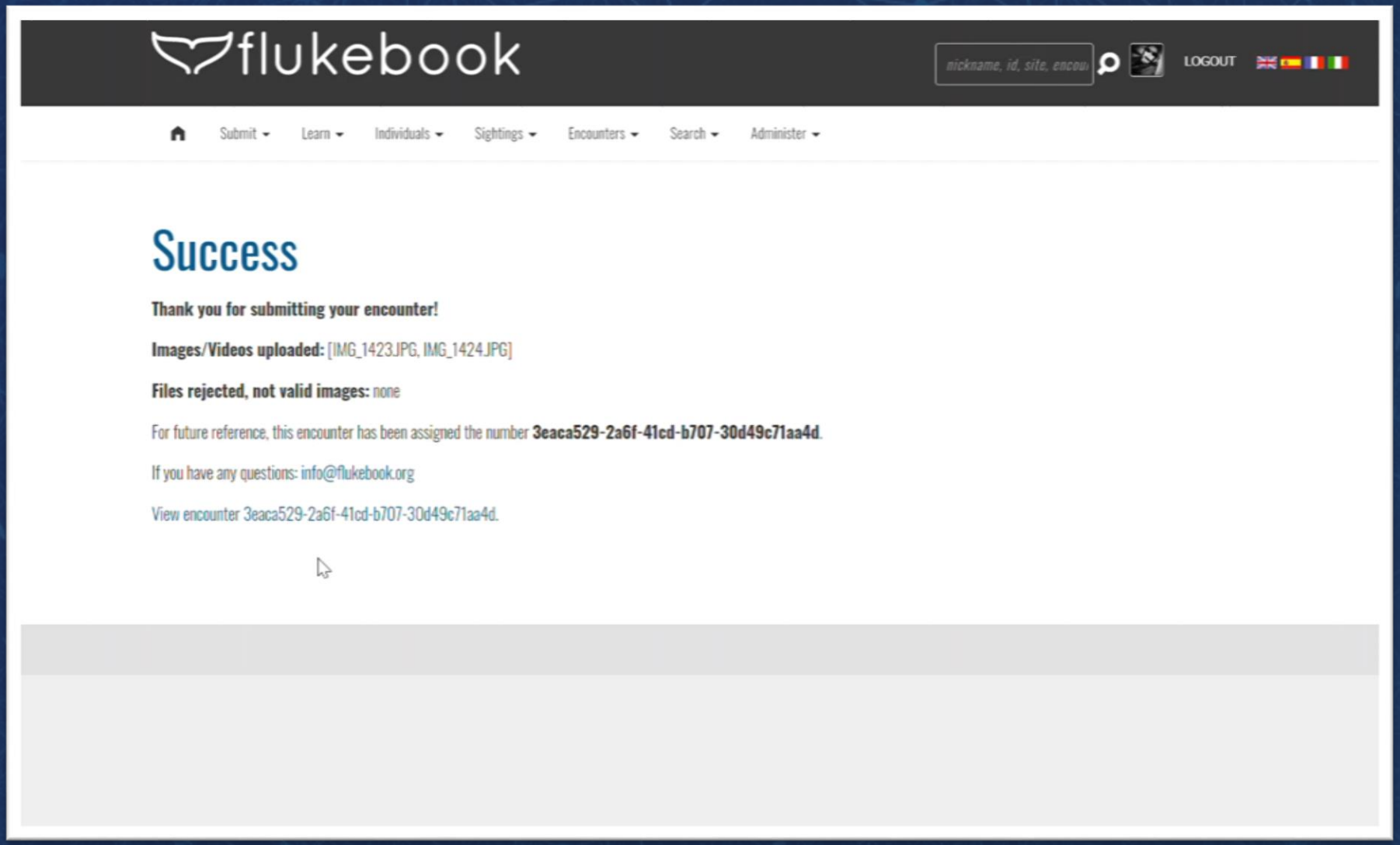
RETRAINED DEEPSENSE

RETRAINED HOTSPOTTER

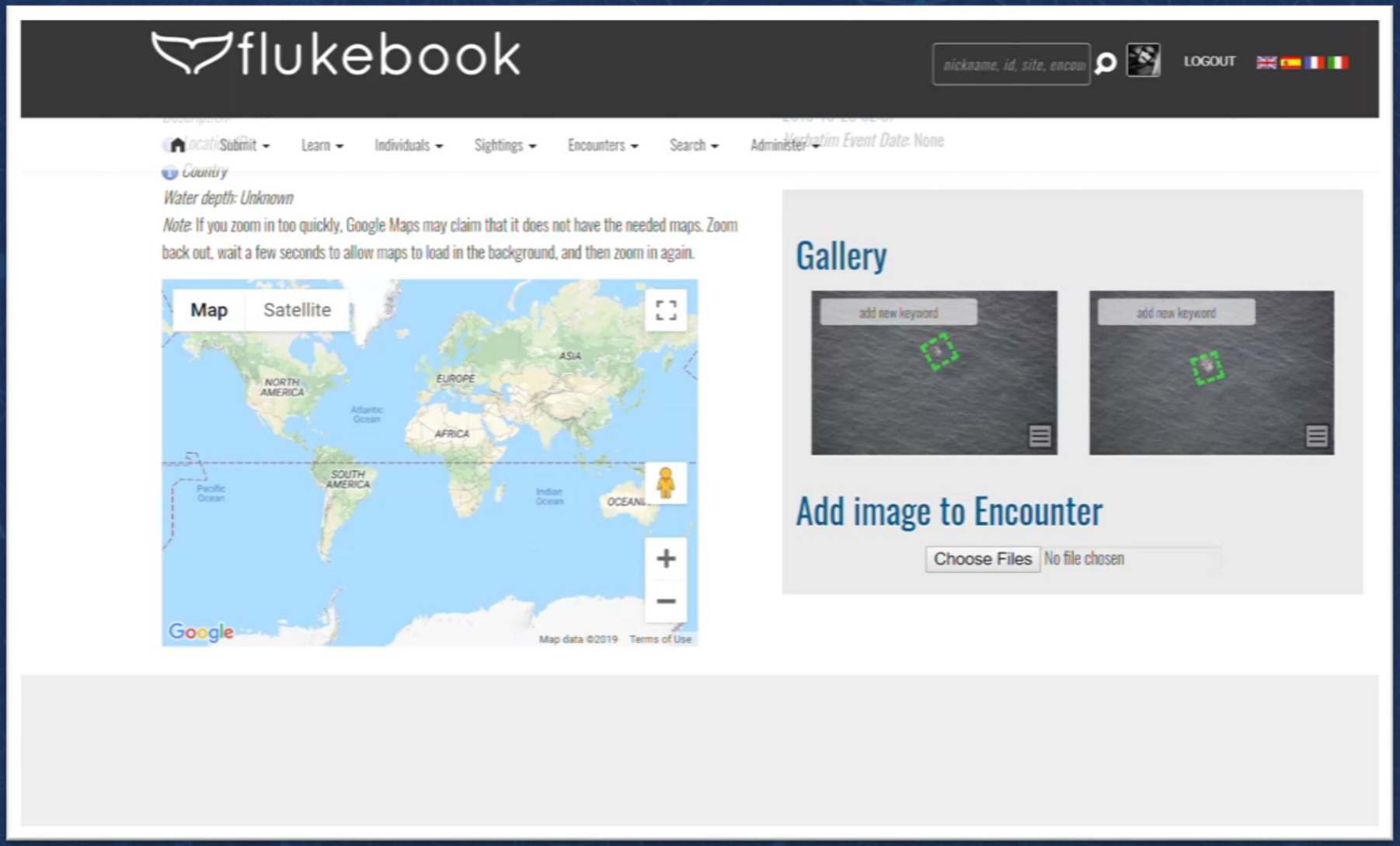


LIVE BETA NOW!

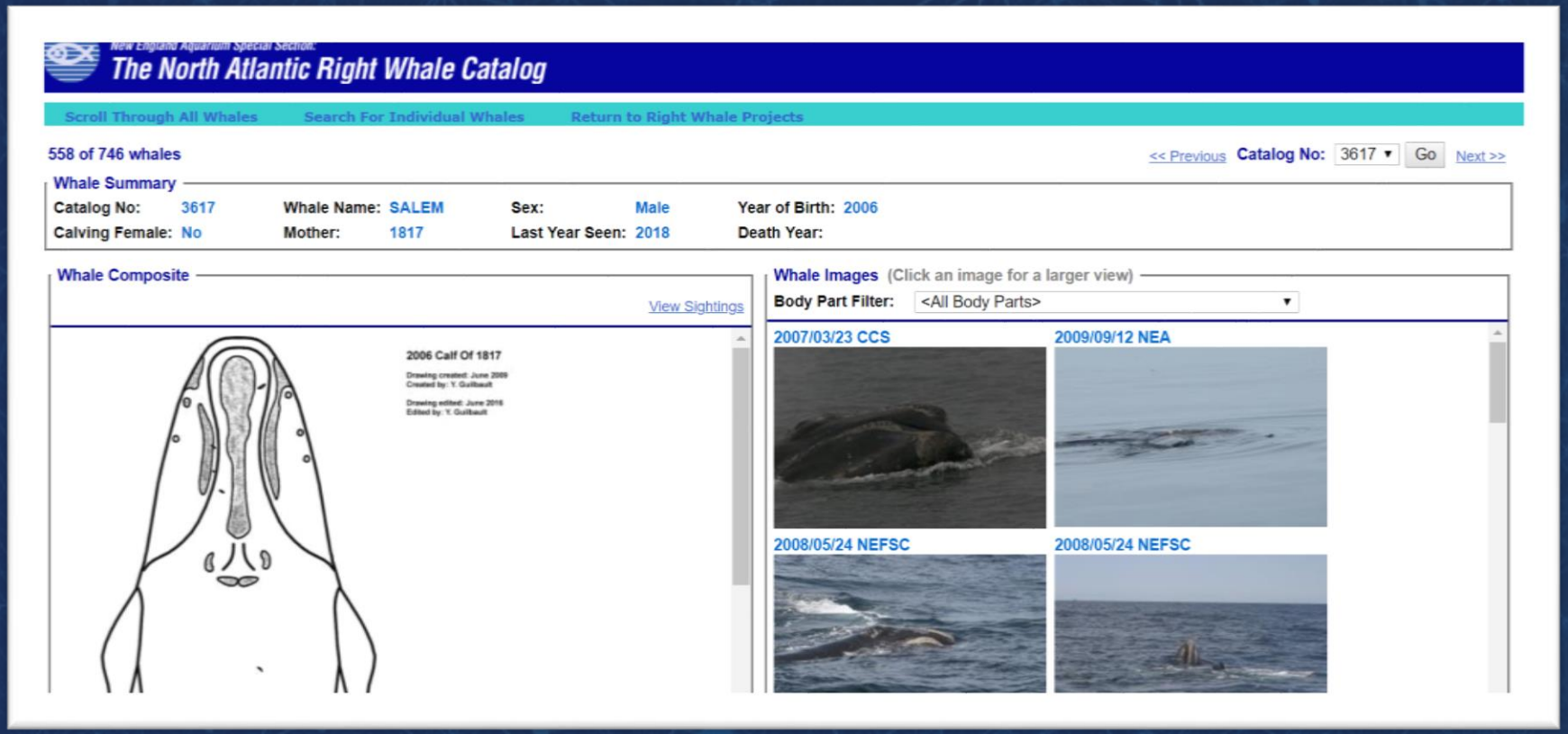
LIVE BETA NOW!



LIVE BETA NOW!



NEXT STEPS


New England Aquarium Special Section:
The North Atlantic Right Whale Catalog
Scroll Through All Whales
Search For Individual Whales
Return to Right Whale Projects
558 of 746 whales
<< Previous
Catalog No: 3617
Go
Next >>
Whale Summary
Catalog No: 3617
Whale Name: SALEM
Sex: Male
Year of Birth: 2006
Calving Female: No
Mother: 1817
Last Year Seen: 2018
Death Year:
Whale Composite
View Sightings
2006 Calf Of 1817
Whale Images (Click an image for a larger view)
Body Part Filter: <All Body Parts>
2007/03/23 CCS
2009/09/12 NEA
2008/05/24 NEFSC
2008/05/24 NEFSC

NEXT STEPS

WORLDWIDE SOLUTION

christin.khan@noaa.gov