Dr. Joseph Onoufriou

Quantitative Spatial Ecologist

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Research Interests

I am an applied ecologist specializing in the spatial and behavioural ecology of marine predators, with particular expertise in pinniped movement, foraging dynamics, and anthropogenic interactions. My research integrates advanced statistical modelling, telemetry, and environmental data to quantify how physical and biological processes, especially those associated with renewable energy infrastructure, influence animal behaviour, distribution, and population risk.

I have a strong track record of translating ecological insights into practical tools for industry and policy, including collision risk modelling and impact assessments for marine energy projects. Through extensive collaboration with stakeholders, I have helped shape conservation strategies and regulatory guidance in high-conflict marine environments. My work bridges quantitative ecology, oceanography, and conservation physiology, and is underpinned by a commitment to producing robust, reproducible, and decision-relevant science.

Key Words: Movement ecology; marine mammals; environmental modelling; spatial statistics; renewable energy; applied conservation science

Education

University of St Andrews — *St Andrews, Scotland*

PhD Biology — *Nov. 2015 - Jan. 2020*

- Thesis title: 'Movement Ecology of seals in a tidally energetic environment: Implications for interactions with tidal energy devices.'

University of St Andrews — *St Andrews, Scotland*

MRes Marine Mammal Science — *Sep. 2011 - Aug. 2012*

- Thesis title: 'A validated step-wise approach to drift-dive classification using high resolution accelerometery data.'

University of Southampton — *Southampton, England*

BSc (Hons) Marine Biology and Oceanography — *Sep. 2006 - Sep. 2010*

- Thesis title: 'The effects of the toxic dinoflagellate, *Coolia monotis*, on respiration rate and survival of brine shrimp.'

Relevant Employment

Marine Directorate of the Scottish Government — *Aberdeen, Scotland*

Senior Marine Mammal Scientist — *Apr. 2022 - Mar. 2025*

- Providing scientific advice to licensing, policy and statutory advisors on matters relating to marine mammal consenting, impacts of renewable energy, and population dynamics
- Producing evidence to support advice and consenting through passive acoustic monitoring projects and spatial modelling of marine mammal distribution and density in relation to renewable energy developments, using predictive habitat models (e.g., GAMs, boosted regression trees) and spatially-explicit risk assessments. Oversaw integration of passive acoustic and telemetry data into spatial decision-making frameworks for marine planning.
- Project managing government funded projects from internal and external parties.
- Managing a team of 5 biologists and acousticians to collect, analyze and interpet large, nationwide datasets and collaborating with industry and academic partners to ensure multi-year data collection projects run efficiently

University of the Highlands and Islands *Oban, Scotland*

POST-DOCTORAL RESEARCHER *Apr. 2020 - Apr. 2022*

- Investigating the effects of tidal turbine sound exposure on seal movement and distribution.
- Providing analytical, administrative and project focussed support and mentoring to PhD students.
- Using animal movement data to help refine estimates of collision risk between marine mammals and tidal turbines. Conducted high-resolution spatial analyses of seal telemetry data, developing state-dependent utilization distributions and kernel density maps to identify 3-dimensional risk zones. Integrated turbine operational schedules with spatiotemporal presence models to quantify exposure likelihood and avoidance thresholds.

University of St Andrews *St Andrews, Scotland*

TUTOR AND LECTURER *Sep. 2019 - Apr. 2025*

- Guest lecturer in marine animal movement and spatial analysis (2 lectures per semester) - BL5110
- Developing and leading lab practicals on the use of R to quantify movement behaviour using telemetry data - BL5122
- Demonstrating for lab practicals on quantitative methods in ecology and GIS for ecologists - BL5110

University of St Andrews *St Andrews, Scotland*

POST-DOCTORAL RESEARCHER *Jan. 2020 - Apr. 2020*

- Supporting delivery of the Marine Scotland Scientific Support Programme through dissemination of spatial analysis to Scottish ministers. including spatial prioritization and mapping tools for policy briefings. Applied fine-scale spatial interpolation methods (e.g., kriging) and density estimation to inform ministers on seal-turbine interaction zones.
- Providing consultation on collision risk and impact of operational tidal turbine arrays

University of St Andrews *St Andrews, Scotland*

POST-GRADUATE RESEARCH ASSISTANT *Sep. 2014 - Nov. 2016*

- Quantifying the spatial overlap between seals and shipping traffic in the Moray Firth, Scotland.
- Conducted spatially-explicit risk mapping using AIS and telemetry data, applying point-pattern analysis, distance-based metrics, and spatial smoothing. Developed risk surfaces incorporating behavioural data and seal haul-out densities.

University of St Andrews *St Andrews, Scotland*

POST-GRADUATE RESEARCH ASSISTANT *Apr. 2013 - Nov. 2014*

- Investigating unusual mortality events ("Corkscrew Lesions") in seals around the UK.
- Curating databases of seal stranding cases around the Scottish coast.
- Designing and conducting experiments to test the hypothetical link between corkscrew lesions and ship propellers.
- Leading the investigation into grey seals as a potential source of unusual mortality events in seals using pathological analyses, telemetry data and recorded behavioural data

Selected Publications

For a complete list of publications and reports see *my Google Scholar profile (link)*.

Foraging in dynamic habitats: the importance of considering flow in animal movement analyses *Journal Article*

FUNCTIONAL ECOLOGY *in review*

- **Onoufriou, J.**, Russell, D.J.F., Thompson, D., Moss, S., O'Hara Murray, R., Hastie, G. Functional Ecology.

Evaluating the performance of a dual frequency multibeam echo-sounder for small target detection *Journal Article*

JOURNAL OF MARINE SCIENCE AND ENGINEERING *Dec. 2023*

- Petzinna, N. Nikora, V. **Onoufriou, J.** and Williamson, B.J. 2023. Evaluating the performance of a dual frequency multibeam echo-sounder for small target detection Journal of Marine Science and Engineering. 11(11), p.2084.

Underwater noises of two operational tidal streamturbines: a comparison *Book Chapter*

IN: THE EFECTS OF NOISE ON AQUATIC LIFE *Sep. 2023*

- Risch, D., Marmo, B., van Geel, N., Gillespie, D., Hastie, G., Sparling, C., **Onoufriou, J.** and Wilson, B. 2023. Underwater noises of two operational tidal streamturbines: a comparison In: The effects of noise on aquatic life: Principles and practical considerations (pp. 1-22). Chambridge: Springer International Publishing

Quantifying the effects of tidal turbine array operations on the distribution of marine mammals: implications for collision risk and spatial planning *Journal Article*

Renewable Energy *Aug. 2021*

- **Onoufriou, J.**, Russell, D.J.F., Thompson, D., Moss, S., Hastie, G. Renewable Energy. 2021; 180: 157-165.https://doi.org/10.1016/j.renene.2021.08.052

Empirical determination of severe trauma in seals from collisions with tidal turbine blades *Journal Article*

Journal of Applied Ecology *Jan. 2019*

- **Onoufriou, J.**, Brownlow, A., Moss, S., Hastie, G., Thompson, D. Empirical determination of severe trauma in seals from collisions with tidal turbine blades. J Appl Ecol. 2019; 56: 1712– 1724. https://doi.org/10.1111/1365-2664.13388

Seals and shipping: quantifying population risk and individual exposure to vessel noise *Journal Article*

Journal of Applied Ecology *Apr. 2017*

- Jones, E.L., Hastie, G.D., Smout, S., **Onoufriou, J.**, Merchant, N.D., Brookes, K.L. and Thompson, D. Seals and shipping: quantifying population risk and individual exposure to vessel noise. J Appl Ecol, 54: 1930-1940. https://doi.org/10.1111/1365-2664.12911

Corkscrew Seals: Grey Seal (*Halichoerus grypus*) infanticide and cannibalism may indicate the cause of spiral lacerations in seals *Journal Article*

PLOS ONE *Jun. 2016*

- Brownlow A., **Onoufriou, J.**, Bishop A., Davison N., Thompson D. Corkscrew Seals: Grey Seal (*Halichoerus grypus*) Infanticide and Cannibalism May Indicate the Cause of Spiral Lacerations in Seals. PLOS ONE 11(6): e0156464. https://doi.org/10.1371/journal.pone.0156464

Cannibalism by a male grey seal (*Halichoerus grypus*) in the North Sea *Journal Article*

Aquatic Mammals *Jun. 2016*

- Bishop, A. M., **Onoufriou, J.**, Moss, S, Pomeroy, P, Twiss, S.D. Cannibalism by a male grey seal (*Halichoerus grypus*) in the North Sea. Aquatic Mammals: Vol. 42, Iss. 2. 137-143. DOI:10.1578/AM.42.2.2016.137

Investigations into the interactions between harbour seals (*Phoca vitulina*) and vessels in the inner Moray Firth *Government Report*

Scottish Marine and Freshwater Science *Mar. 2016*

- **Onoufriou, J.**, Jones, E., Hastie, G. Thompson, D. Investigations into the interactions between harbour seals (*Phoca vitulina*) and vessels in the inner Moray Firth. Scottish marine and freshwater science: 7(15). DOI: 10.7489/1805-1

Testing the hypothetical link between shipping and unexplained seal deaths *Government Report*

Marine Scotland Scientific Support Reserach Programme *Mar. 2016*

- **Onoufriou, J.**, Thompson, D., Brownlow, A. Testing the hypothetical link between shipping and unexplained seal deaths. MMS/001/11-USD2. http://www.smru.st-and.ac.uk/documents/1926.pdf

Technical Skills

Software and Programming

Coding Languages	Software	Data Types	Other
R – SQL – MatLab	QGIS – ArcGIS – Manifold – GIMP – Zotero – MSOffice	GPS – ARGOS – TDR – AIS – Accelerometry	Git – Markdown – LaTex

Statistics

1. **Generalised Linear Models (GLMs) & Generalised Additive Models (GAMs).** Used to account for non-linear relationships with complex and dynamic habitat covariates. Examples include modelling dive behaviour of seals as a complex interactive function of a suite of fine-scale habitat drivers of behaviour such as diurnal patterns, tidal stream vectors of movement and bathymetric variables.
2. **GAMs with Generalised Estimating Equations (GEEs).** These models were employed to handle temporal autocorrelation, typical in systematic animal observation data of the same individuals. This allowed robust

estimation of population level trends while accounting for within-subject correlation. Examples include estimating behavioural response curves enabling quantification of avoidance behaviour of seals at varying distances from operational tidal turbines.

3. **Time-series & state-space modelling (including HMMs).** Developed and applied unique HMMs and state-space models to infer latent behavioural states from seal movement and dive data in areas where observed movement is intrinsically biased. These models incorporated depth, dive duration, movement speed and turning angles to probabilistically assign behavioural states at fine temporal scales. Intergrated the concept of 'hydrospace' into the data streams by combining tidal flow vectors with obersevred movement to infer animal swimming direction. This gave rise to the observed paths, thus determining movement effort to further refine latent state inferences. In combination with environmental covariates, the models provide state-dependent habitat use maps enhancing understanding of applied and pure ecological inferences.
4. **Spatially explicit expertise.** Predictive habitat modelling (GAMs, BRTs, MaxEnt); Point pattern analysis, kernel density estimation, utilization distributions; Spatial autocorrelation (Moran's I), variogram modelling; Raster-based analysis (e.g., bathymetry, SST, chlorophyll); Integration of ARGOS, GPS, AIS, and environmental data; Spatial interpolation (i.e. kriging); Spatial visualization (ggplot2, leaflet, QGIS, ArcGIS).

Fieldwork

8 years experience of capture, handling and tag attachment of phocid seals (grey and harbor seals).

3 years experience as an aerial survey technician for breeding and molting surveys of UK phocid seals (grey and harbor seals).

2 field seasons assisting capture and handling of seabirds (puffins and shags) on a breeding colony.

Experienced small-boat operator - Royal Yacht Association (RYA) Power Boat level 2

Marine and Coastguard Agency (MCA) approved sea-survival

Conferences and workshops

ScotMER Symposium 2025 \ *Conference Chair and co-organiser. Online*

EIMR 2024 \ *Conference Chair and co-organiser. In Person.*

Scottish Passive Acoustic Network: strategic acoustic monitoring of marine mammals and anthropogenic noise alongside renewable energy proliferation
Oral Presentation — Onoufriou, J., Quer, S., Philpott, E., Lucas, J., Millar, H., Kosecka, M., Wilson, L., Brookes, K. (2024)
ScotMER Symposium 2024. Online.

Harbour seal (*Phoca vitulina*) diving behaviour is dependent on flow speed in a tidal stream environment
Oral Presentation — Onoufriou, J., Russell, D.J.F., Thompson, D., Moss, S.E., Hastie, G. (2021)
7th International Bio-Logging Science Symposium. Online.

Variable diving behaviour of seals in tidally energetic channels
Oral Presentation — Onoufriou, J., Russell, D.J.F., Thompson, D., Moss, S.E., Hastie, G. (2021)
MASTS: Marine Alliance for Science and Technology Forum. Online.

Quantifying the effects of tidal turbine array operations on the distribution of marine mammals: implications for collision risk
Oral Presentation — Onoufriou, J., Russell, D.J.F., Thompson, D., Moss, S.E., Hastie, G. (2020)
EIMR: Environmental Interactions of Marine Renewable Energy Technologies. Online.

Overt avoidance behaviour of seals in response to tidal turbine array operations
Oral Presentation — Onoufriou, J., Russell, D.J.F., Thompson, D., Moss, S.E., Hastie, G. (2020)
ScotMER Symposium, Marine Scotland. Online.

Foraging in dynamic habitats: the importance of considering flow in animal movement analyses
Speed Talk — Onoufriou, J., Russell, D.J.F., Thompson, D., O'Hara Murray, R., Moss, S., Hastie, G. (2019)
World Marine Mammal Conference. Barcelona, Spain.

Foraging plasticity and extrinsic drivers of activity budgets in a tidally energetic system
Invited Talk — Onoufriou, J., Russell, D.J.F., Thompson, D., O'Hara Murray, R., Moss, S., Hastie, G. (2019)
SEECC 2019: Scottish Ecology, Environment and Conservation Conference. Glasgow, UK.

Empirical determination of severe trauma in seals from collisions with tidal turbine blades
Invited Talk — Onoufriou, J., Brownlow, A., Moss, S., Hastie, G., Thompson, D. (2019)
ScotMER Symposium, Marine Scotland.

Empirical determination of severe trauma in seals from collisions with tidal turbine blades
Poster — Onoufriou, J., Brownlow, A., Moss, S., Hastie, G., Thompson, D. (2019)
SIMC: Scotland's International Marine Conference.

Experimental determination of a mortality threshold for collisions between marine megafauna and tidal turbines
Oral Presentation — Onoufriou, J., Thompson, D., Brownlow, A., Sparling, C., Hastie, G. (2018)
EIMR: Environmental Interactions of Marine Renewable Energy Technologies.

Seal collision trials and fine-scale tracking around an operating turbine array
Invited Talk — Onoufriou, J., Evers, C., Thompson, D., Brownlow, A., Hastie, G. (2017)
Workshop on Environmental Impacts of Tidal Energy Industry: 22nd Biennial Conference for the Society of Marine Mammalogy. Halifax, NS.

Corkscrew seals: grey seal infanticide and cannibalism may indicate the cause of spiral lacerations in seals
Workshop Coordinator — Onoufriou, J., Brownlow, A., Moss, S., Hastie, G., Thompson, D. (2015)
21st Biennial Conference for the Society of Marine Mammalogy. San Francisco, CA.

Unravelling the mystery of corkscrew seals
Workshop Coordinator — Onoufriou, J., Brownlow, A., Thompson, D. (2015)

UKIRSCSMM: UK and Ireland Student Chapter of the Society of Marine Mammalogy Conference. Bangor, UK.

A validated, step-wise approach to drift-dive classification using high resolution accelerometery
Oral Presentation — Onoufriou, J., Fedak, M., Thompson, D. (2013)
20th Biennial Conference for the Society of Marine Mammalogy. Dunedin, NZ.

Students

Supervised/advised

2023-25 Sophie Smith, PhD (co-supervised), 2022-25 Nicholas Petzina, PhD (co-supervised), 2022-25 Tim Awbery, PhD (co-supervised), 2022-25 Julia Sutherland, PhD (co-supervised), 2020-22 Charlotte Findlay, PhD (co-supervised), 2019-20 Tierney Carter, MSc (co-supervised), 2018-19 Laura Palmer, MSc (co-supervised), 2017-18, Claire Evers, MSc (co-supervised),

PhD students mentored under The Bryden Centre Doctoral Training Program 2020-2021

Natalie Issakson (Environmental Research Institute), Inne Withouck (NAFC Marine Centre), Morag Cooper (Inverness College), Rowland Fraser (Inverness College), Monika Kosecka (Scottish Association for Marine Science)

Professional service

Reviewer for Scientific Journals

Journal of the Marine Biological Association of the UK, International Marine Energy Journal, Scientific Reports, Aquatic Conservation, PLOS One, Journal of Marine Science and Engineering, Renewable Energy

Editorial positions

Review editor: Frontiers in Physiology (physio-logging)