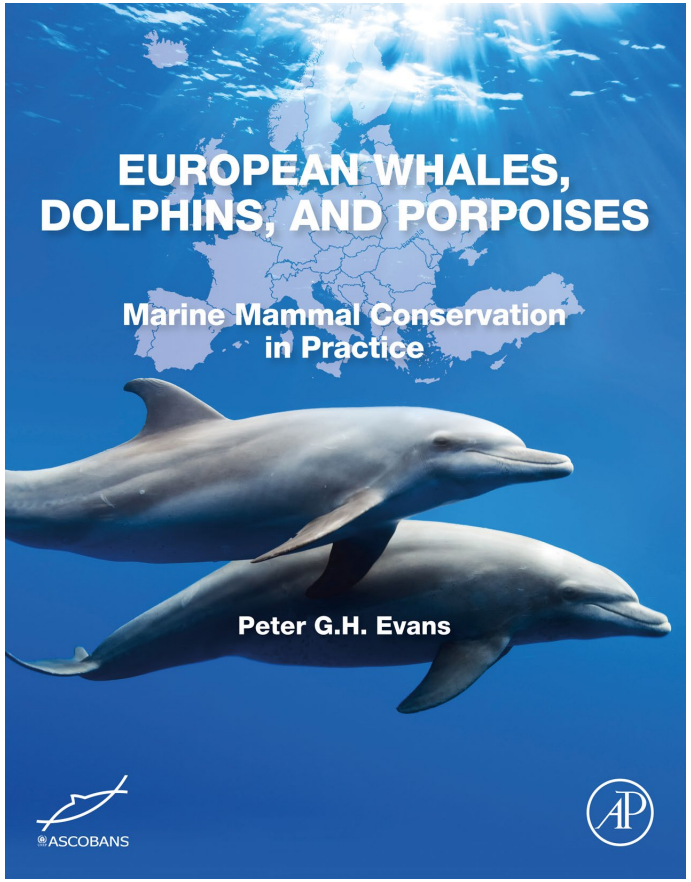
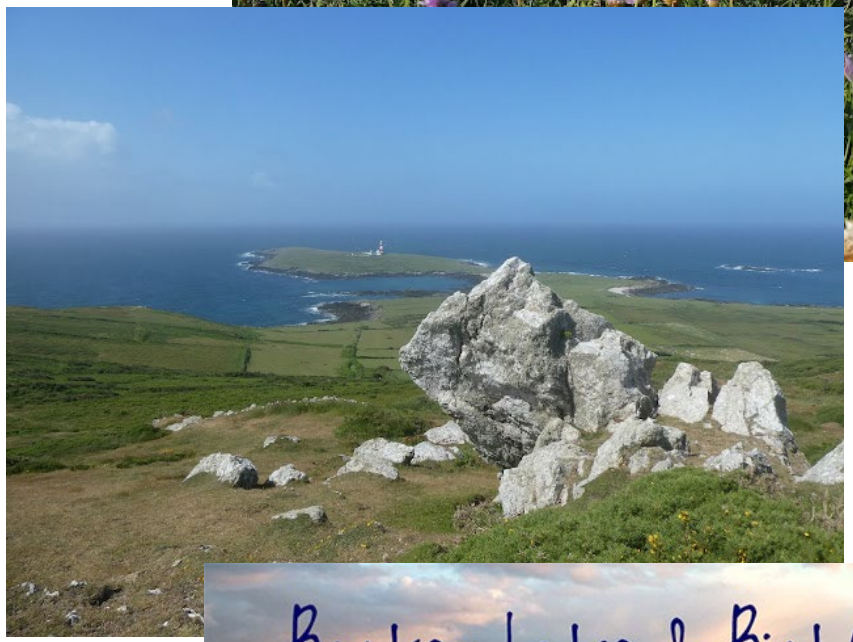
THE RISSO'S DOLPHIN – a better-known, lesser-known species in Europe.

Mark P Simmonds and Peter Evans

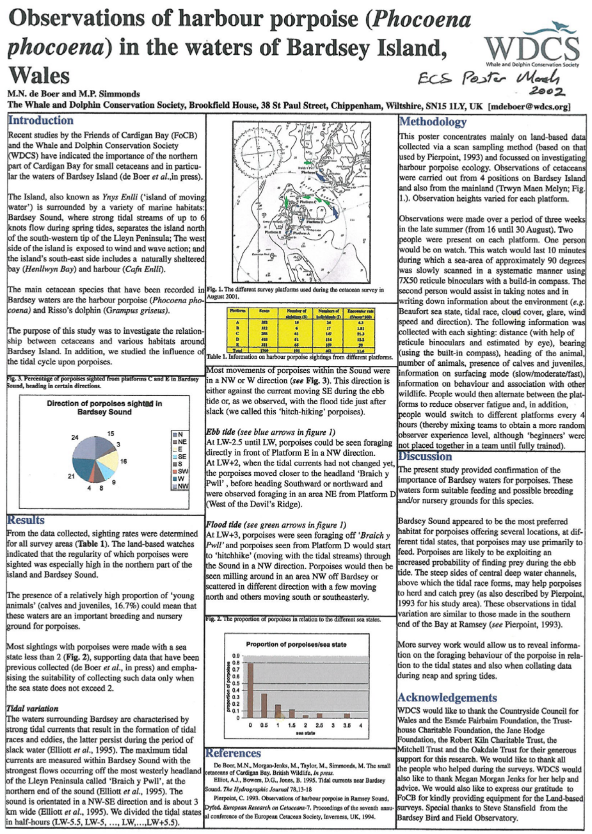


"The Risso's dolphin is a relatively difficult species to study: difficult to approach and, in our experience, are relatively shy and as deep divers often disappear under- water for long periods of time," De Boer et al. 2014



Bardsey Bird Observatory
BBFO.org.uk

1976-2005 opportunistic sightings



Observations of harbour porpoise (*Phocoena phocoena*) in the waters of Bardsey Island, Wales

ECS Poster March 2002

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Introduction

Recent studies by the Friends of Cardigan Bay (FoCB) and the Whale and Dolphin Conservation Society (WDCS) have indicated the importance of the northern part of Cardigan Bay for small cetaceans and in particular the waters of Bardsey Island (de Boer *et al.*,in press).

The Island, also known as *Ynys Enlli* ('island of moving water') is surrounded by a variety of marine habitats: Bardsey Sound, where strong tidal streams of up to 6 knots flow during spring tides, separates the island north of the south-western tip of the Lleyn Peninsula; The west side of the island is exposed to wind and wave action; and the island's south-east side includes a naturally sheltered bay (*Henllwyn Bay*) and harbour (*Cafn Enlli*).

The main cetacean species that have been recorded in Bardsey waters are the harbour porpoise (*Phocoena phocoena)* and Risso's dolphin (*Grampus griseus)*.

The purpose of this study was to investigate the relationship between cetaceans and various habitats around Bardsey Island. In addition, we studied the influence of the tidal cycle upon porpoises.

Fig. 3. Percentage of porpoises sighted from platforms C and E in Bardsey Sound, heading in certain directions.

Direction of porpoises sighted in Bardsey Sound

N, NE, E, SE, S, SW, W, NW

15, 3, 16, 9, 8, 4, 21, 24

Results

From the data collected, sighting rates were determined for all survey areas (**Table 1**). The land-based watches indicated that the regularity of which porpoises were sighted was especially high in the northern part of the island and Bardsey Sound.

The presence of a relatively high proportion of 'young animals' (calves and juveniles, 16.7%) could mean that these waters are an important breeding and nursery ground for porpoises.

Most sightings with porpoises were made with a sea state less than 2 (**Fig. 2**), supporting data that have been previous collected (de Boer *et al.*, in press) and emphasising the suitability of collecting such data only when the sea state does not exceed 2.

Tidal variation

The waters surrounding Bardsey are characterised by strong tidal currents that result in the formation of tidal races and eddies, the latter persist during the period of slack water (Elliott *et al.*, 1995). The maximum tidal currents are measured within Bardsey Sound with the strongest flows occurring off the most westerly headland of the Lleyn Peninsula called 'Braich y Pwll', at the northern end of the sound (Elliott *et al.*, 1995). The sound is orientated in a NW-SE direction and is about 3 km wide (Elliott *et al.*, 1995). We divided the tidal states in half-hours (LW-5.5, LW-5, …, LW,…,LW+5.5).

Fig. 1. The different survey platforms used during the cetacean survey in August 2001.

Platform	Scans	Number of sightings (S)	Numbers of individuals (I)	Encounter rate (S/scan*100)
A	352	15	34	4.3
B	332	6	17	1.81
C	286	61	147	21.3
D	418	51	114	12.2
E	321	65	109	20
Total	1709	198	461	11.6

Table 1. Information on harbour porpoise sightings from different platforms.

Most movements of porpoises within the Sound were in a NW or W direction (*see* **Fig. 3**). This direction is either against the current moving SE during the ebb tide or, as we observed, with the flood tide just after slack (we called this 'hitch-hiking' porpoises).

***Ebb tide** (see blue arrows in figure 1)*

At LW-2.5 until LW, porpoises could be seen foraging directly in front of Platform E in a NW direction.

At LW+2, when the tidal currents had not changed yet, the porpoises moved closer to the headland 'Braich y Pwll' , before heading Southward or northward and were observed foraging in an area NE from Platform D (West of the Devil's Ridge).

***Flood tide** (see green arrows in figure 1)*

At LW+3, porpoises were seen foraging off '*Braich y Pwll'* and porpoises seen from Platform D would start to 'hitchhike' (moving with the tidal streams) through the Sound in a NW direction. Porpoises would then be seen milling around in an area NW off Bardsey or scattered in different direction with a few moving north and others moving south or southeasterly.

Fig. 2. The proportion of porpoises in relation to the different sea states.

Proportion of porpoises/sea state

proportion of porpoises

sea state

Methodology

This poster concentrates mainly on land-based data collected via a scan sampling method (based on that used by Pierpoint, 1993) and focussed on investigating harbour porpoise ecology. Observations of cetaceans were carried out from 4 positions on Bardsey Island and also from the mainland (Trwyn Maen Melyn; Fig. 1.). Observation heights varied for each platform.

Observations were made over a period of three weeks in the late summer (from 16 until 30 August). Two people were present on each platform. One person would be on watch. This watch would last 10 minutes during which a sea-area of approximately 90 degrees was slowly scanned in a systematic manner using 7X50 reticule binoculars with a build-in compass. The second person would assist in taking notes and in writing down information about the environment (*e.g.* Beaufort sea state, tidal race, cloud cover, glare, wind speed and direction). The following information was collected with each sighting: distance (with help of reticule binoculars and estimated by eye), bearing (using the built-in compass), heading of the animal, number of animals, presence of calves and juveniles, information on surfacing mode (slow/moderate/fast), information on behaviour and association with other wildlife. People would then alternate between the platforms to reduce observer fatigue and, in addition, people would switch to different platforms every 4 hours (thereby mixing teams to obtain a more random observer experience level, although 'beginners' were not placed together in a team until fully trained).

Discussion

The present study provided confirmation of the importance of Bardsey waters for porpoises. These waters form suitable feeding and possible breeding and/or nursery grounds for this species.

Bardsey Sound appeared to be the most preferred habitat for porpoises offering several locations, at different tidal states, that porpoises may use primarily to feed. Porpoises are likely to be exploiting an increased probability of finding prey during the ebb tide. The steep sides of central deep water channels, above which the tidal race forms, may help porpoises to herd and catch prey (as also described by Pierpoint, 1993 for his study area). These observations in tidal variation are similar to those made in the southern end of the Bay at Ramsey (*see* Pierpoint, 1993).

More survey work would allow us to reveal information on the foraging behaviour of the porpoise in relation to the tidal states and also when collating data during neap and spring tides.

Acknowledgements

WDCS would like to thank the Countryside Council for Wales and the Esmée Fairbairn Foundation, the Trusthouse Charitable Foundation, the Jane Hodge Foundation, the Robert Kiln Charitable Trust, the Mitchell Trust and the Oakdale Trust for their generous support for this research. We would like to thank all the people who helped during the surveys. WDCS would also like to thank Megan Morgan Jenks for her help and advice. We would also like to express our gratitude to FoCB for kindly providing equipment for the Land-based surveys. Special thanks to Steve Stansfield from the Bardsey Bird and Field Observatory.

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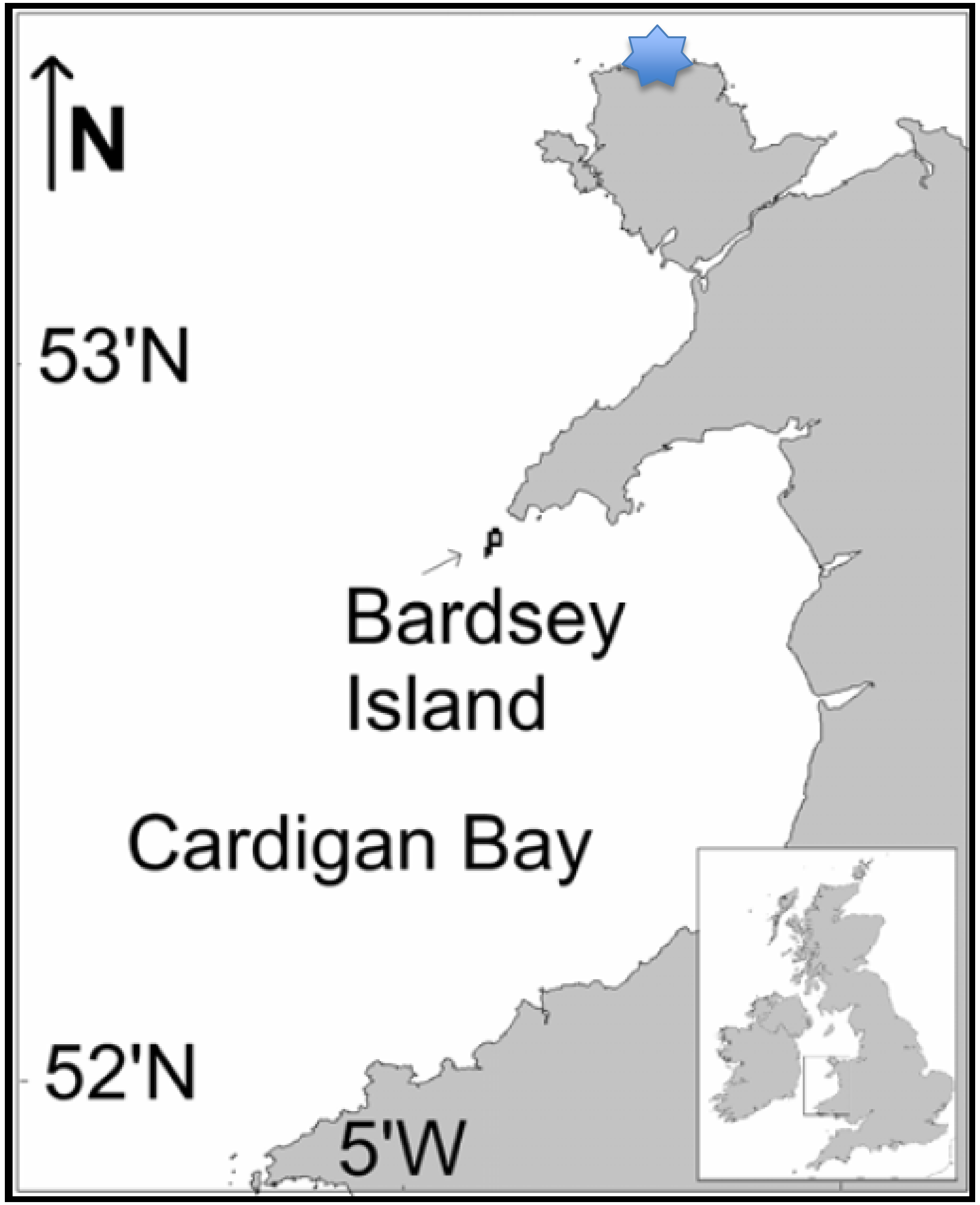
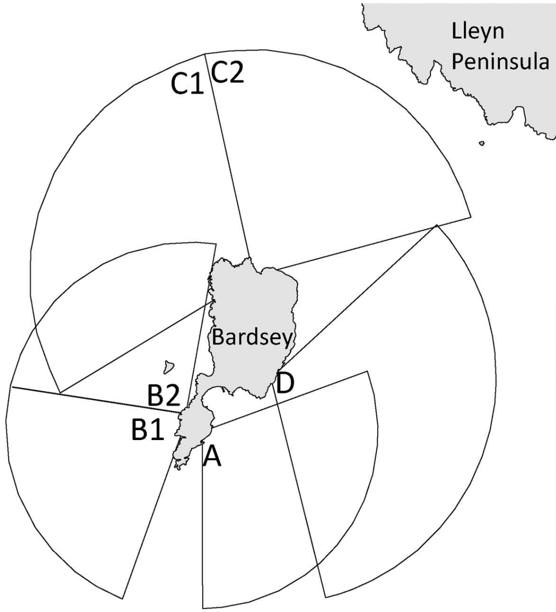
Pierpoint, C. 1993. Observations of harbour porpoise in Ramsey Sound, Dyfed. *European Research on Cetaceans*-7. Proceedings of the seventh annual conference of the European Cetacean Society, Inverness, UK, 1994.

2002





2013
Data 1997-2007

Open Journal of Marine Science, 2013, 3, 66-75
http://dx.doi.org/10.4236/ojms.2013.32A007 Published Online June 2013 (http://www.scirp.org/journal/ojms)

Scientific Research

Photo-Identification Methods Reveal Seasonal and Long-Term Site-Fidelity of Risso's Dolphins (*Grampus griseus*) in Shallow Waters (Cardigan Bay, Wales)

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ABSTRACT

A photo-identification study on Risso's dolphins was carried out off Bardsey Island in Wales (July to September, 1997-2007). Their local abundance was estimated using two different analytical techniques: 1) mark-recapture of

Marijke de Boer

OPEN ACCESS Freely available online

PLOS ONE

The Influence of Topographic and Dynamic Cyclic Variables on the Distribution of Small Cetaceans in a Shallow Coastal System

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Abstract

The influence of topographic and temporal variables on cetacean distribution at a fine-scale is still poorly understood. To study the spatial and temporal distribution of harbour porpoise *Phocoena phocoena* and the poorly known Risso's dolphin *Grampus griseus* we carried out land-based observations from Bardsey Island (Wales, UK) in summer (2001–2007). Using Kernel analysis and Generalized Additive Models it was shown that porpoises and Risso's appeared to be linked to topographic and dynamic cyclic variables with both species using different core areas (dolphins to the West and porpoises to the East off Bardsey). Depth, slope and aspect and a low variation in current speed (for Risso's) were important in explaining the patchy distributions for both species. The prime temporal conditions in these shallow coastal systems were related to the tidal cycle (Low Water Slack and the flood phase), lunar cycle (a few days following the neap tidal phase), diel cycle (afternoons) and seasonal cycle (peaking in August) but differed between species on a temporary but predictable basis. The measure of tidal stratification was shown to be important. Coastal waters generally show a stronger stratification particularly during neap tides upon which the phytoplankton biomass at the surface rises reaching its maximum about 2–3 days after neap tide. It appeared that porpoises occurred in those areas where stratification is maximised and Risso's preferred more mixed waters. This fine-scale study provided a temporal insight into spatial distribution of two species that single studies conducted over broader scales (tens or hundreds of kilometers) do not achieve. Understanding which topographic and cyclic variables drive the patchy distribution of porpoises and Risso's in a Headland/Island system may form the initial basis for identifying potentially critical habitats for these species.

Citation: de Boer MN, Simmonds MP, Reijnders PJH, Aarts G (2014) The Influence of Topographic and Dynamic Cyclic Variables on the Distribution of Small Cetaceans in a Shallow Coastal System. PLoS ONE 9(1): e86331. doi:10.1371/journal.pone.0086331

Editor: Judi Hewitt, University of Waikato (National Institute of Water and Atmospheric Research), New Zealand

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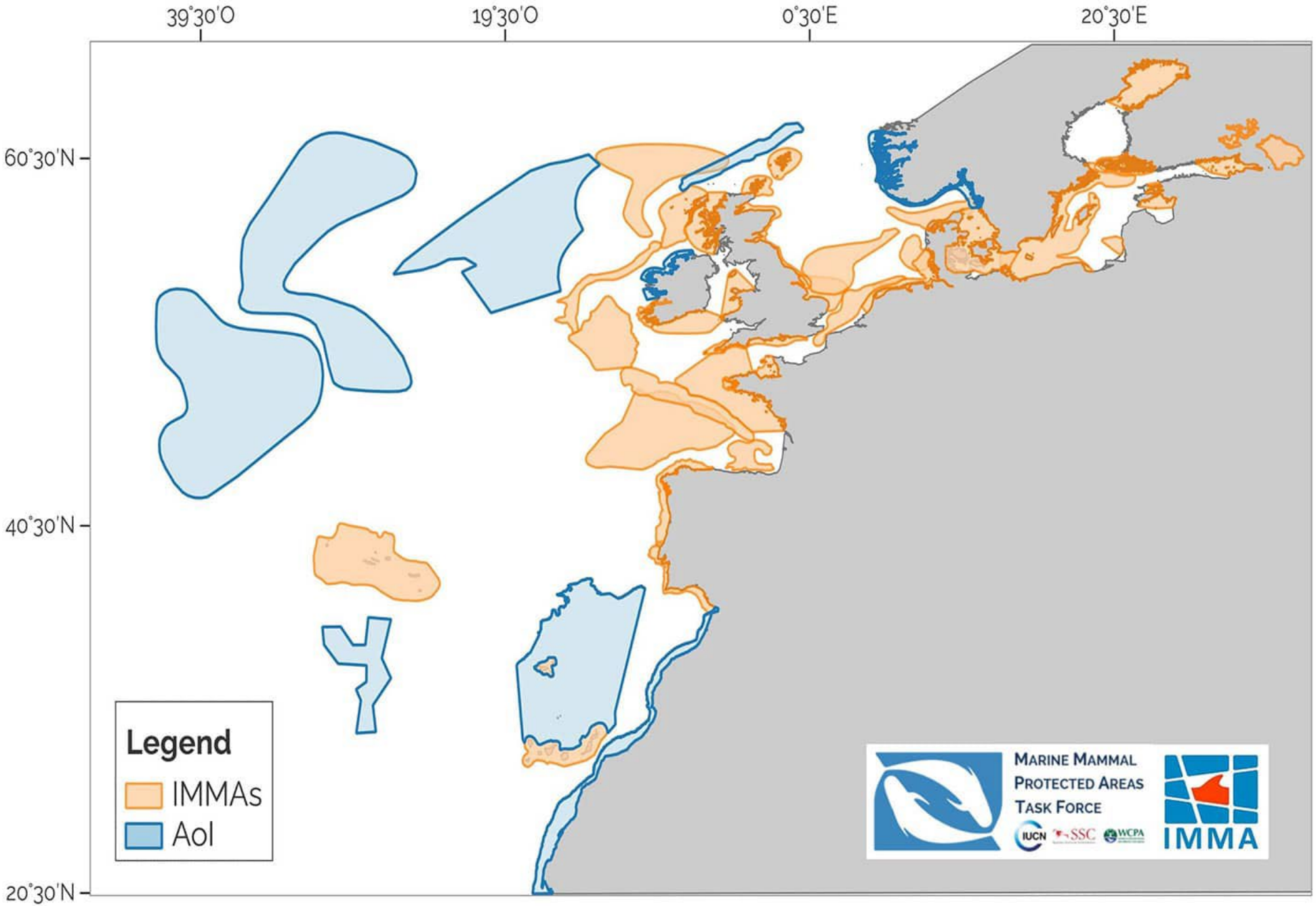
2014
Data 2001-2007


39°30'O
19°30'O
0°30'E
20°30'E
60°30'N
40°30'N
20°30'N
Legend
IMMAs
AoI
Marine Mammal Protected Areas Task Force
IUCN
SSC
WCPA
IMMA

2024

What do we know?
Basics -

- Large, stout, blunt-faced dolphin with tall dorsal fin and pilot whale-like pectorals
- Dark grey young, paler and heavily scarred when older
- 'No where common' but widely distributed
- Favours continental shelf waters (200-1200m); 50-100m in Britain
- Prey- cephalopods – octopus, cuttlefish, small squid
- Genetic studies show variation between UK and Mediterranean
- Gestation c. 13-14 (av. 13.9) months
- Lactation period unknown
- Calving interval 2-3 (av. 2.4) years
- Calving – mainly March-July
- Age at sexual maturity 8-10 years (females), 7-12 years (males)
- Life span 45-50 years

Behaviour –

- Highly –social: Group size (ASCOBANS area): 2-200, occasionally 50+
- Highly vocal – clicks+ buzzes, squeaks, squeals and moans – regional differences
- Travel speeds generally 6-8 km/h; spurts may reach speeds of 20-25 km/h
- Usually surface every 7 secs; most dives 2-4 mins max. possibly to 30 mins
- Highly surface active - breaches, lob-tailing, spy-hops, tail & flipper slaps

POPULATION ESTIMATES IN THE NORTH ATLANTIC

Western North Atlantic

- Eastern United States: 35,215
- Northern Gulf of Mexico: 1,974

Source: NOAA, 2021, 2022

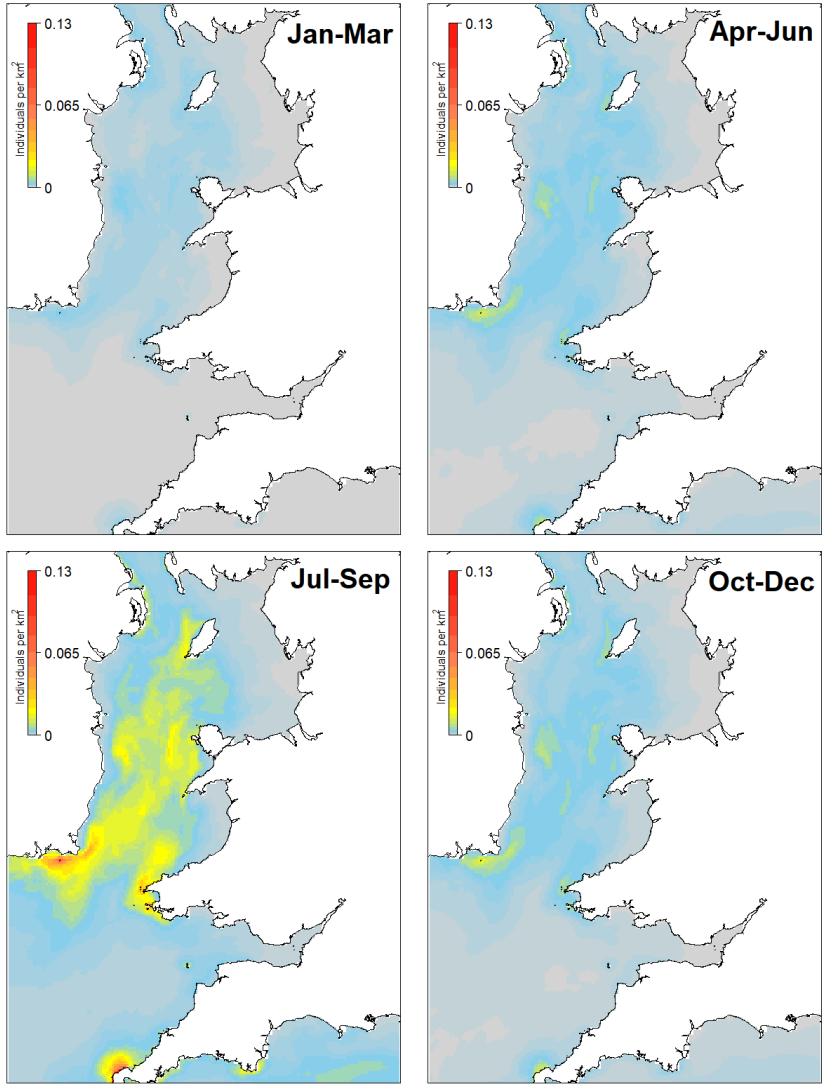
Eastern North Atlantic

- ASCOBANS Agreement Area: 13,584
  - Irish EEZ: 2,630

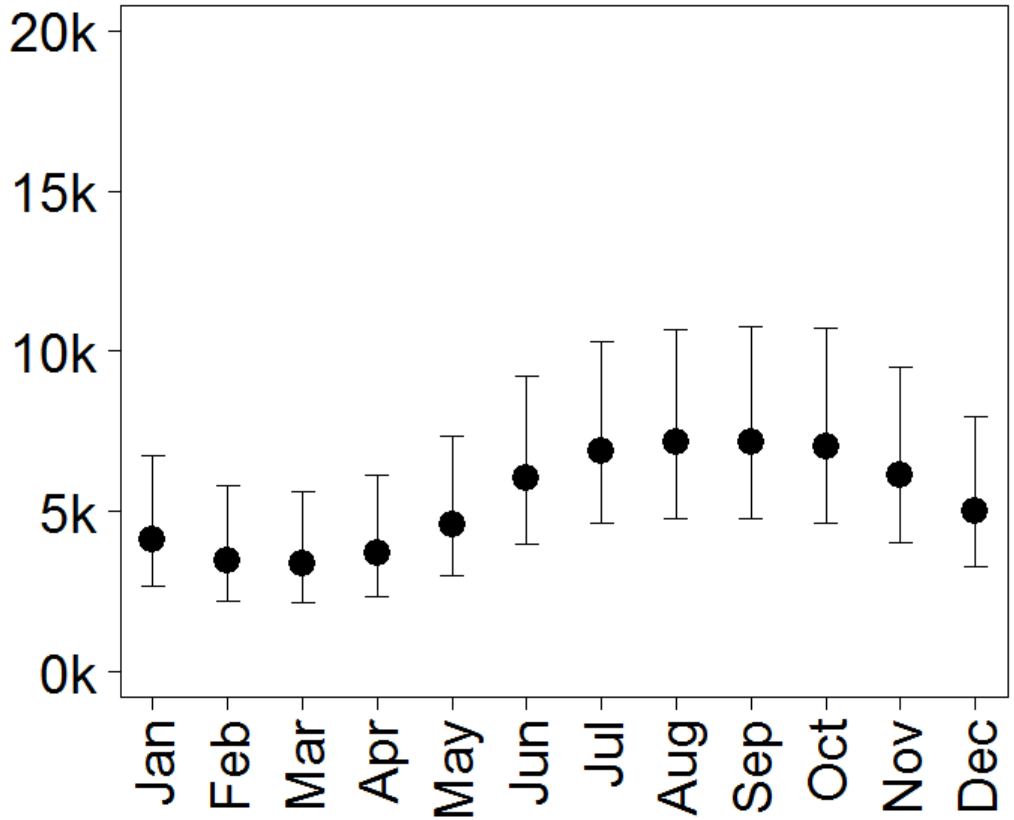
Source: Rogan *et al*., 2017; Hammond *et al*., 2021

SEASONAL OCCURRENCE IN RISSO'S DOLPHINS

a) Irish Sea

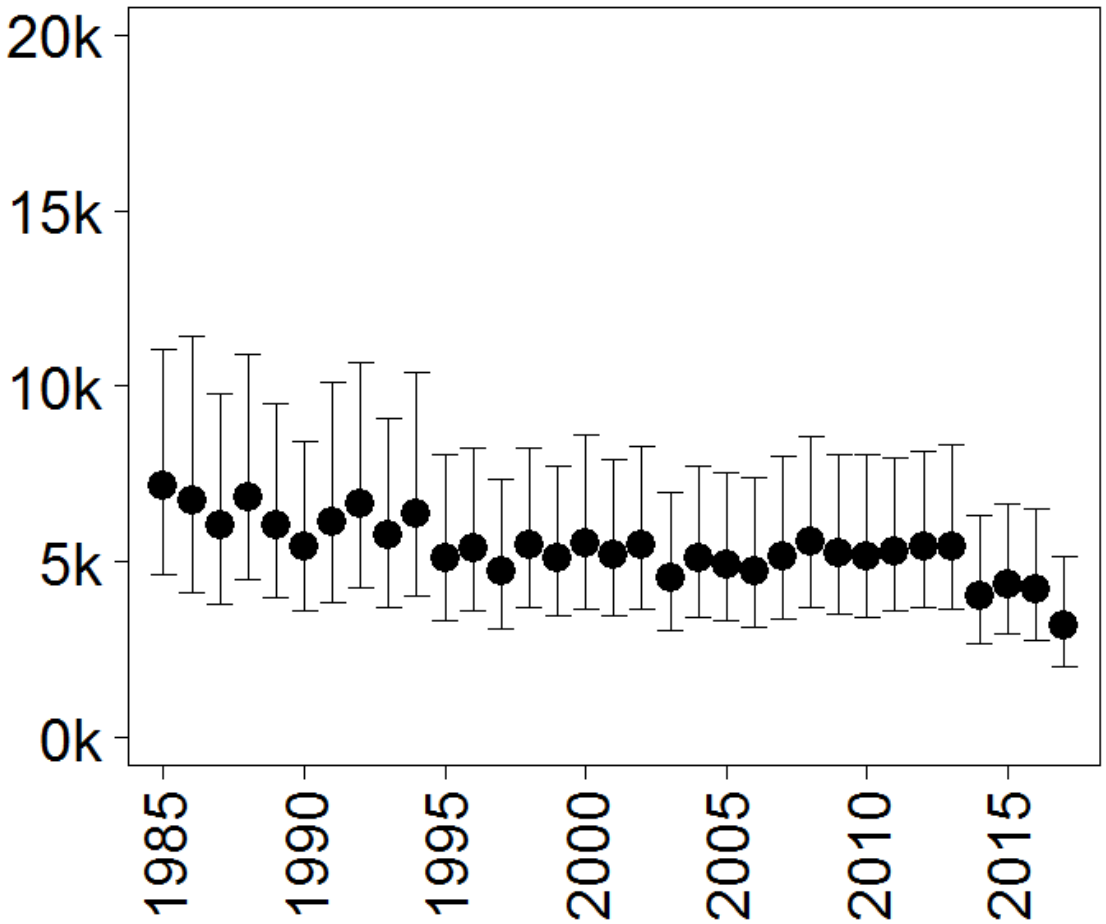


b) North-west Europe



Sources: Waggitt *et al.*, 2020; Evans & Waggitt, 2023

LONGER-TERM TRENDS IN RISSO'S DOLPHIN ABUNDANCE IN NW EUROPE



Source: Waggitt *et al.*, 2020

PHOTO-IDENTIFICATION

• Nicks in trailing edge of the dorsal fin – best feature

• Pale markings on fin & back – can be used when distinct

• But rake marks can change over time, coalescing to form larger areas, and whitening with age

HABITAT PREFERENCES OF RISSO'S DOLPHINS IN THE SHELF SEAS OF WESTERN UK

- Areas with depths of 20-40 m and slightly shelving slopes favoured (Outer Hebrides, Bardsey Island & north Anglesey)
- Areas with tidal eddies favoured (e.g. off Bardsey Island & in north Anglesey)
- LW & ebb tides favoured at Bardsey, whereas HW & flood tides favoured in north Anglesey
- Higher occurrence in late afternoon off Bardsey Island whereas in north Anglesey, no particular diurnal pattern was observed

Sources: Gill *et al.,* 1997; Anderwald, 2002; de Boer *et al*., 2013, 2014; Stevens, 2014; Mandlik, 2020; Evans, 2021

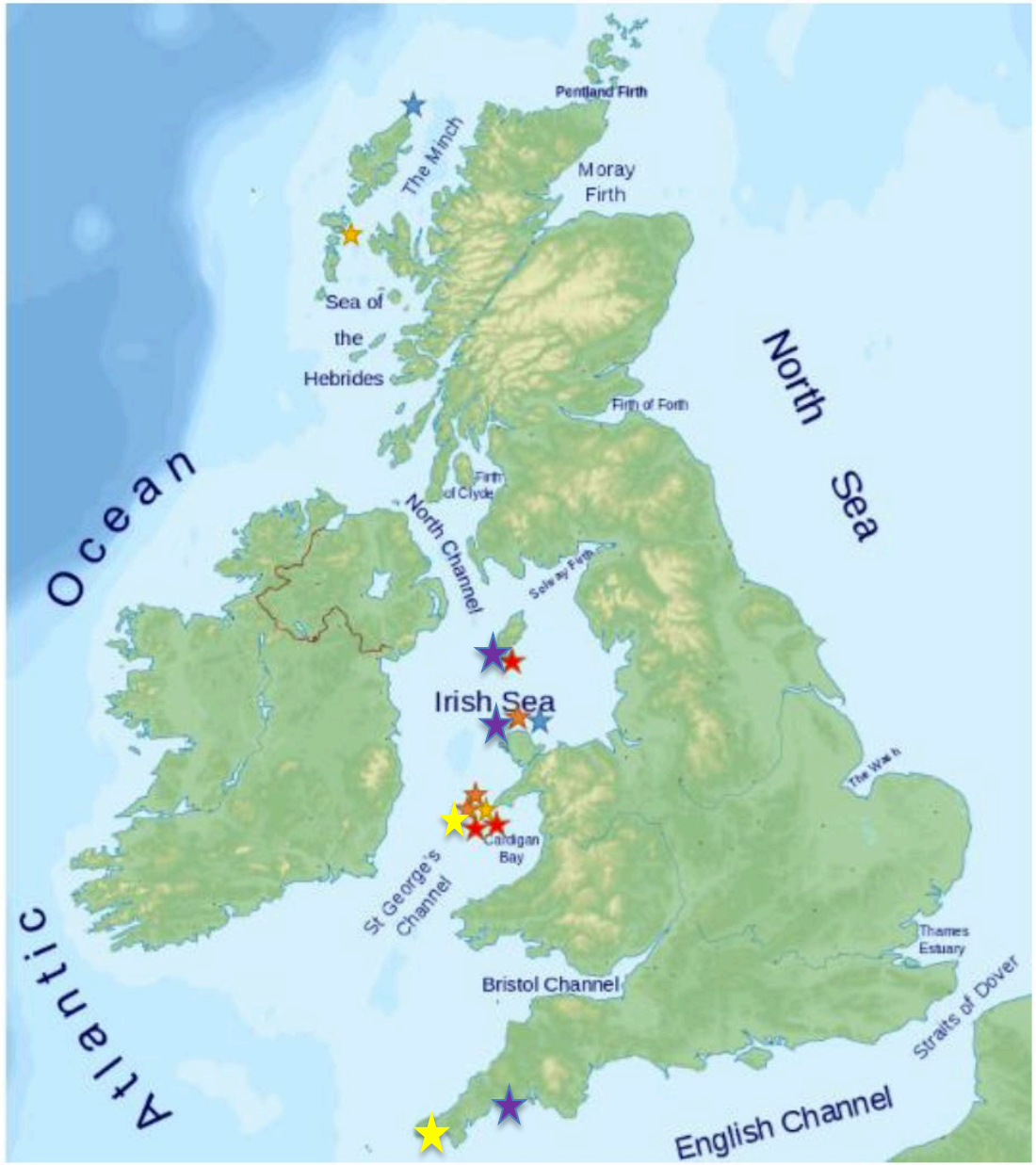
PHOTO-ID MATCHES IN WESTERN UK

a)

b)

Risso's dolphin probable female (no. *21AN20*) photographed off north Anglesey in Oct 2015 (top), and re-sighted in April 2021 in Cornwall (bottom). It was also sighted in the Isle of Man in 2005.

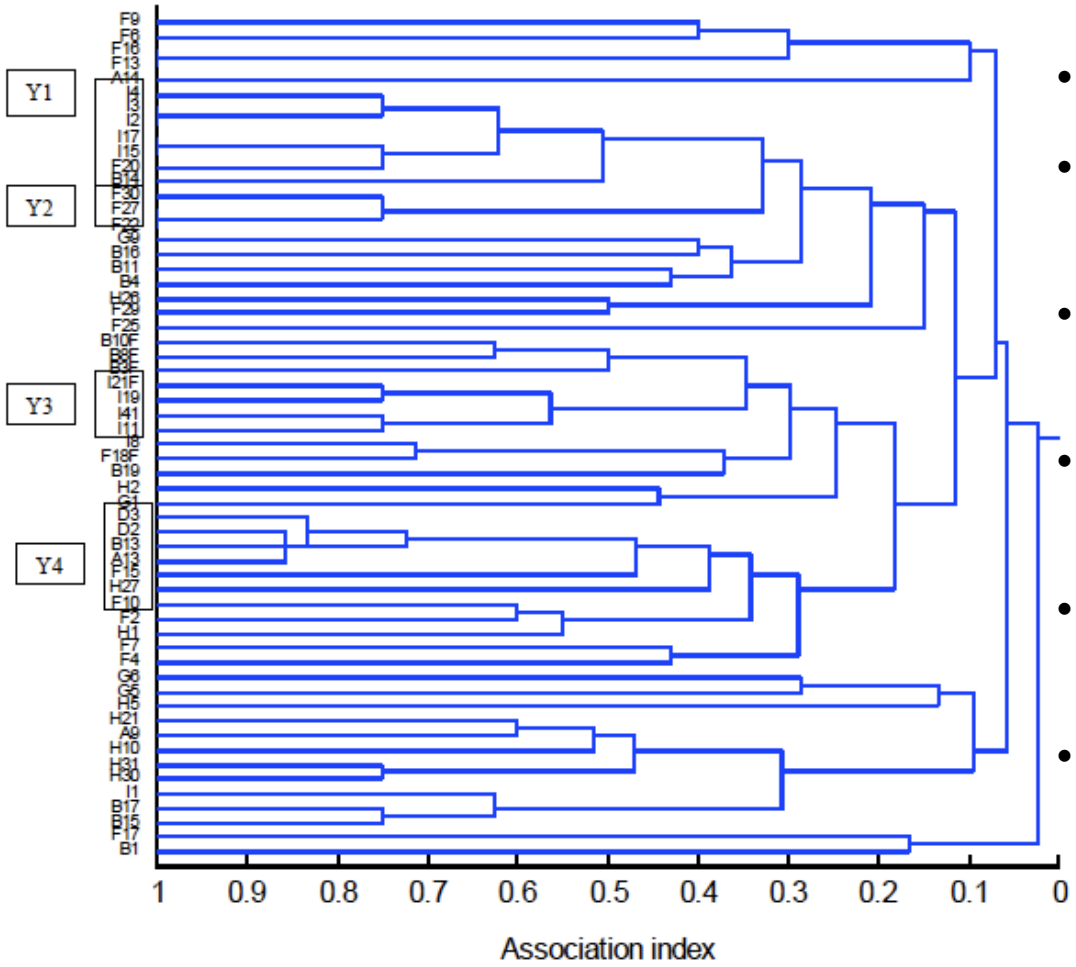
Sources: de Boer *et al*., 2013; Stevens, 2014; Mandlik, 2020;



SOCIAL STRUCTURE

a) Ligurian Sea

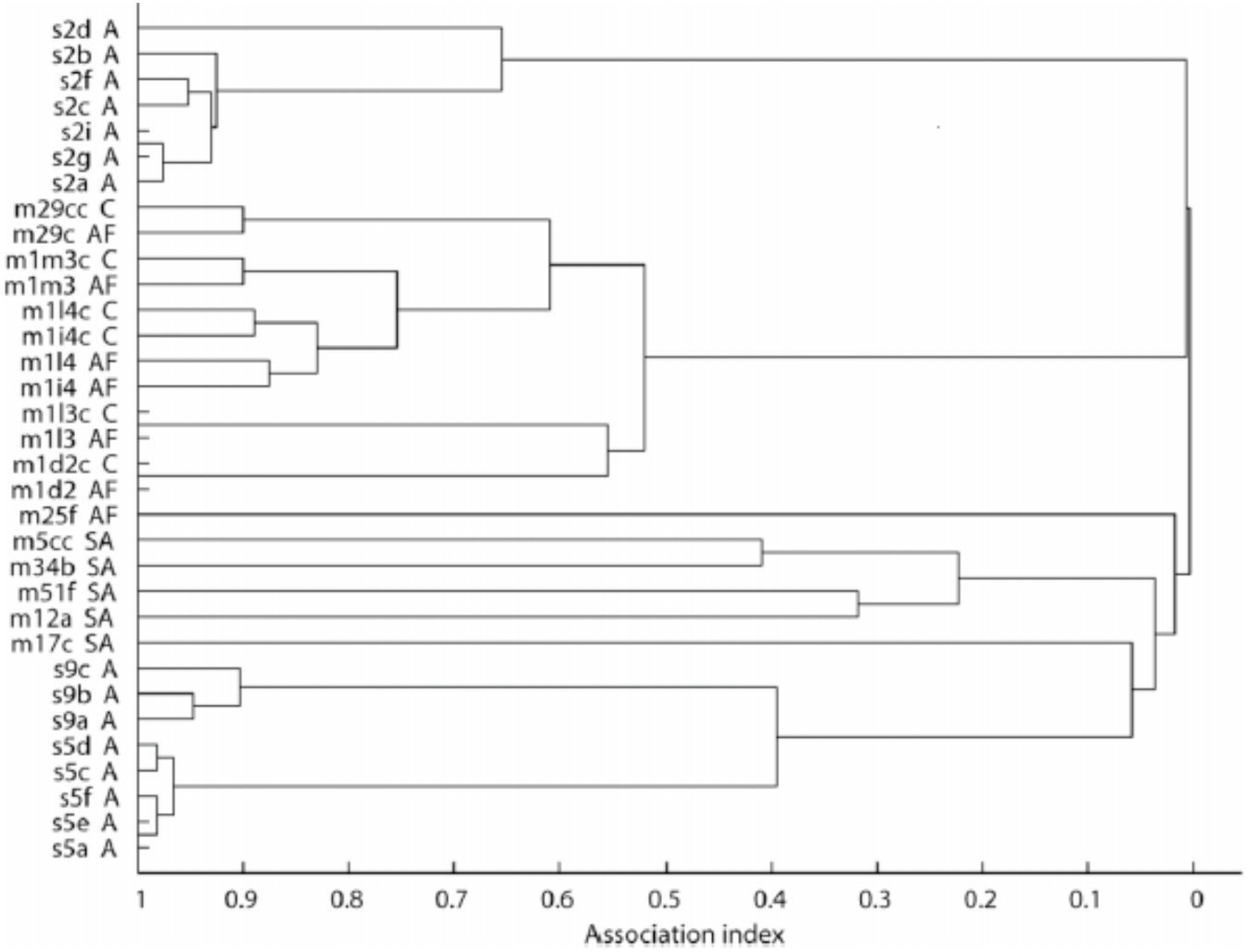
Dendrogram of associations between individual Risso's dolphins: average linkage cluster analysis of association matrix of 58 photo-identified individuals



- Cluster analysis indicates four groups
- Cluster Y1 comprised 6 individuals, 4 of which were always sighted together
- Cluster Y2 comprised 3 individuals, with high individual fidelity
- Cluster Y3 comprised 4 individuals, with moderate individual fidelity
- Cluster Y4 comprised 4 individuals, with moderate individual fidelity
- Strong preference for specific indivs. to associate with each other

Source: Gaspari, 2004

SOCIAL STRUCTURE

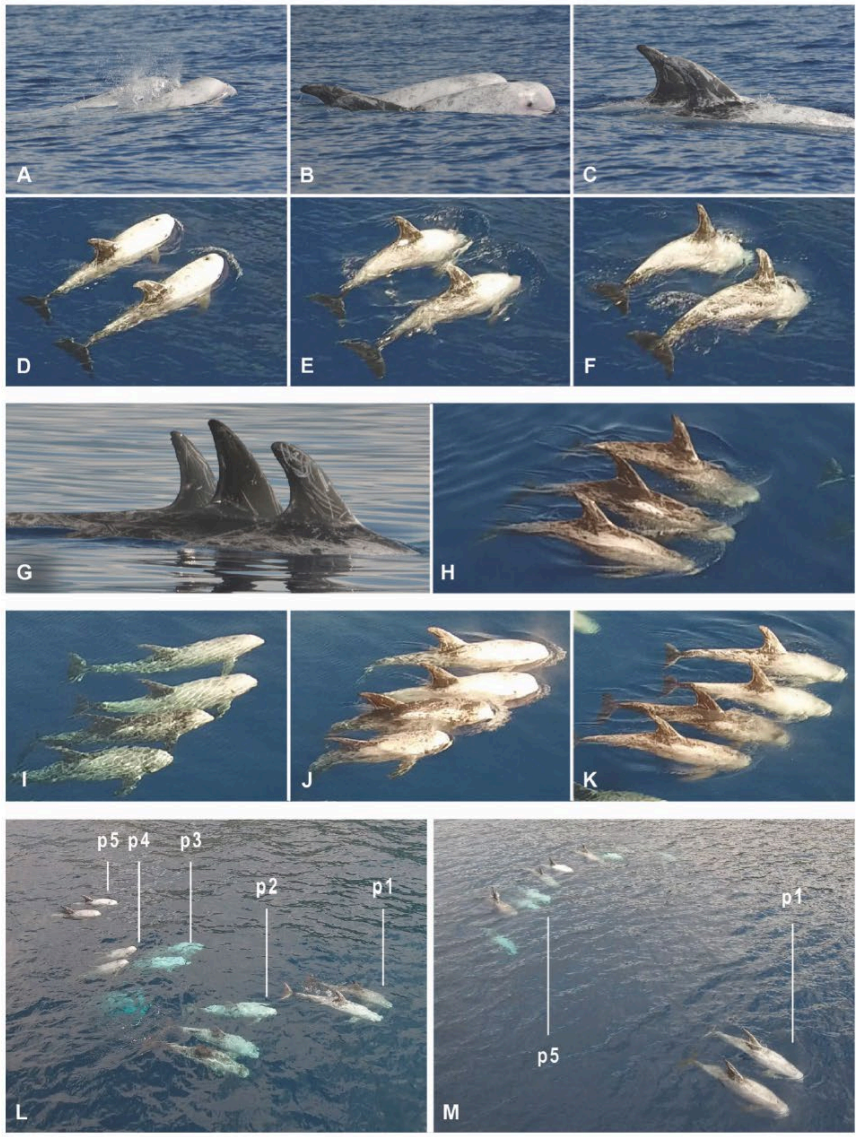


b) Azores

- Individuals form stable long-term bonds in pairs or clusters of 3-12 individuals
- Strong associations between adult males and between adult females

Source: Hartman *et al.*, 2008

Continuous focal group follows using aerial drones

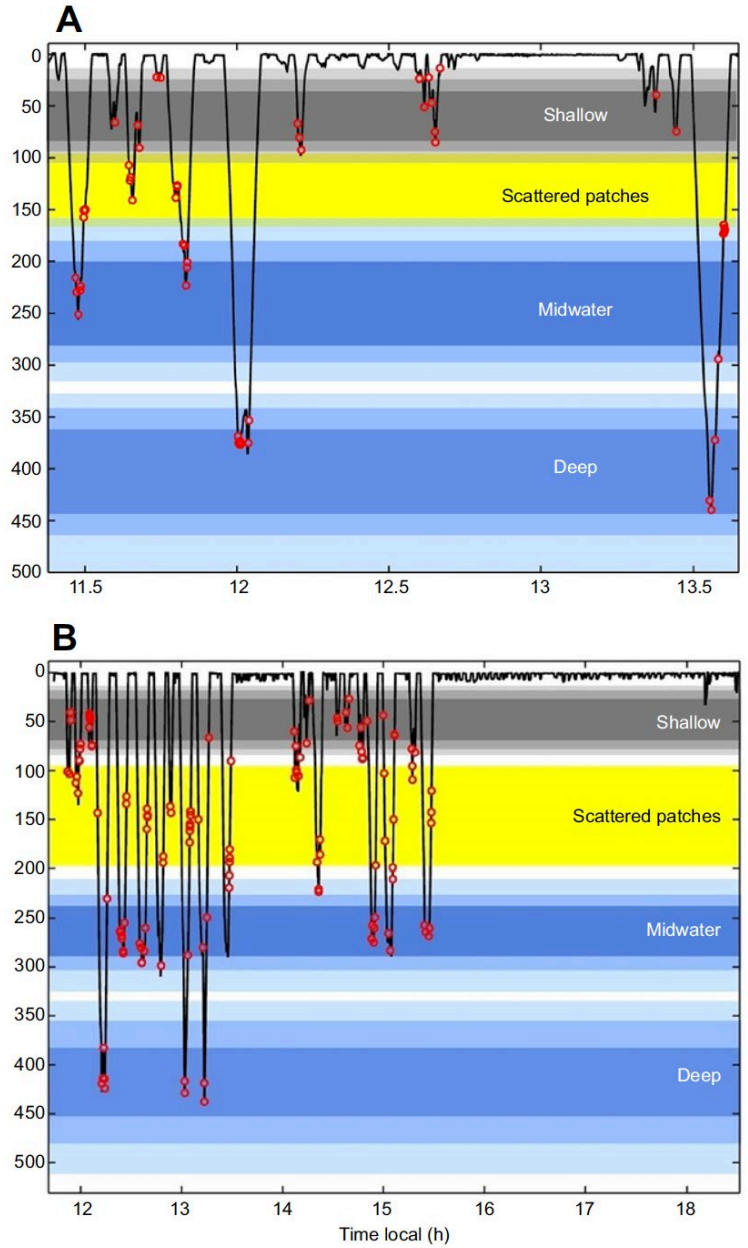


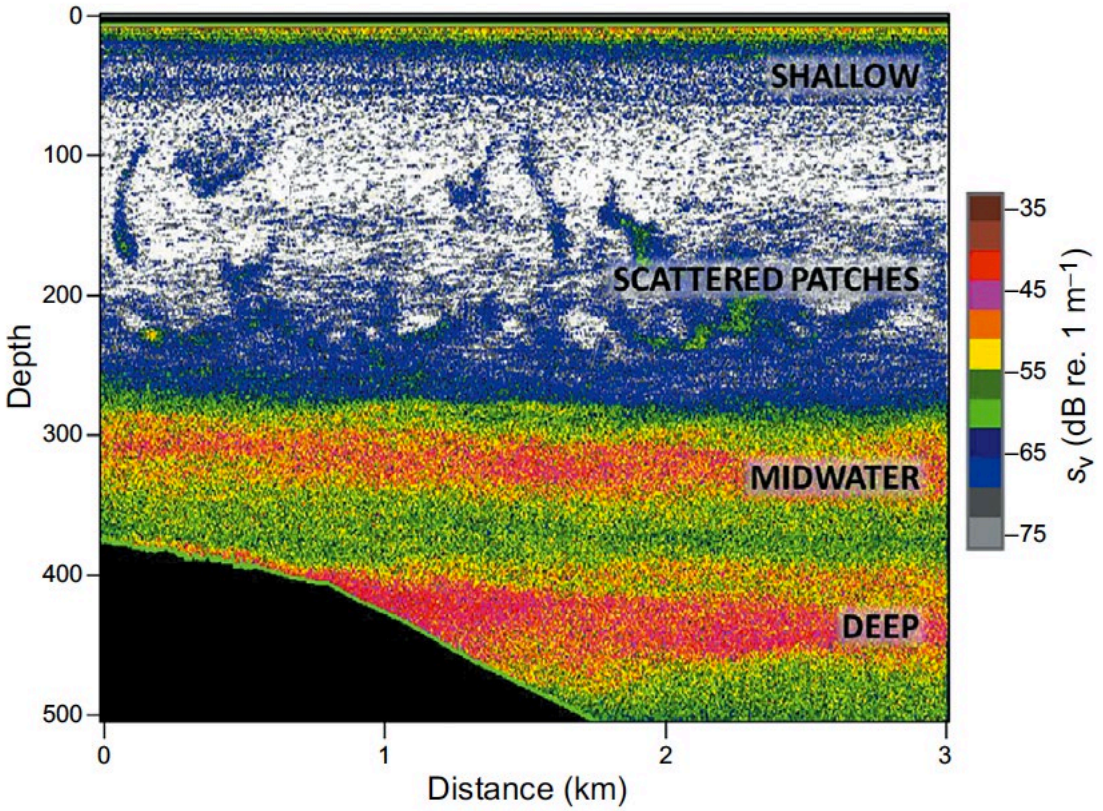
- Data based upon focal follows of 13 male Risso's dolphins in the Azores
- 21 separate UAV flights during 7 surveys in July-August 2017, recording 2,886 breathing events and 571 synchronous dyads
- Results showed strong differences in sociality between individuals: two strongly associated pairs, one strongly associated trio, and six less associated individuals within the group
- Provides a better understanding of individual associations, group structure & dynamics

Source: Hartman *et al.*, 2020

FIGURE 2 | Examples of individual identification and group compositions used for scoring relative positions of individuals. **(A–C)** Photo identification of a synchronized pair using conventional photo identification methods. **(D–F)** Same pair, captured by the UAV. **(G)** Photo identification of a synchronized triplet. **(H)** Same triplet, captured by the UAV. **(I–K)** Photo identification of a synchronized quartet, captured by the UAV. **(L)** The IKB group organized in 5 rows, using a relative classification for individual positions categorized as: front row (p1), row behind the front (p2), center (p3), row before the rear (p4), or rear row (p5). **(M)** The IKB group organized in 2 rows: front (p1) and rear (p5).

FORAGING ACTIVITY OF RISSO'S DOLPHINS AND SYNCHRONOUS TIME-DEPTH DISTRIBUTION OF PREY AGGREGATIONS, CALIFORNIA, USA

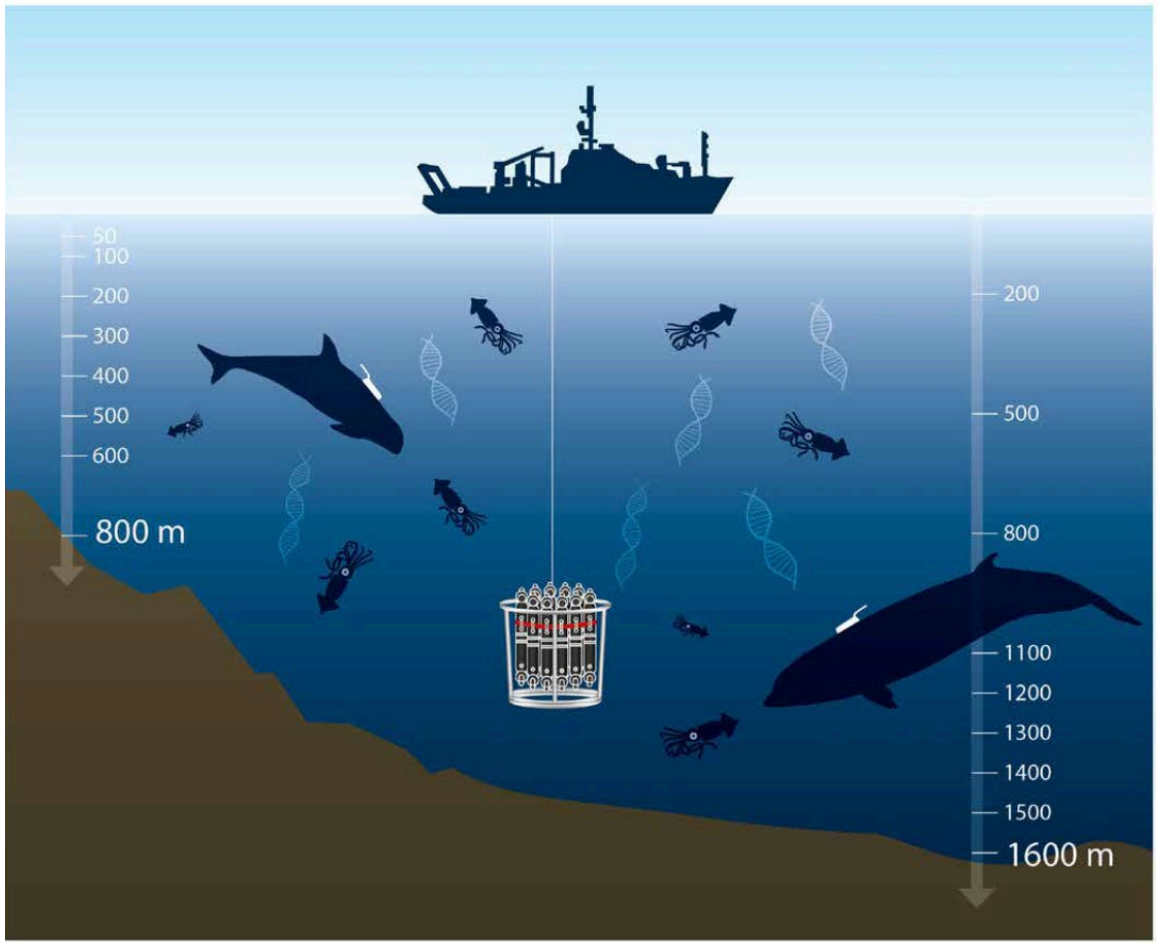


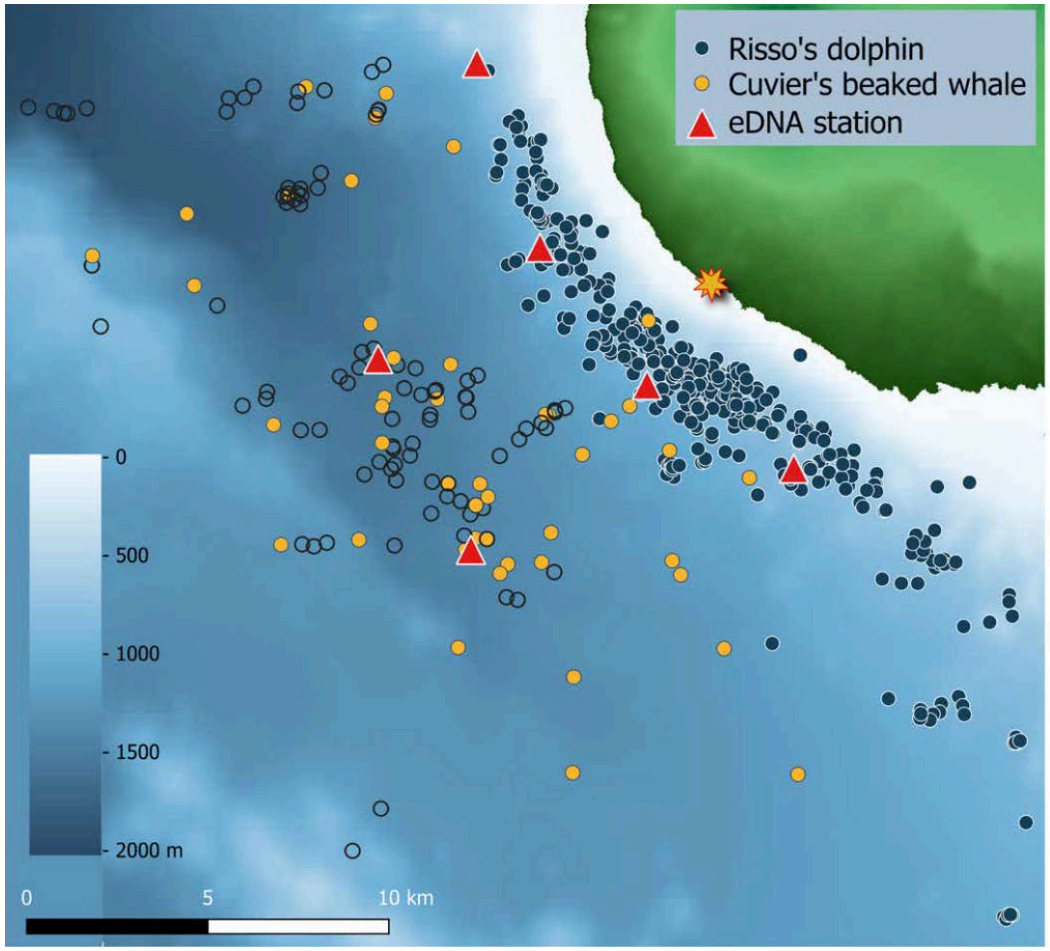


- Three sound-scattering layers revealing patches of high prey biomass: 'shallow' – 30-90m depth, 'midwater' – 200-300 m depth, migrating vertically in 24-hr cycles, 'deep' – 350-450 m depth, no diurnal migration

Source: Arranz *et al.*, 2018

STUDIES OF NICHE SEGREGATION BETWEEN RISSO'S DOLPHIN & CUVIER'S BEAKED WHALE





Source: Visser *et al.*, 2021

CAUSES OF MORTALITY IN RISSO'S DOLPHINS

In the UK, between 1995 & 2018, 45 strandings have had PMEs:
8 live strandings, 5 gas embolism, 4 (meningo)encephalitis, 4 infectious disease, 2 others, 4 by-catch, 4 starvation, 2 neonatal death, 2 dystocia, 2 gastritis/enteritis, 2 physical trauma, (boat/ship strike), 1 physical trauma (unidentified cause), 5 not established

Sources: Bennett *et al*., 2000; SAC, 2000; Jepson, 2005; Deaville & Jepson, 2011, 2018, Deaville, 2019

STRANDED RISSO'S DOLPHIIN WITH GAS EMBOLISM

- male stranded at Cemlyn, Anglesey on 17 Sept 2009

- identified swimming off north coast a few days earlier, and the previous year

- massively enlarged spleen

- diffuse and severe gas cavitation

IMPACTS UPON RISSO'S DOLPHINS

Fisheries Conflicts: squid fisheries, long-lining, gill netting, seine netting, driftnets

Pollution: PCBs, flame retardants, tributyl tins, mercury, cadmium, plastic debris

Sound Disturbance: active sonar, seismic surveys, detonations, shipping

General Disturbance: whale watching, water sports, coastal developments

RECOMMENDATIONS

- Systematic surveys & habitat modelling to identify hotspots, particularly offshore

- Population estimates from photo-ID and line-transects

- Wide-scale surveys of genetic variation throughout N. Atlantic & Mediterranean Sea, and better understand population structure using complementary techniques such as acoustics & stable isotopes

- Long-term collaborative studies using photo-ID to investigate home ranges, movements, social structure, and life history parameters

- Examine further geographical & seasonal variations in diet using stomach contents, fatty acid & stable isotope analysis, eDNA, etc

- Better assess relative importance of different conservation threats on a geographical basis