

Satellite Tagging Reveals Movements and Occupancy Patterns of Southern Right Whales in Southern Australian Waters and the Southern Ocean.

Claire Barr¹, Luciana Möller^{1,2}, Sarah Laverick³, Rob Slade³, Simon Childerhouse³, Dave Paton³, Amy Kennedy⁴, Alex Zerbini⁴

¹ Cetacean Ecology, Behaviour and Evolution Laboratory, College of Science and Engineering, Flinders University, GPO Box 2100, Adelaide, South Australia 5001, Australia
² Molecular Ecology Laboratory, College of Science and Engineering, Flinders University, GPO Box 2100, Adelaide, South Australia 5001, Australia
³ Blue Planet Marine, PO Box 919, Jamison Centre, Canberra, Australian Capital Territory 2614, Australia
⁴ Cooperative Institute for Climate, Ocean and Ecosystem Studies, University of Washington, Marine Mammal Laboratory, Alaska Fisheries Science Center, NOAA Fisheries, and Marine Ecology and Telemetry Research, Seattle, WA, USA

✉ Luciana.moller@flinders.edu.au

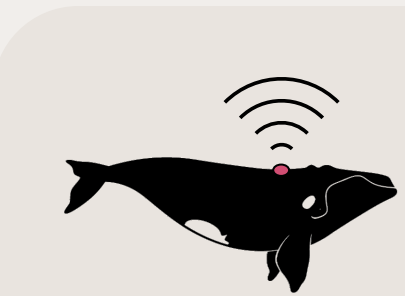
Introduction

Several southern right whale (*Eubalaena australis*) coastal calving areas have been identified in southern Australia, but little is known about movements outside these areas, or their overlap with anthropogenic activities.

To address this, we aimed to:

- Track migratory movements from Encounter Bay, South Australia, using satellite telemetry.
- Identify behavioural changes across space and time and identify key occupancy areas.
- Evaluate spatial overlap with vessel traffic to inform conservation planning and future risk assessments.

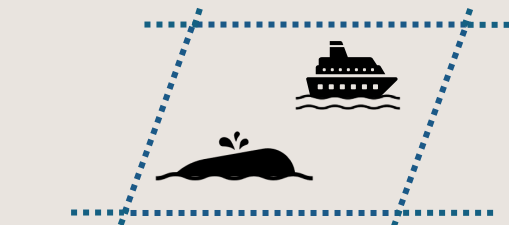
Methods



Four southern right whales were tagged in Encounter Bay, SA, in June 2024 with SPLASH satellite tags (Wildlife Computers ©).

A continuous-time correlated random walk (CTCRW) model was applied to filtered Argos location data to predict location data at regular 6 hr intervals.

Dive depth and duration patterns were analysed



AIS vessel traffic concentrations in 30 km² grids were overlaid with whale tracks to quantify spatial overlap during the tagging period.



A Hidden Markov Model (HMM) was used to identify changes in movement behaviour (i.e., transit vs. area-restricted search).

Results

Tag durations were between 132 and 198 days between June 2024 and January 2025 (Table 1). Two whales calved after tagging, the other two are currently unsexed.

Tag ID	Name (Ngarrindjeri)	Sex	Tag duration	Minimum distance travelled	No. dives (excursions >5m)	Ave. dive depth	Ave. dive duration
261252	Muralapi	Unknown	185 days	9,938 km	5,310	19.95 m	3.93 min
261253	Plonggi	Unknown	198 days	11,626 km	7,433	16.25 m	4.66 min
261255	Tari	Female, pregnant/ with calf	150 days	4,089 km	2,247	9.99 m	3.52 min
261256	Marti	Female, pregnant/ with calf	132 days	6,014 km	5,443	8.40 m	3.39 min

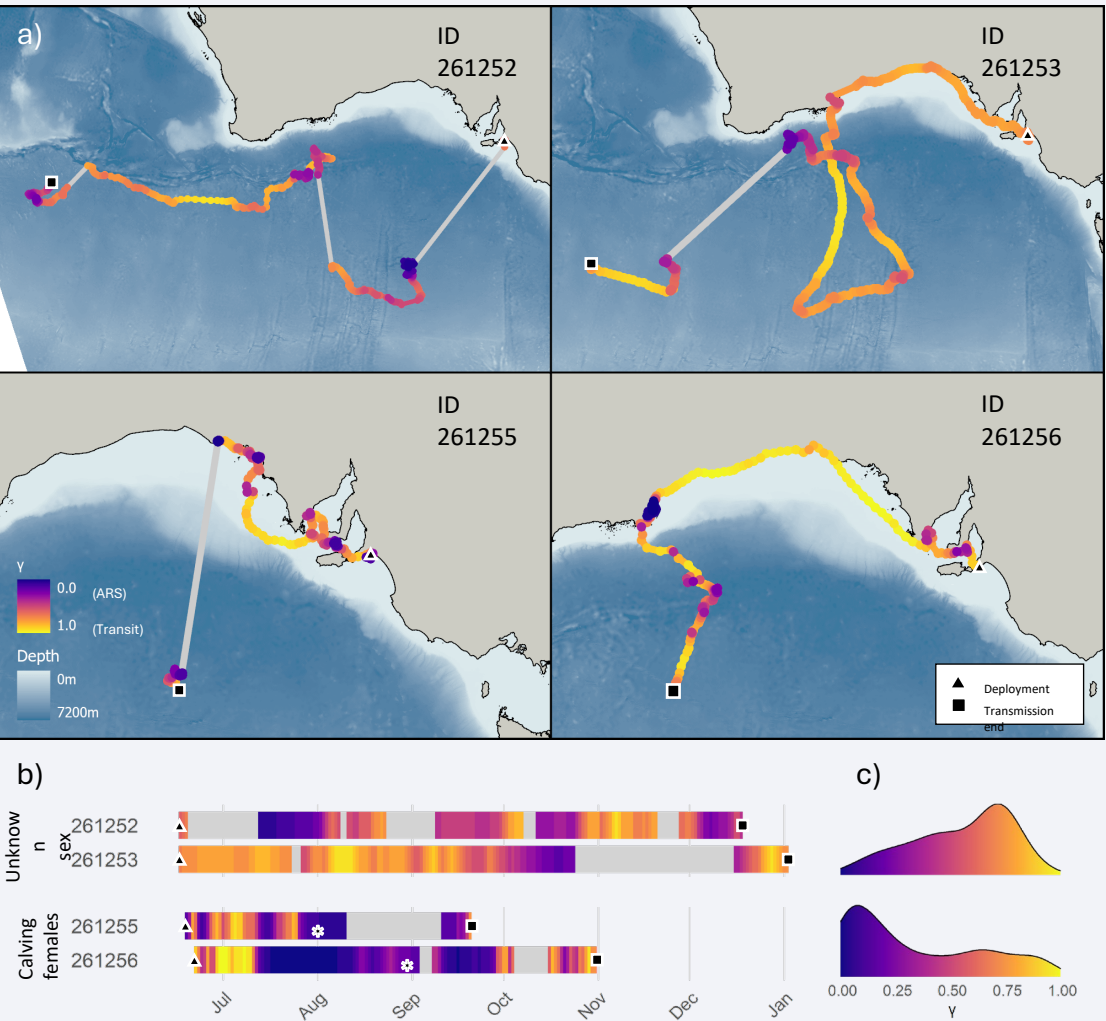


Figure 1. Movement persistence (γ) of the four tagged whales, where low γ indicates area-restricted search (i.e., foraging, socialising, or breeding) and high γ indicates fast direct travel (i.e., migration). (A) Spatial distribution of γ values. (B) Temporal variation in γ , highlighting differences between individuals and between reproductive status. (C) Comparison of daily γ values between calving and non-calving individuals, showing that females with a calf spent more time conducting area-restricted search behaviour.

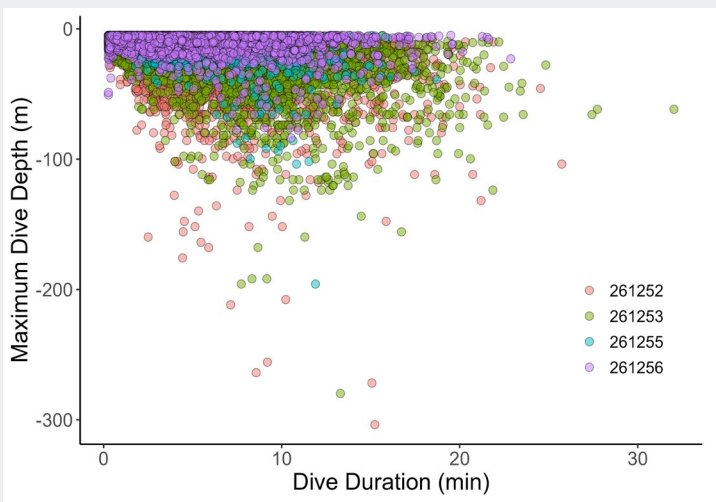


Figure 2. Scatterplot of dive depths in relation to dive duration for the four satellite-tagged southern right whales. Non-calving adults ($n = 2$) conducted the deepest and longest dives. Over 20,000 dive profiles were recorded; mean depth ranged from 8.4–20.0m and the maximum recorded dive was 307.5m.

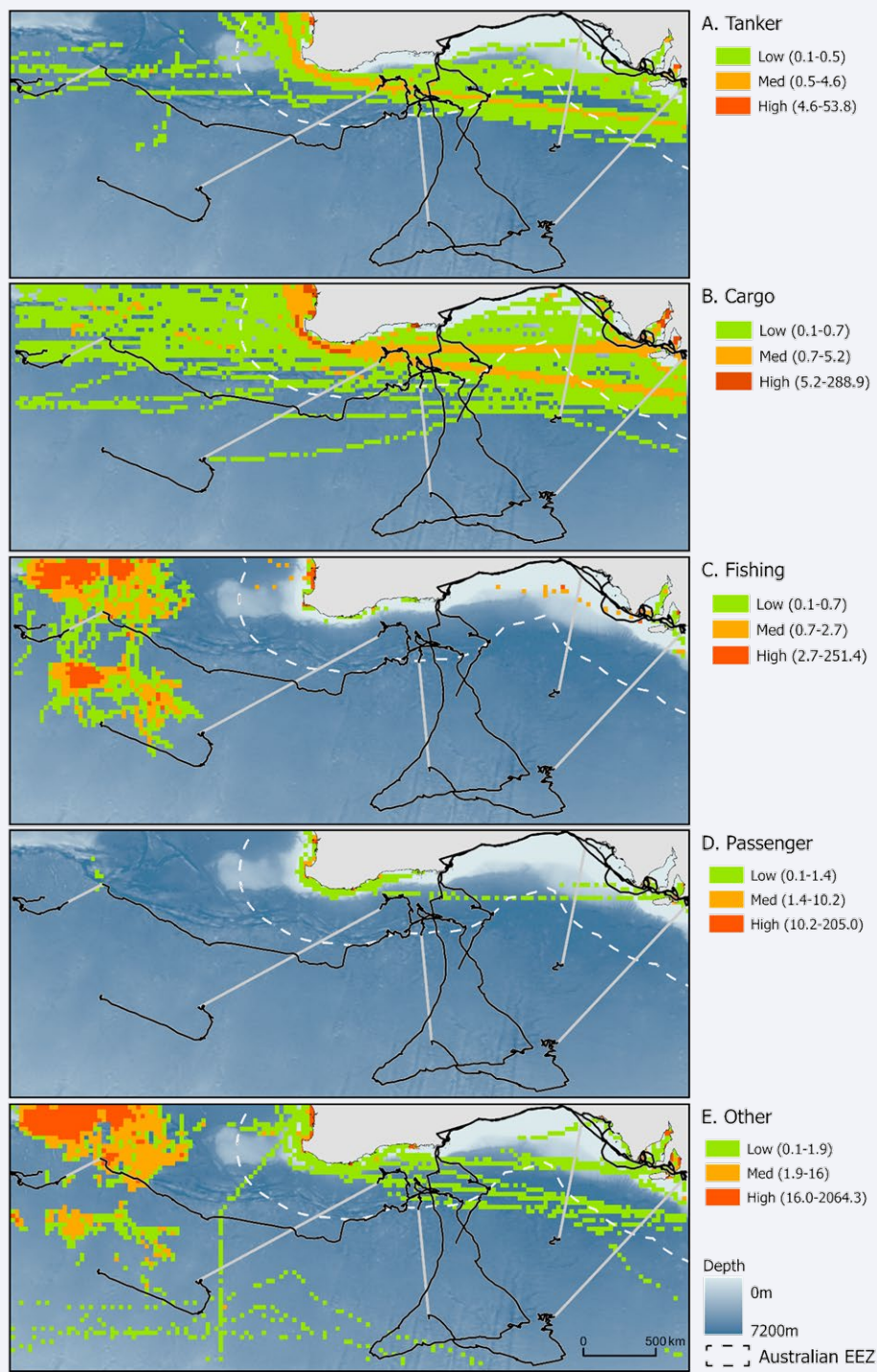


Figure 3. Southern right whale movements (black tracks) overlapping vessel density distribution during the tagging period (Jun 2024-Jan 2025), confirming overlap with significant marine industry activity and highlighting potential risk of vessel strike or fishing gear entanglement.

Discussion

Southern right whales tagged in Encounter Bay, SA, exhibited a variety of movement, dive, and behaviour patterns across southern Australia and movements overlapped with major vessel traffic. All whales travelled west or southwest (Fig. 1), and two individuals calved after tagging, spending significant time in known coastal calving areas. Calving females also exhibited more area-restricted search behaviour, which is likely resting or nursing to aid calf growth². Vessel strike and entanglement in fishing gear are major threats to right whales³, and the overlap with vessel traffic during the tagging period in this study raises concerns for the broader population while utilising waters of southern Australia.

Future Directions

Behavioural analysis and overlap with significant shipping and fishing vessel presence highlight the need for a full risk assessment to be completed. This will aid in future management decisions as the population expands.

Conclusion

Satellite tracking of southern right whales identified spatial and temporal variability in behaviour throughout southern Australia. Overlap with significant marine industry activity was also found, highlighting risks to this recovering population and providing information to support conservation under the National Recovery Plan for the Southern Right Whale¹.

References

1. DCCEEW 2024, National Recovery Plan for the Southern Right Whale. Department of Climate Change, Energy, the Environment and Water, Canberra.
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3. Peel, D., Smith, J. N., & Childerhouse, S. (2018). Vessel Strike of Whales in Australia: The Challenges of Analysis of Historical Incident Data. Frontiers in Marine Science, 5, 69. <https://doi.org/10.3389/fmars.2018.00069>

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