



## First-pass whale-strike risk-screening for port development

I pay my respect to all First Nations peoples, their cultures and to their Elders, past and present



expert insight and  
practical solutions



# What is whale-strike?

## Humpback whale struck in head by boat propeller off Pilbara coastline in WA

ABC Pilbara / By Jane Murphy and Rosemary Murphy  
Posted Tue 19 Sep 2023 at 9:34am

## Royal Australian Navy ship HMAS Sydney linked to deaths of two whales

Posted Wed 12 May 2021 at 9:52am, updated Wed 12 May 2021 at 11:17am

## News: \$50k human waste facility approved by council, whale died after 'ship-strike'

Posted Fri 9 Aug 2019 at 5:52am, updated Fri 9 Aug 2019 at 6:03pm

## Whale-safe ship design urged

Posted Wed 23 Jan 2008 at 9:22am, updated Wed 23 Jan 2008 at 1:01pm

## Humpback carcass attracts sharks to Adelaide's Port River after whale was hit by ship

Posted Mon 23 Aug 2021 at 5:35pm, updated Mon 23 Aug 2021 at 5:56pm

# What is whale-strike?

Hur  
pro

## Men 'lucky to be alive' after whale sinks boat

ABC Pilbr  
Posted T

Graeme Powell

Posted Wed 6 Oct 2010 at 10:44am, updated Wed 6 Oct 2010 at 1:17pm

## Fisherman slapped across face by whale's tail at Tweed Heads

ABC Gold Coast / By Danielle Mahe

Posted Sun 18 Aug 2024 at 4:44pm, updated Sun 18 Aug 2024 at 5:54pm

## Whale-safe ship

Posted Wed 23 Jan 2008 at 9:22am, up

## Orcas have sunk another vessel off the European coast. Why won't they stop ramming boats?

By Audrey Courty

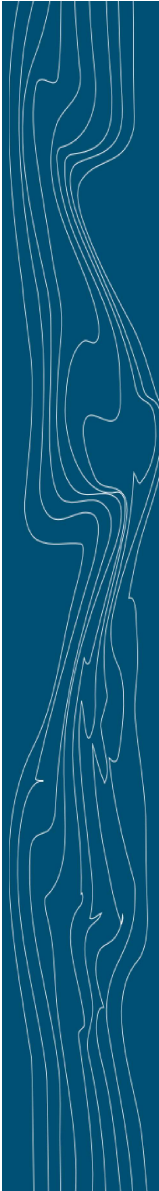
Posted Tue 14 May 2024 at 6:47pm



They linked  
arks to Adelaide's  
c by ship







# What is the prevalence?



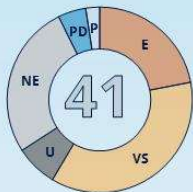




# ENDANGERED NORTH ATLANTIC RIGHT WHALE UNUSUAL MORTALITY EVENT (2017-2024\*)

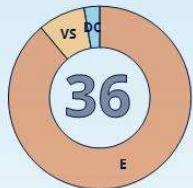
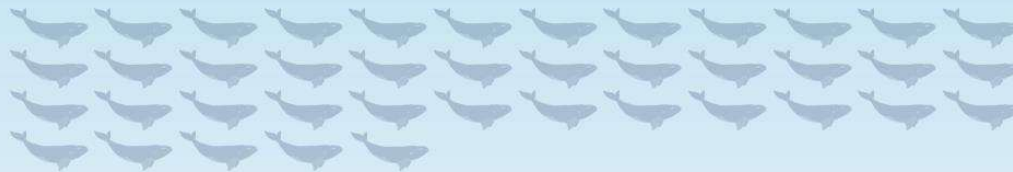


Endangered North Atlantic right whales are approaching extinction. **Approximately 360 remain.** Human impacts threaten the survival of this species. The leading cause of this Unusual Mortality Event is human interaction, specifically from **entanglements** or **vessel strikes**.



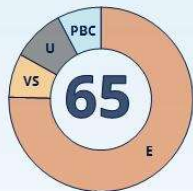
## DEAD (CONFIRMED)

- 9 Entanglements (E)
- 15 Vessel Strikes (VS)
- 3 Unknown (U)
- 11 Not Examined (NE)
- 2 Perinatal Deaths (PD)
- 1 Pending (P)



## SERIOUSLY INJURED

- 32 Entanglements (E)
- 3 Vessel Strikes (VS)
- 1 Dependent Calf (DC)



## INJURED OR IN POOR HEALTH

- 49 Entanglements (E)
- 5 Vessel Strikes (VS)
- 6 Unknown (U)
- 5 Poor Body Condition (PBC)



# 142 WHALES IN THE UME



\*Updated July 30, 2024



Source: NOAA 2017–2024 North Atlantic Right Whale Unusual Mortality Event

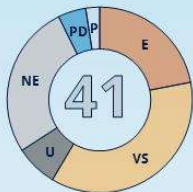
expert insight and practical solutions



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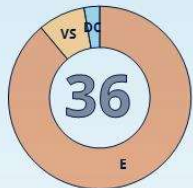
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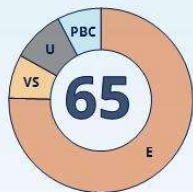
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Highest portion of confirmed deaths are from vessel strike



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# EPBC Triggers

Four species listed  
as 'Threatened  
Fauna' EPBC Act  
list

10 total listed  
'Migratory  
Species' on EPBC  
Act list



# UN SDGs

## Goal 9

Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

## Goal 12

Ensure sustainable consumption and production patterns.

## Goal 14

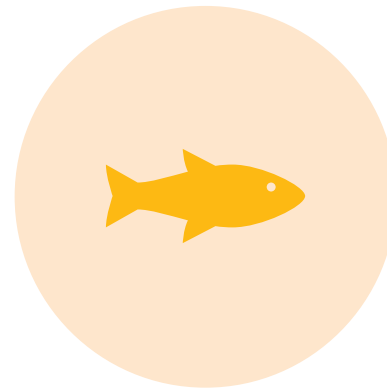
Conserve and sustainably use the oceans, seas and marine resources for sustainable development.



# Modelling Literature



AIS DATA



TAGGED WHALES



# Modelling Literature

$$M = \lambda_b t_b \cdot P(S|D_b) \cdot P(M | v_b) \cdot (1 - P(A | v_b))$$



# Modelling Literature

$$M = \lambda_b t_b \cdot P(S|D_b) \cdot P(M | v_b) \cdot (1 - P(A | v_b))$$

Encounter Rate  
in Time Period

# Modelling Literature

$$M = \lambda_b t_b \cdot P(S|D_b) \cdot P(M | v_b) \cdot (1 - P(A | v_b))$$

Probability of strike given  
depth (and draft)  
-> 1 if not sure

# Modelling Literature

$$M = \lambda_b t_b \cdot P(S|D_b) \cdot P(M | v_b) \cdot (1 - P(A | v_b))$$

Probability of mortality given  
vessel speed  
-> 1 if not sure  
50% at 10kt, 100% at 20kt



# Modelling Literature

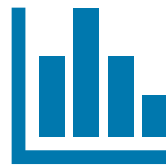
$$M = \lambda_b t_b \cdot P(S|D_b) \cdot P(M | v_b) \cdot (1 - P(A | v_b))$$

Probability of avoidance  
given vessel speed  
-> 0 if not sure

# Modelling Literature



Species specific



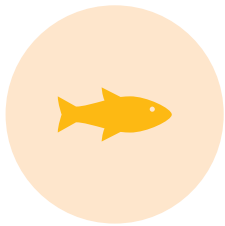
Difficult data



Extrapolation  
confidence



# Case Study



260 WHALES



CROSSING  
FORTNIGHTLY



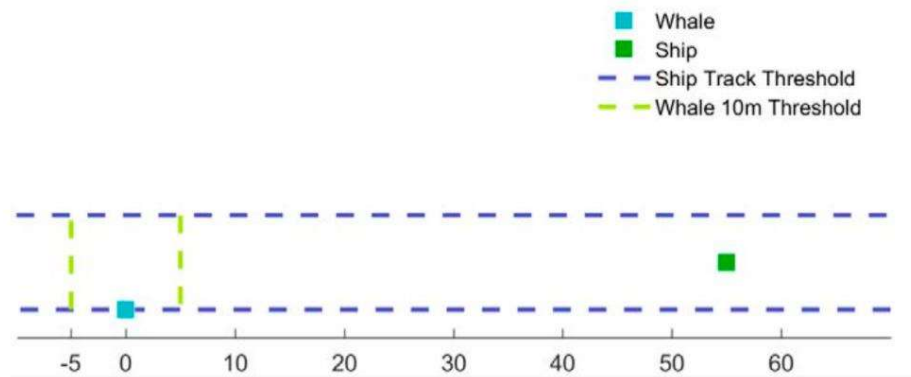
ASSUMED  
WHALE/SHIP SPEEDS



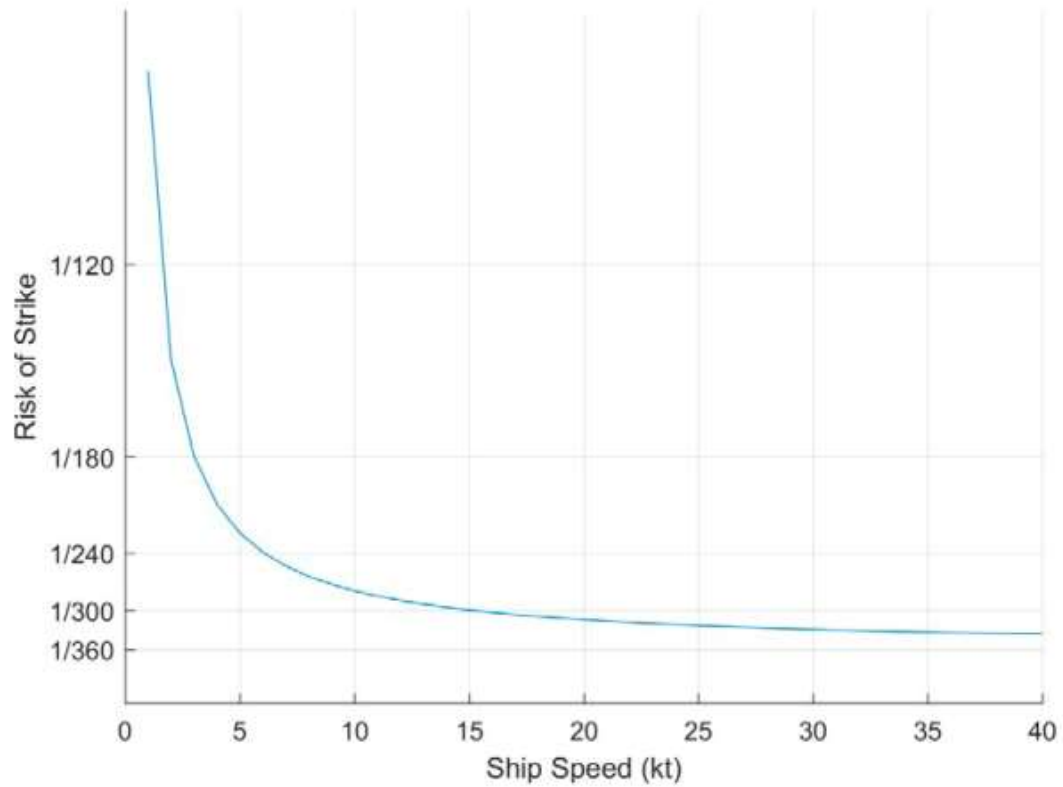
LENGTH OF TRANSIT  
OF GAB



# Case Study



# Limitations / Considerations



# Takeaways



Relative risk is key?



What are trigger points?



Further/ongoing data and research

# Thank you

