'JELLYFISH' IN UK COASTAL WATERS

Analysis of a 'Citizen Science' database

Stephen Pikesley

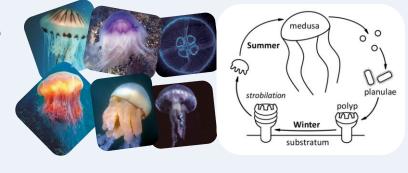
Postgraduate Researcher S.K.Pikesley@exeter.ac.uk





Outline

- Species in UK waters & lifecycle
- Previous studies

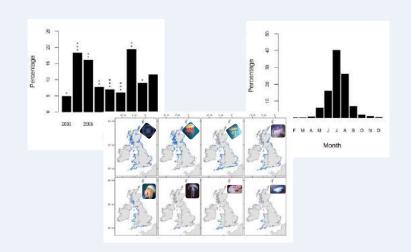


- Data:
 - source & analysis



•http://www.mcsuk.org/sightings/jellyfish.php

- Results:
 - annual & seasonal patterns
 - UK species specific distributions
- Summary/Conclusion







- Eight species of 'jellyfish'
- 6 Scyphozoa



Lion's mane

Blue

Barrel

Aurelia aurita

Cyanea capillata

Chrysaora hysoscella Cyanea lamarckii

Pelagia noctiluca

Rhizostoma octopus

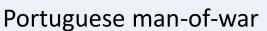
all images MCS





- Eight species of 'jellyfish'
- 6 Scyphozoa
- 2 Hydrozoa (not true jellyfish)





Physalia physalis



By-the-wind sailor

Velella velella

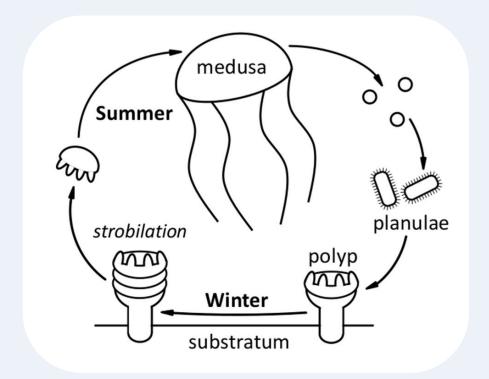
all images MCS





Generalised Scyphozoa lifecycle

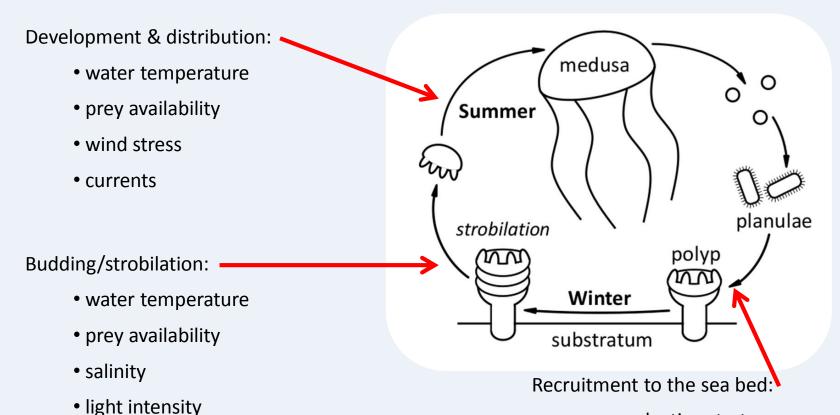
... can include benthic & free swimming stages



this cycle may be influenced
 by multiple factors







- reproductive strategy
- water temperature & turbulence
- type of substrate

(Condon et al. 2001; Lucas 2001; Lynam et al. 2004; Purcell 2007; Han & Uye 2010)

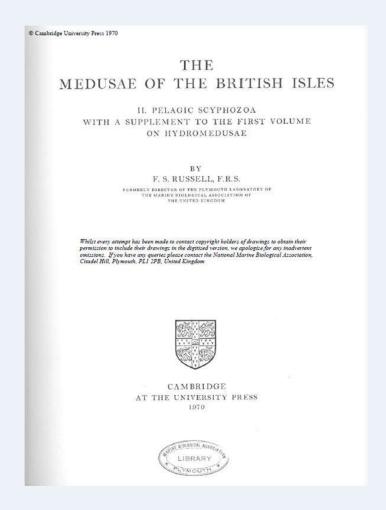


photoperiod

oxygen concentrations



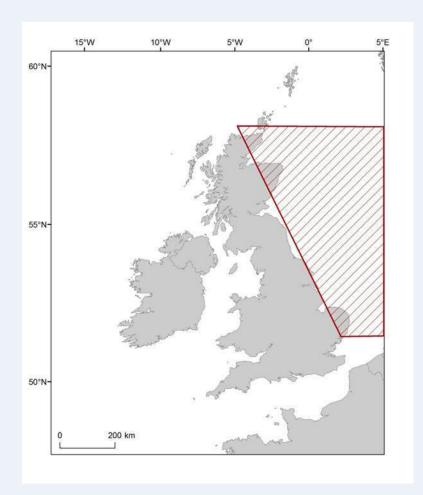
• Extensive UK wide review of historic literature (ca. 100 years) (Russell 1970)







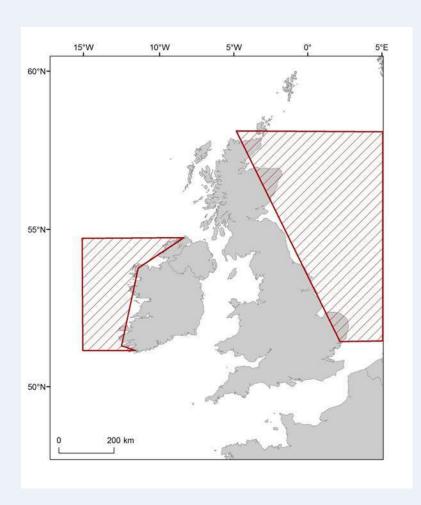
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- North Sea







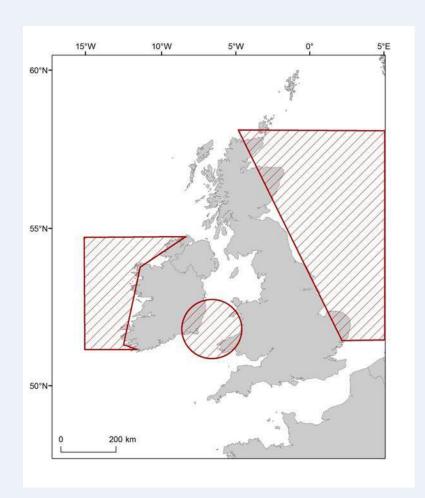
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- North Sea
- Northeast Atlantic (Irish coastal waters)







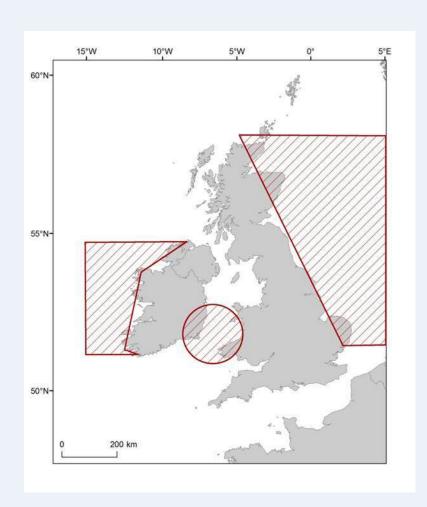
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- Celtic & Irish Sea







- Extensive UK wide review of historic literature (ca. 100 years) (Russell 1970)
- North Sea
- Northeast Atlantic (Irish coastal waters)
- Celtic & Irish Sea
- Survey methods:
 - o plankton recorder
 - o trawls
 - o beach
 - o aerial
 - observations from boats (ferry)







- Marine Conservation Society
- Public driven sightings scheme



record sightings online

http://www.mcsuk.org/sightings/jellyfish.php

























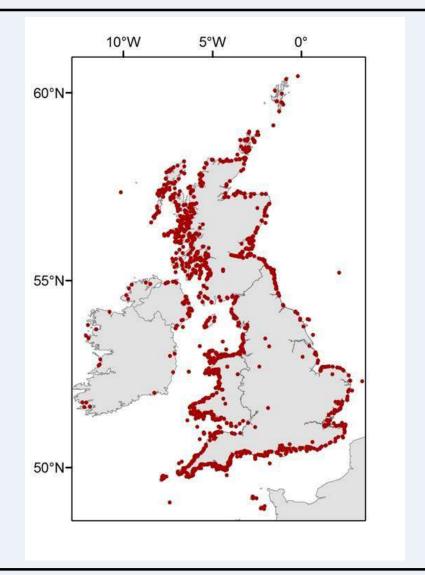








2003 to 2011 raw database: 7229 records



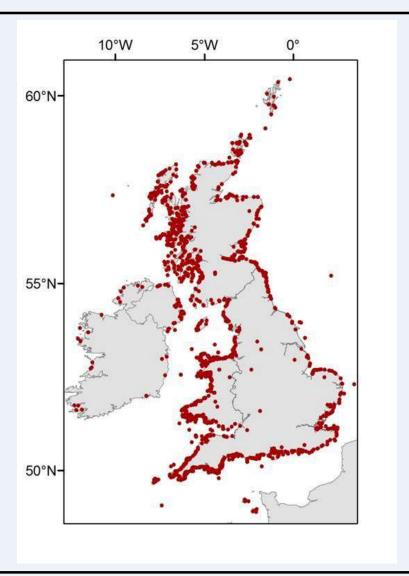




2003 to 2011 raw database: 7229 records

2003 to 2007: postal submission

from 2007: on-line submission







2003 to 2011 raw database: 7229 records

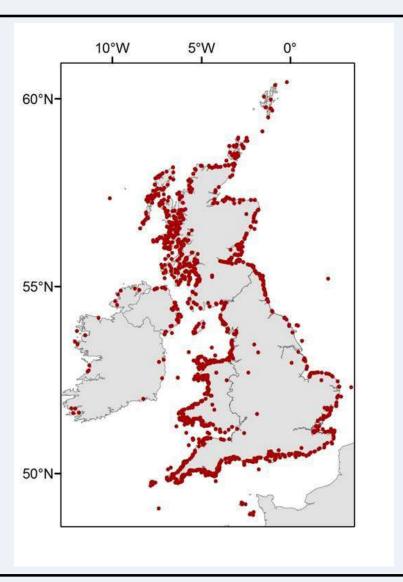
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Tidy up - remove records with:

- no spatial reference
- no species id
- no date







2003 to 2011 raw database: 7229 records

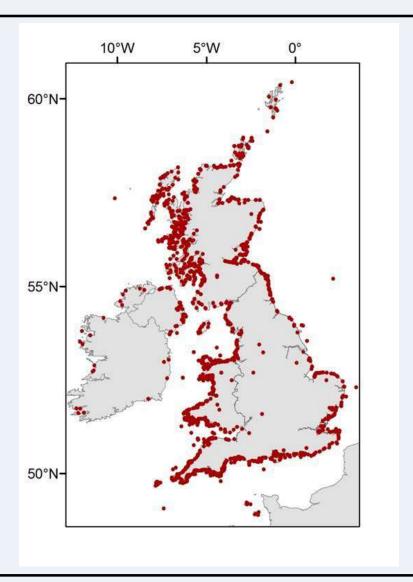
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Correct or remove locations with unlikely spatial references







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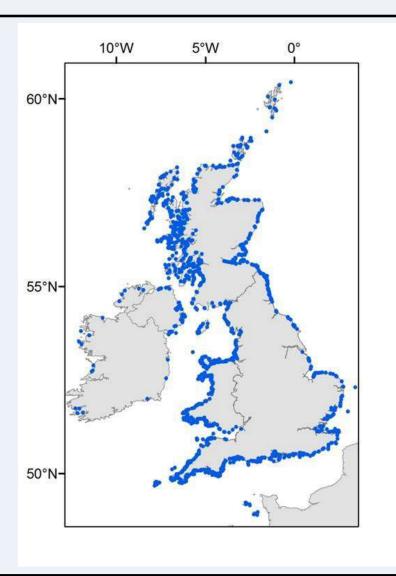
from 2007: on-line submission

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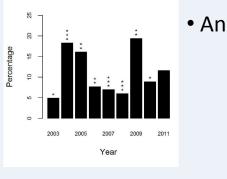
Correct or remove locations with unlikely spatial references

Validated database: 5051 records single or multiple jellyfish sightings, beached or afloat

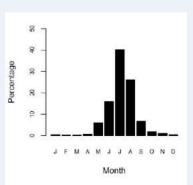








Annual



Seasonal



60°N-55°N-50°N-

5°W

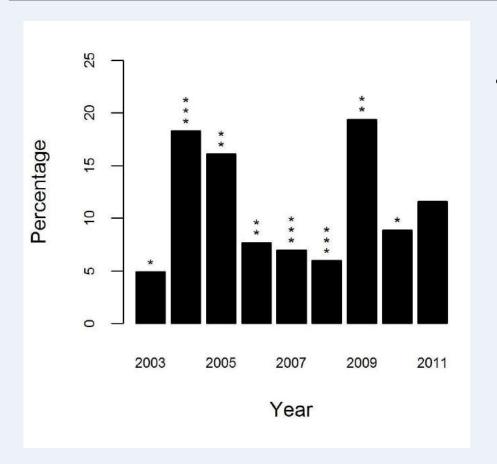
10°W

Spatial





Annual: all species



Scheme promoted annually in July
 national & regional media releases
 (newspaper, radio & television)

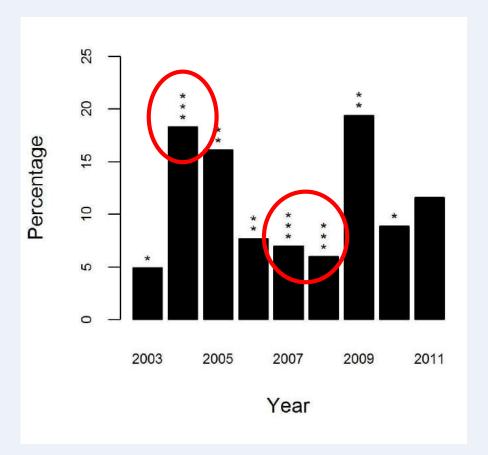
Sightings by year expressed as a percentage of all sightings

* yearly promotional effort





Annual: all species



- Scheme promoted annually in July
 - national & regional media releases
 (newspaper, radio & television)

- Considerable inter-annual variability
 - promotion consistent year-on-year
 - *i.e.* 66% fewer sighting 2007 & 2008 compared with 2004

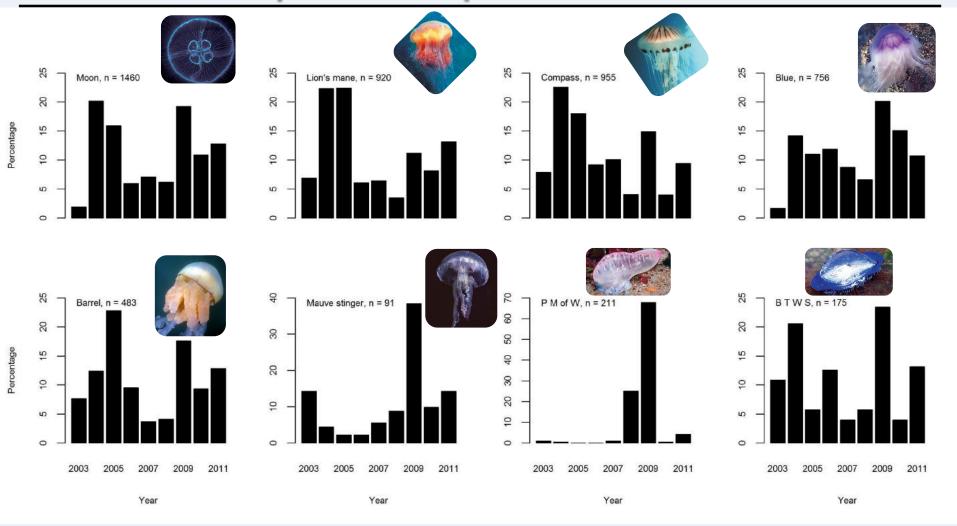
Sightings by year expressed as a percentage of all sightings

* yearly promotional effort





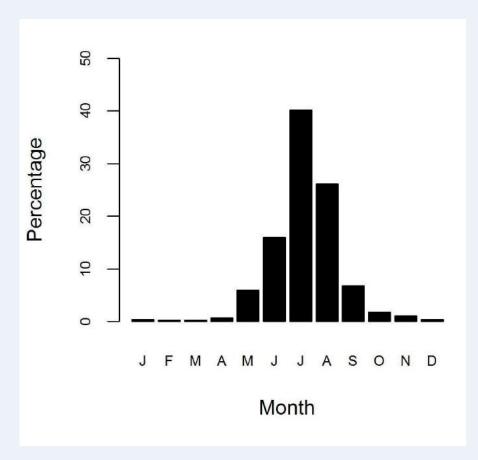
Annual: species specific



Species specific sightings by year expressed as a percentage of conspecific sightings 2003 to 2011.

• Species-specific inter-annual variability - no one species displayed a uniform temporal pattern

Seasonal: all species

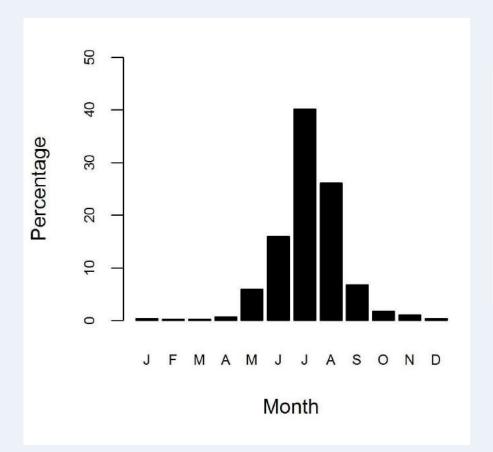


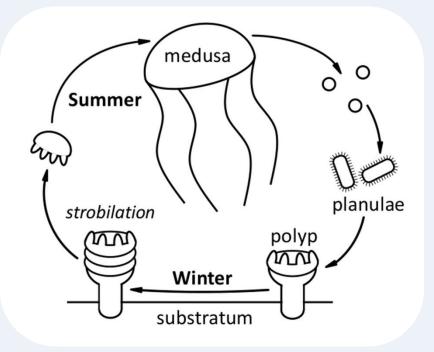
Sightings by month expressed as a percentage of all sightings





Seasonal: all species





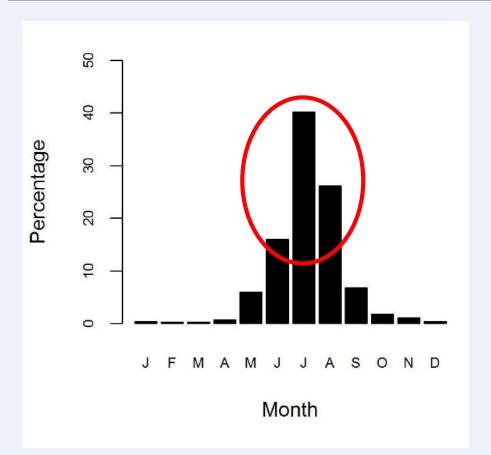
Generalised Scyphozoa lifecycle

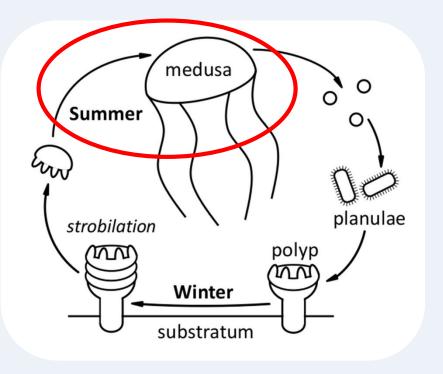
Sightings by month expressed as a percentage of all sightings





Seasonal: all species





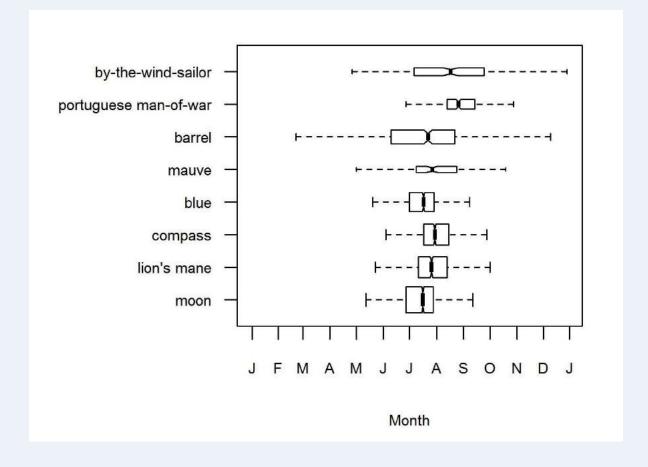
Generalised Scyphozoa lifecycle

Sightings by month expressed as a percentage of all sightings









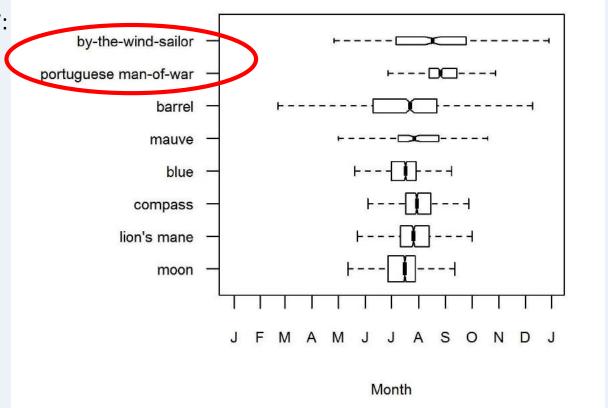
Species specific sightings by month. Box widths are proportional to the number of observations in the box. Outliers are not drawn.







• BTWS & PMW: late summer



Species specific sightings by month. Box widths are proportional to the number of observations in the box. Outliers are not drawn.

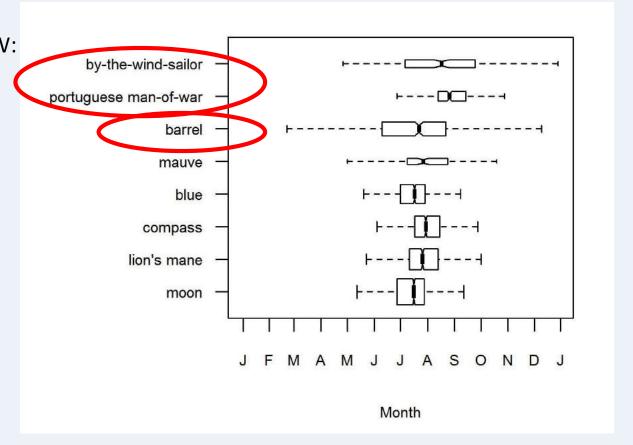






• BTWS & PMW: late summer

barrel: long



Species specific sightings by month. Box widths are proportional to the number of observations in the box. Outliers are not drawn.







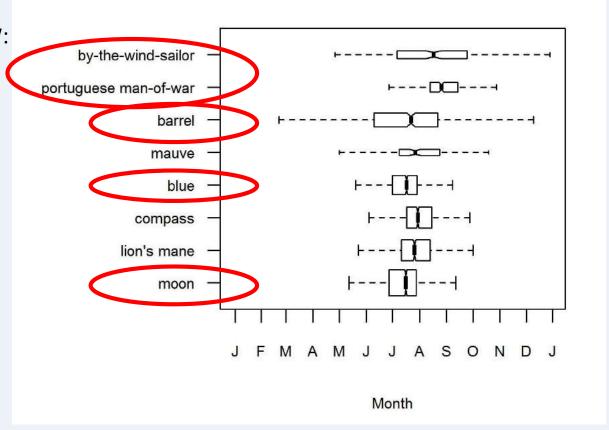
• BTWS & PMW: late summer



barrel: long season



blue & moon appear earlier than compass& lion's mane



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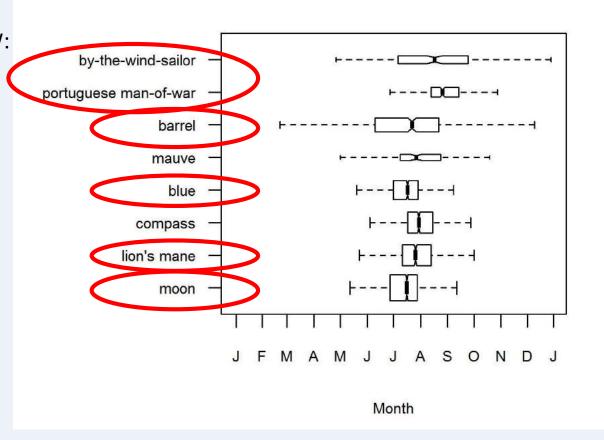


blue & moon appear earlier than compass& lion's mane



lion's mane predate moon

(Bastian et al. 2011)

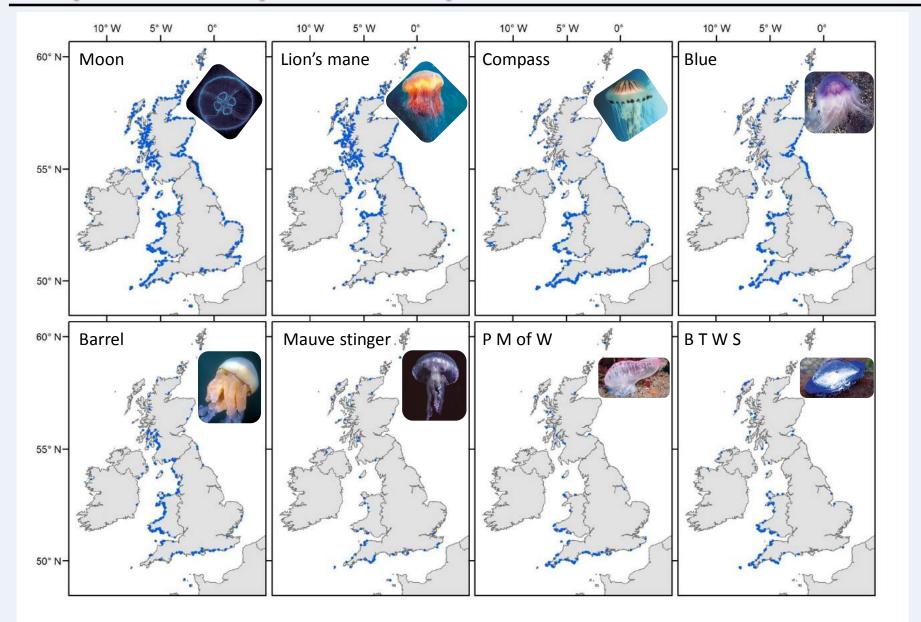


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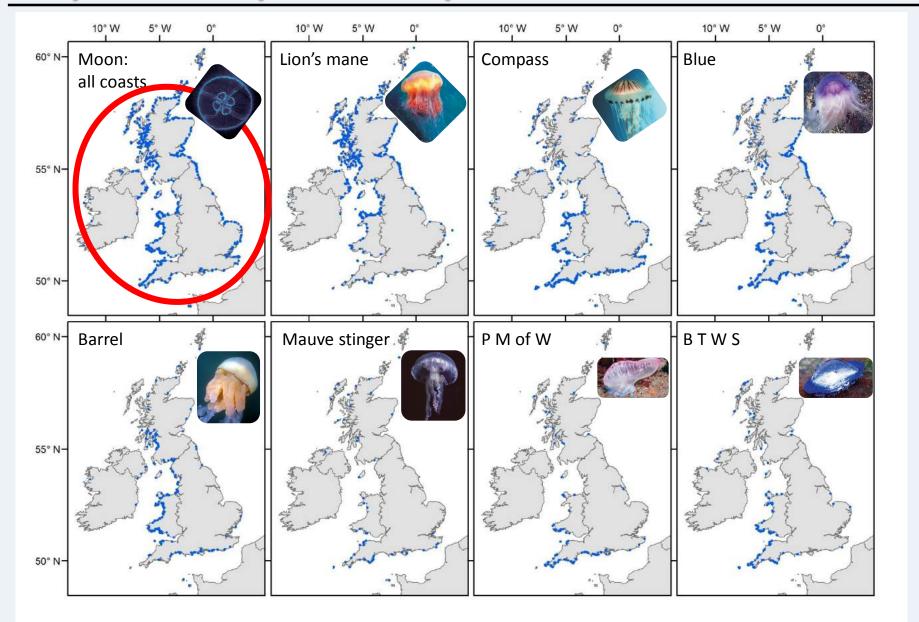




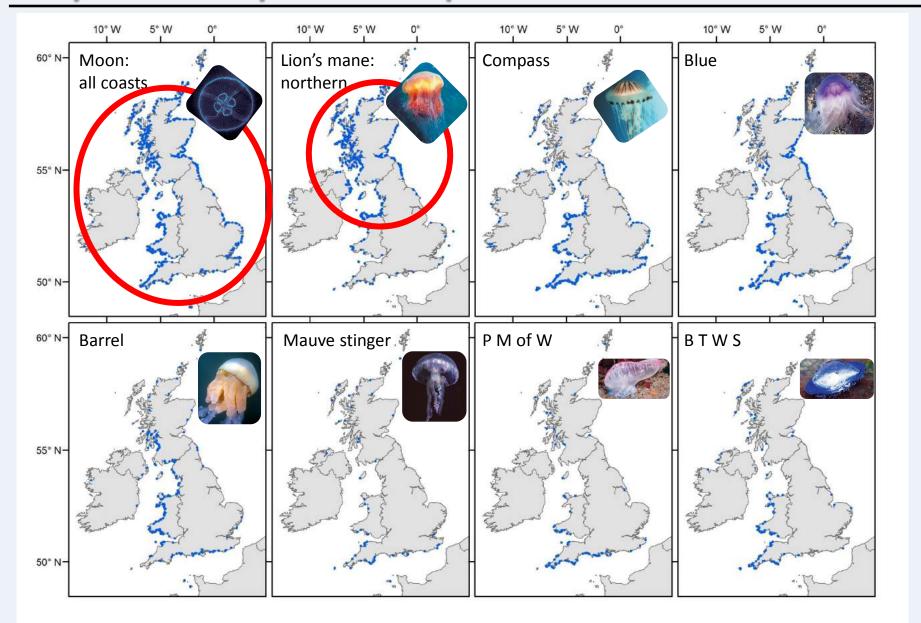
Spatial: species specific

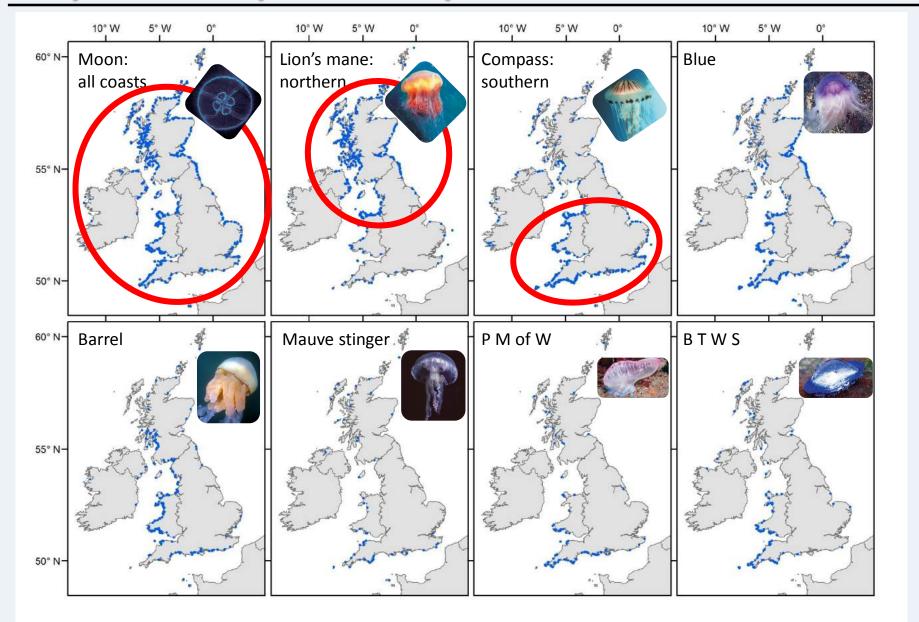


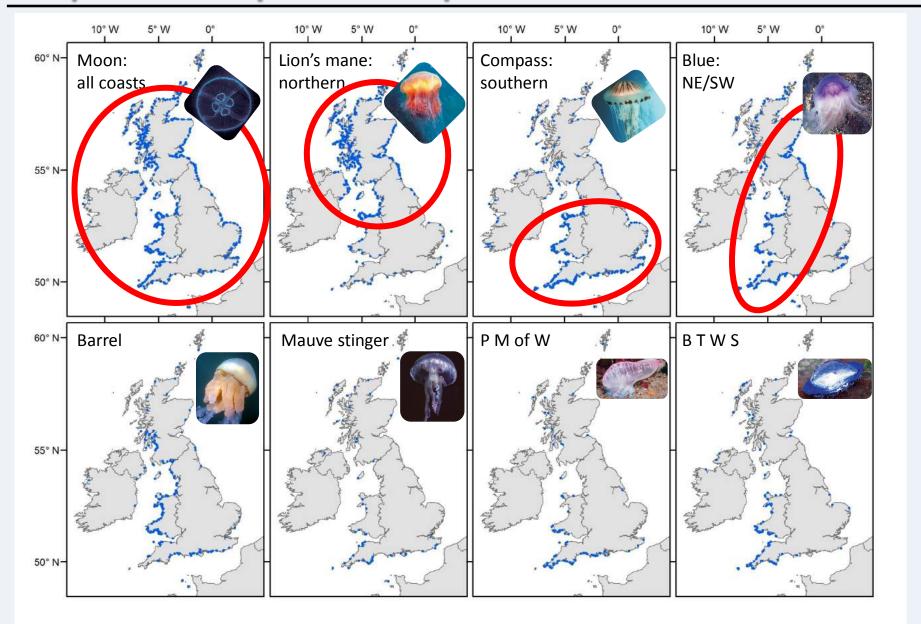
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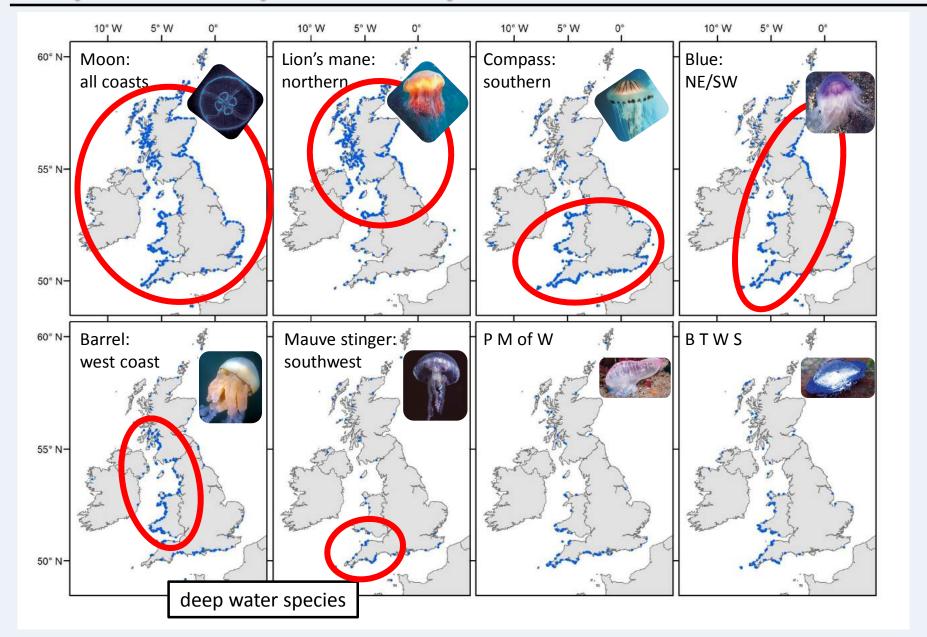


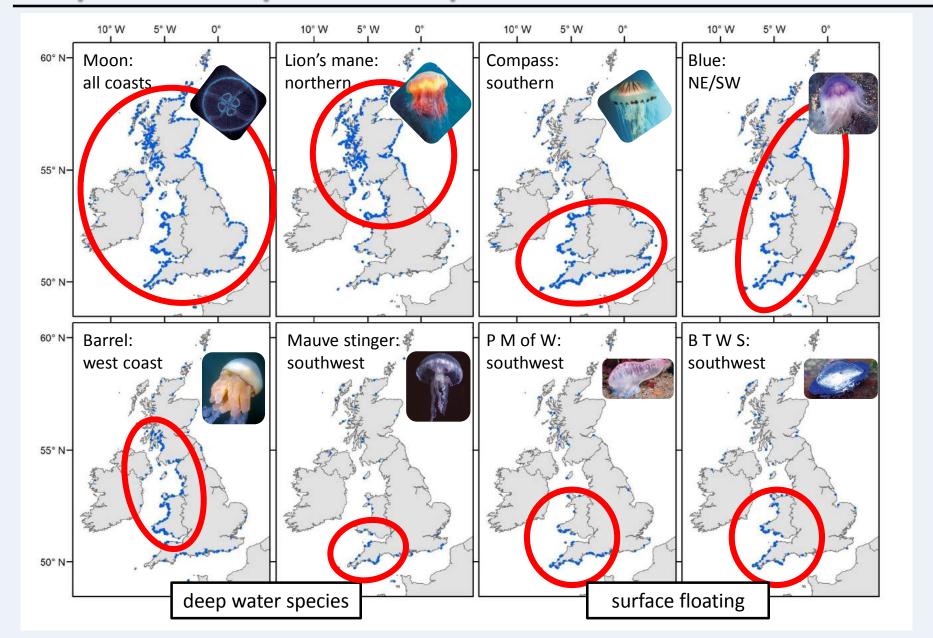
Spatial: species specific











2003 – 2011 analysis

Stephen K. Pikesley, Brendan J. Godley, Sue Ranger, Peter B. Richardson and Matthew J. Witt (2014). Cnidaria in UK coastal waters: description of spatio-temporal patterns and inter-annual variability. *Journal of the Marine Biological Association of the United Kingdom*, 94, pp 1401-1408. http://dx.doi.org/10.1017/S0025315414000137

Journal of the Marine Biological Association of the United Kingdom, page 1 of 8. (*) Marine Biological Association of the United Kingdom, 2014 doi:10.1017/500151144000157

Cnidaria in UK coastal waters: description of spatio-temporal patterns and inter-annual variability

Stephen K. Pikesley 1,2 , brendan J. Godley 1 , sue ranger 1,3 , peter B. Richardson 3 and matthew J. Witt 2

¹Centre for Ecology and Conservation, University of Exeter, Cornwall, TR10 gEZ, UK, ²Environment and Sustainability Institute, University of Exeter, Cornwall, TR10 gEZ, UK, ³Marine Conservation Society, Ross on Wye, HR9 7QQ, UK

Concern has been expressed over future biogeographical expansion and habitat capitalization by species of the phylum Cnidaria, as this may have negative implications on human activities and ecosystems. There is, however, a paucity of knowledge and understanding of jellyfish ecology, in particular species distribution and seasonality. Recent studies in the UK have principally focused on the Cellic, Irish and North Seas, but all in isolation. In this study we analyse data from a publicly-driven sightings scheme across UK coastal waters (2003 – 2011; 9 years), with the aim of increasing knowledge on spatial and temporal patterns and trends. We describe inter-annual variability, seasonality and patterns of spatial distribution, and compare these with existing historic literature. Although incidentally-collectal data lack quantification of effort, we suggest that with appropriate data management and interpretation, publicly-driven, citizen-science-based, recording schemes can provide for large-scale (spatial and temporal) coverage that would otherwise be logistically and financially unattainable. These schemes may also contribute to baseline data from which future changes in patterns or trends might be identified. We further suggest that findings from such schemes may be strengthened by the inclusion of some element of effort-corrected data collection.

Keywords: citizen science, jellyfish, life cycle, public sightings, Scyphozoa, Hydrozoa

Submitted 18 September 2013; accepted 20 January 2014







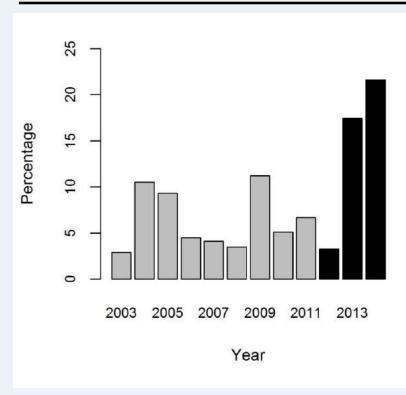


2014







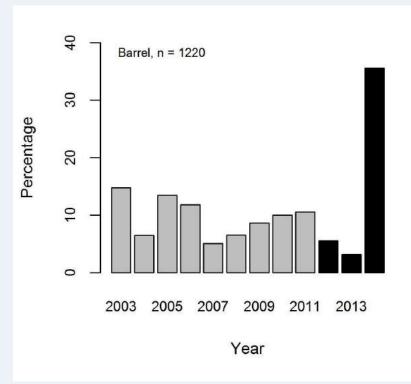


Sightings by year expressed as a percentage of all sightings









Barrel jellyfish sightings by year expressed as a percentage of all sightings by year

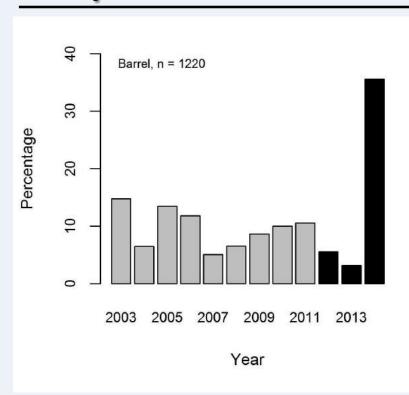
2014big year for barrel jellyfish sightings

- Barrel jellyfish accounted for 36% of all jellyfish sightings recorded in 2014
- 55% of all barrel jellyfish sightings for 2003 to 2014 occurred in 2014



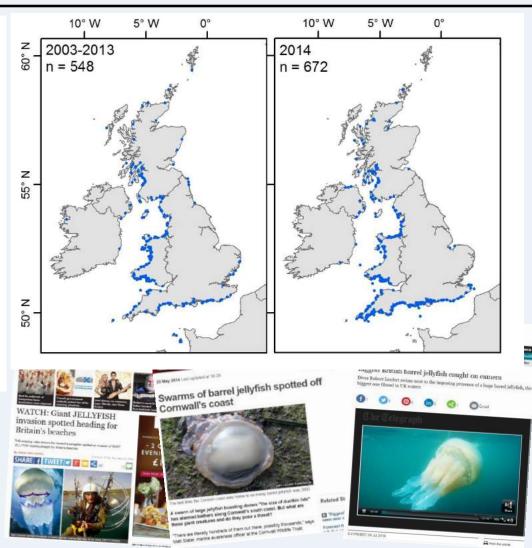






Barrel jellyfish sightings by year expressed as a percentage of all sightings by year

2014big year for barrel jellyfish sightings







Summary

- Limited number of 'jellyfish' studies in UK waters
 - particularly nationwide studies
- We have seen how a 'Citizen Science' compiled database can giving insight into regional & national patterns & trends:
 - annual & seasonal patterns
 - species specific spatial distributions
 - ... for 8 species of 'jellyfish' in UK coastal waters
 - can provide large-scale (spatial and temporal) coverage ...
 - ... that would otherwise be financially & logistically unfeasible







Acknowledgements

- Thanks to:
 - ➤ University of Exeter
 - Dr Matthew Witt
 - Prof. Brendan Godley
 - Marine Conservation Society
 - Dr Peter Richardson
 - ➤ All participants in the MCS jellyfish survey who generously contribute their data











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Han C.-H. and Uye S. (2010) Combined effects of food supply and temperature on asexual reproduction and somatic growth of polyps of the common jellyfish *Aurelia aurita* s.l. *Plankton and Benthos Research* 5, 98–105.