



Overview of bycatch as a threat to common dolphins

Sinéad Murphy

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Murphy, S., E. H. Pinn & P. D. Jepson, (2013) The short-beaked common dolphin (*Delphinus delphis*) in the North-eastern Atlantic: distribution, ecology, management and conservation status. In: *Oceanography and Marine Biology: An Annual Review, Volume 51*: 193. R. N. Hughes, D. J. Hughes & I. P. Smith (Eds.). CRC Press.

Introduction

Species Identification

- North-east Atlantic

Population structure in the North Atlantic

- North-east Atlantic population structure
- Ecological stocks

Distribution and abundance

- Contemporary seasonal movements
- Long-term distribution patterns
- North-Atlantic Oscillation

Population abundance

- Continental shelf waters
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Health status and causes of death

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- United Nations Convention on the Law of the Sea
- Convention on Biological Diversity
- Convention on International Trade in Endangered Species of Wild Fauna and Flora
- The Bonn Convention (CMS) and the Agreement on the conservation of small cetaceans of the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS)
- Convention on the Protection of the Marine Environment of the North-east Atlantic (OSPAR)
- The Bern Convention
- International Whaling Commission
- European
- Directive of Natural Habitats and Wild Fauna and Flora (92/43/EEC)
- EC Council Regulation 812/2004 ('the Fisheries Regulation')
- Marine Strategy Framework Directive and Good Environmental Status

Management of the North-east Atlantic population

- Management units
- Population status
- Summary of main pressures and threats
- Management framework
- Management objectives
- Estimating bycatch limits

Conservation status

- Indicators in support of conservation status assessments

Recommended research

Recommended conservation actions

Conservation management of common dolphins: Lessons learned from the North-East Atlantic

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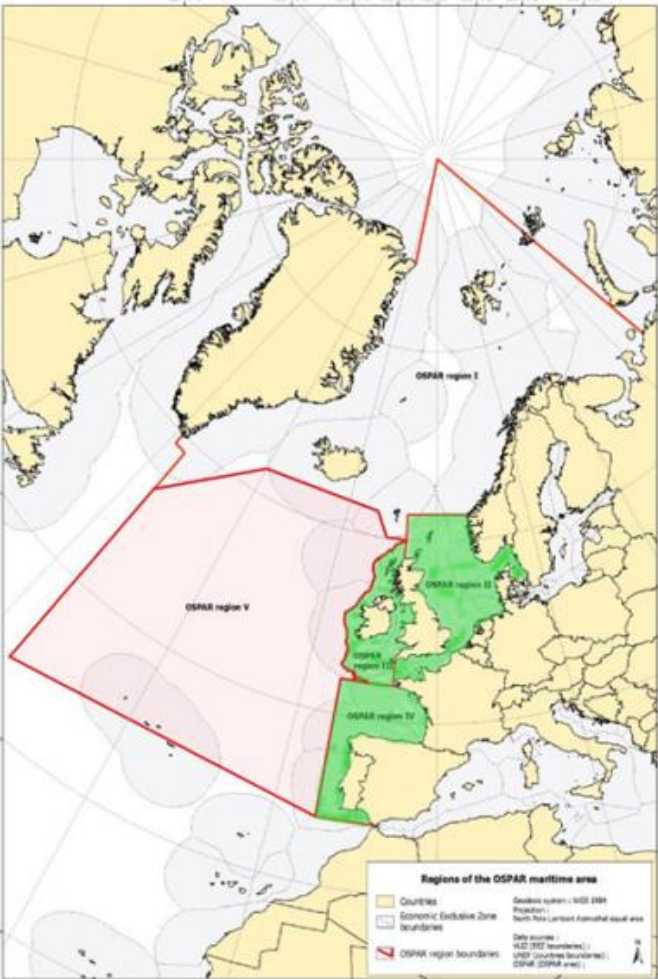
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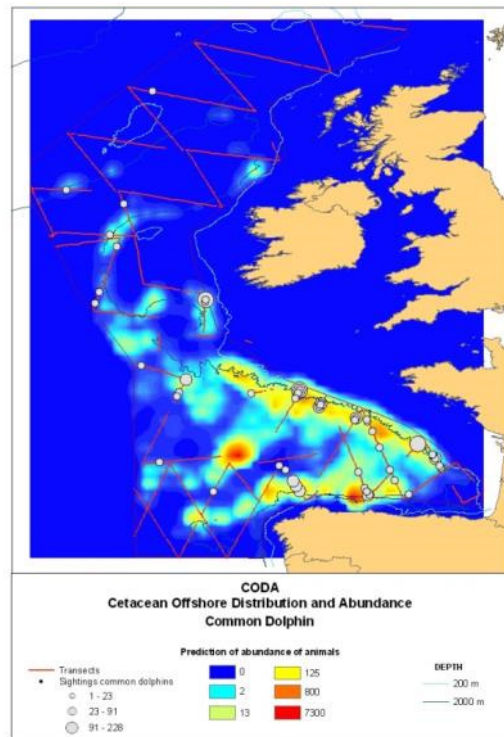
Abstract

1. The short-beaked common dolphin is one of the most numerous cetacean species in the North-East Atlantic and plays a key functional role within the ecosystem as a top predator. However, in 2013, its conservation status for the European Marine Atlantic, under Article 17 of the Habitats Directive, was assessed as 'Unfavourable-Inadequate'. Of key concern for this species is fishery bycatch, with pollution also being an issue. There are, however, major knowledge gaps concerning the extent of the effects of such pressures on the species.
2. Implementation of national observer bycatch programmes and bycatch mitigation measures under EC Regulation 812/2004 has been important. The responsibility for this is currently being transferred to the EU fisheries Data Collection Framework and Technical Measures Framework, the potential advantages and disadvantages of which are discussed. Collection of data and samples through national stranding schemes in some countries has enabled assessments of life-history parameters, dietary requirements, and the effects of stressors such as pollutants.
3. Nevertheless, in order to improve the conservation status of the North-East Atlantic population, a number of key actions are still required. These include the implementation of a species action plan, finalization of a management framework procedure for bycatch, and coordination between member states of monitoring programmes. It is important that there is monitoring of the state of the common dolphin population in the North-East Atlantic management unit through regular surveys spanning the range of the management unit, as well as continued assessment of the independent and interactive effects of multiple stressors. Above all, conservation status would be improved through application and enforcement of existing legislation in European waters.
4. This paper provides a summary of the current state of our knowledge of common dolphins in the North-East Atlantic along with recommendations for conservation management that may also be relevant to the species in the Mediterranean Sea.



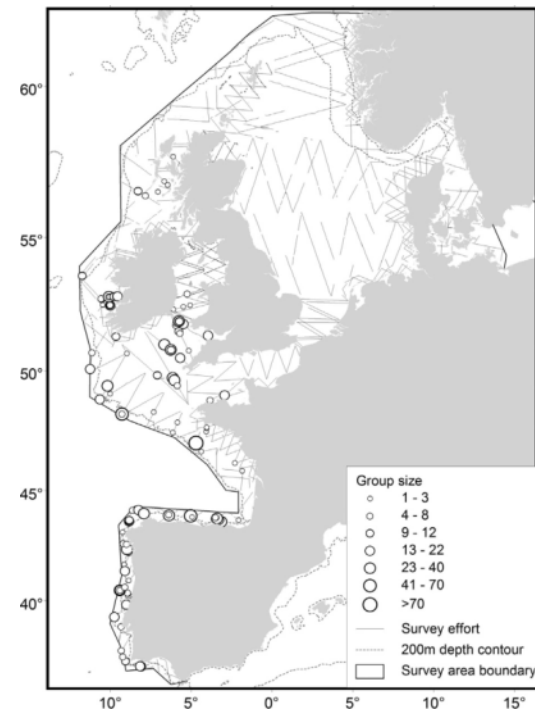
MU Abundance – 172,920 *D. delphis*

Common dolphin
(Coda 2009 -
Coda survey July 2007)



116,709 (CV=0.34)

Common dolphin
(Hammond et al. 2013 –
SCANS II survey July 2005)

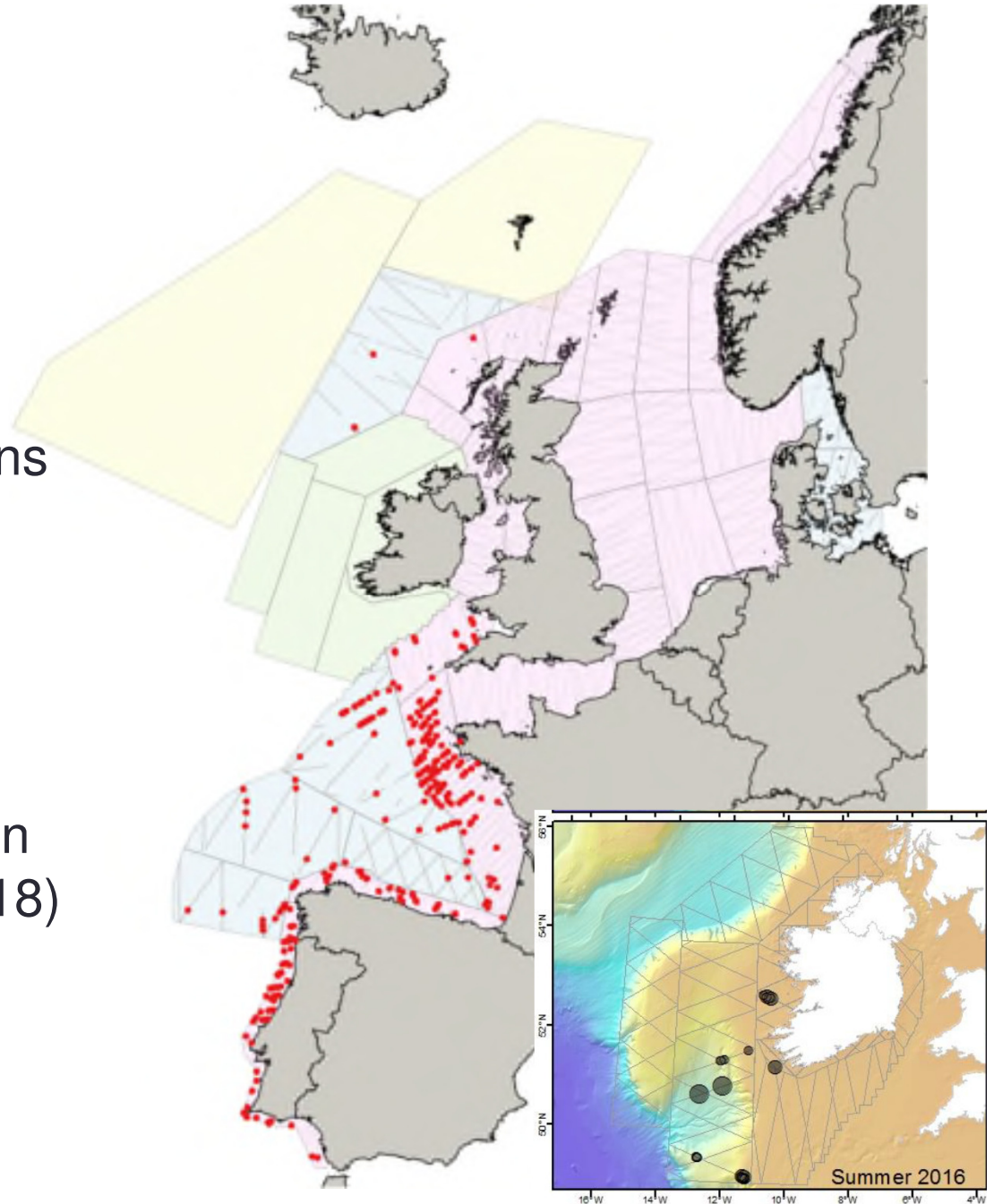


56,221 (CV=0.23)

SCANS III July 2016

>467,673 common dolphins
CV = 0.264
(Hammond et al. 2017)

Irish ObSERVE project
~ 33,215 possible common
dolphins (Rogan et al. 2018)



CODA SURVEY

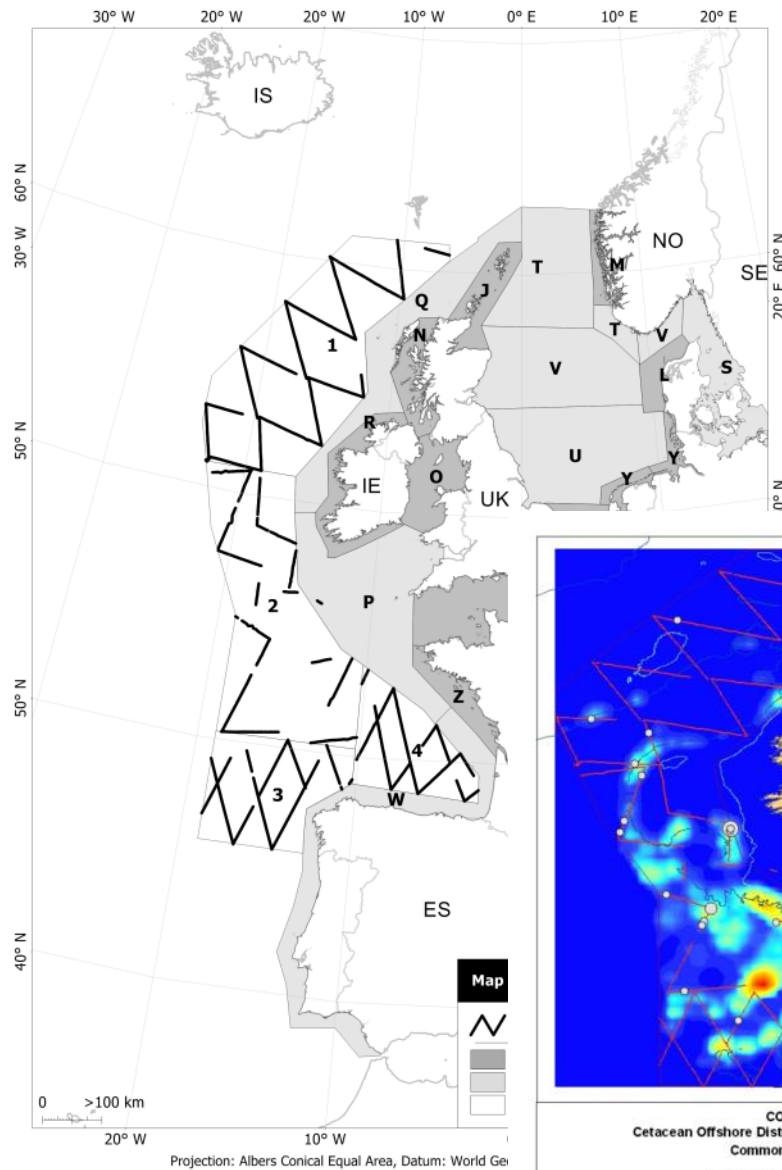
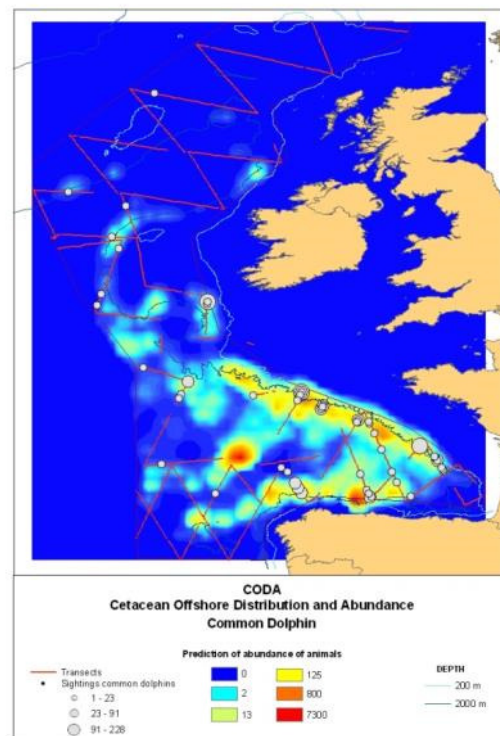
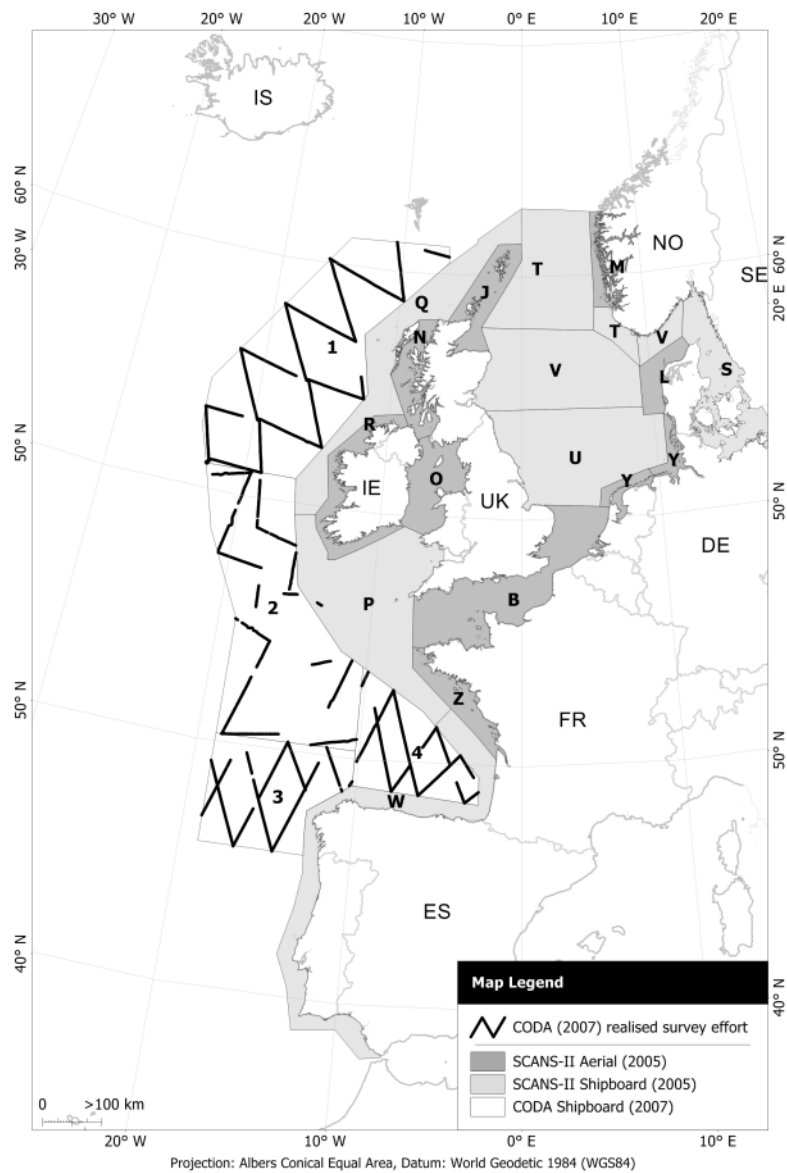


Table 2 Estimates of model-based (density surface modelling) animal abundance estimates, with coefficients of variation (CV) in brackets, and 95% confidence intervals, of *Delphinus delphis* from the CODA survey, July 2007

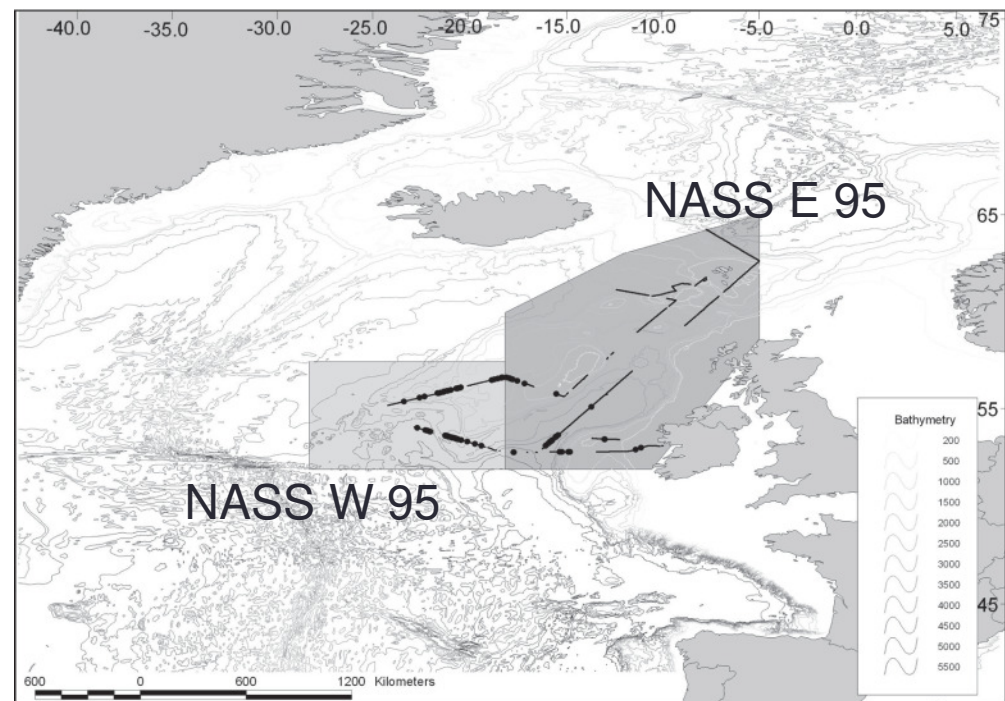
Block	Animal abundance (CV)	95% Confidence interval
1	4,216 (0.57)	1,478–12,027
2	52,749 (0.39)	25,054–111,059
3	21,071 (0.51)	8,270–53,689
4	38,673 (0.46)	16,464–90,839
Total	116,709 (0.34)	61,397–221,849

Sources: Cetacean Offshore Distribution and Abundance in the European Atlantic (CODA), 2009; ICES WGMME (2010).
e Figure 4 for CODA survey blocks.





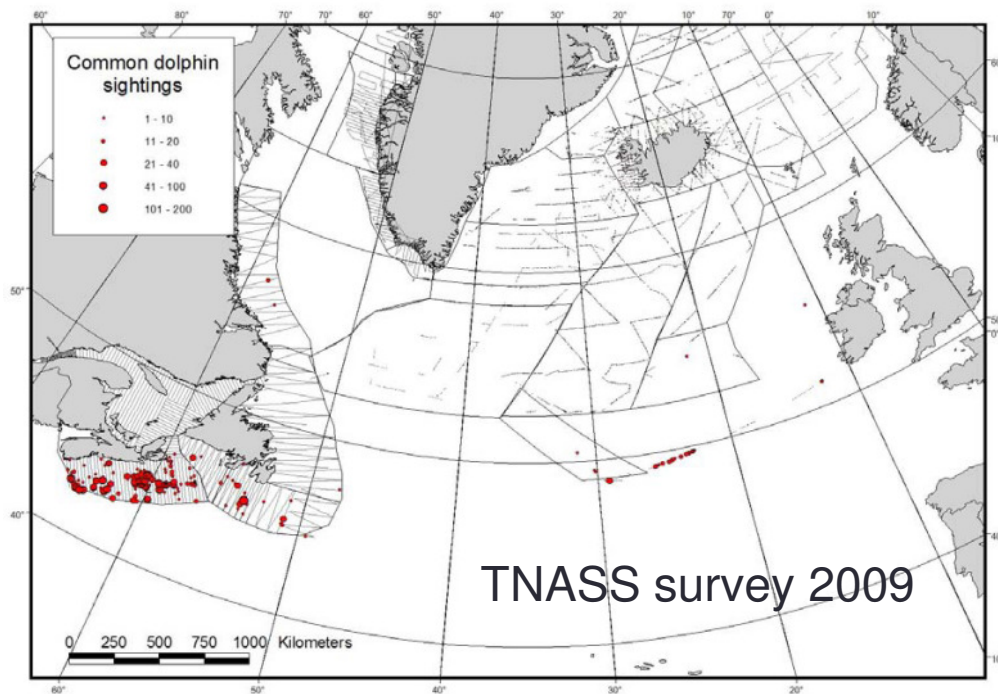
Canadas et al. (2009)



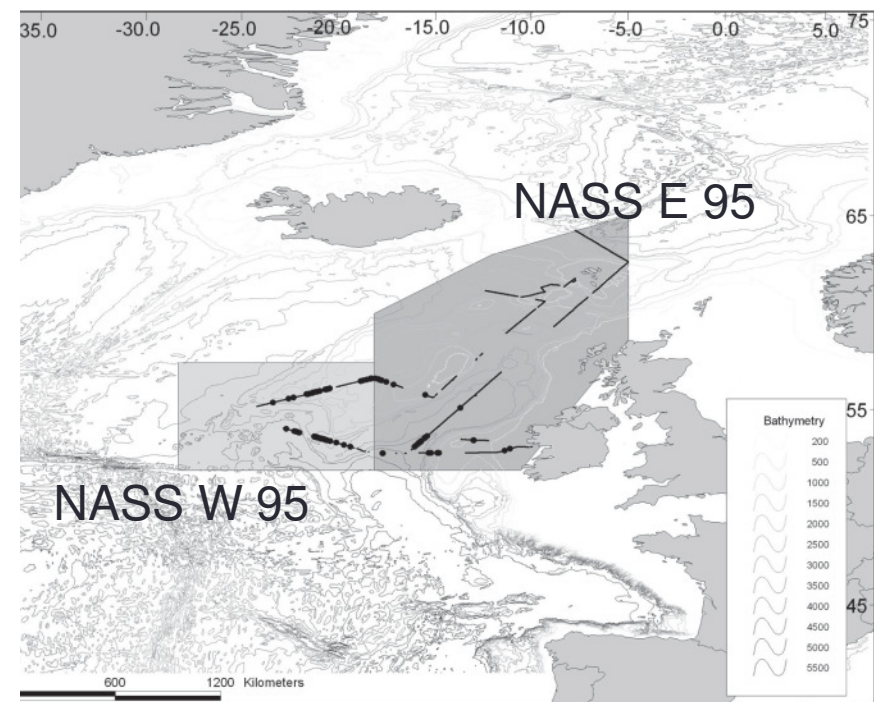
	Abundance	CV
West block	273,159	0.26
East block	77,547*	

*not considered reliable

Lawson et al. (2009)



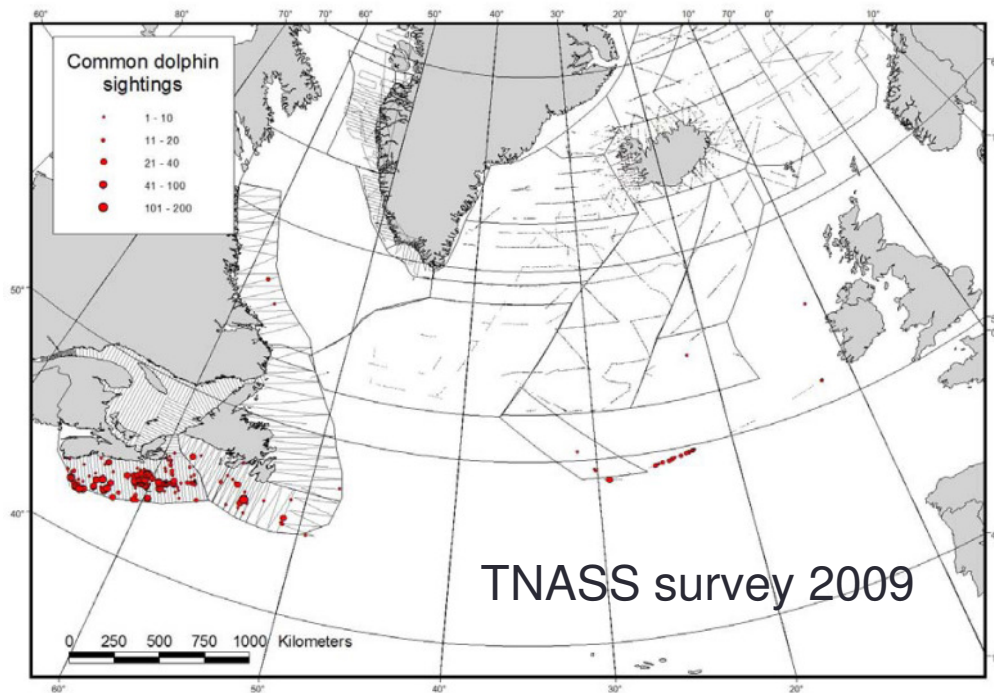
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	Abundance	CV
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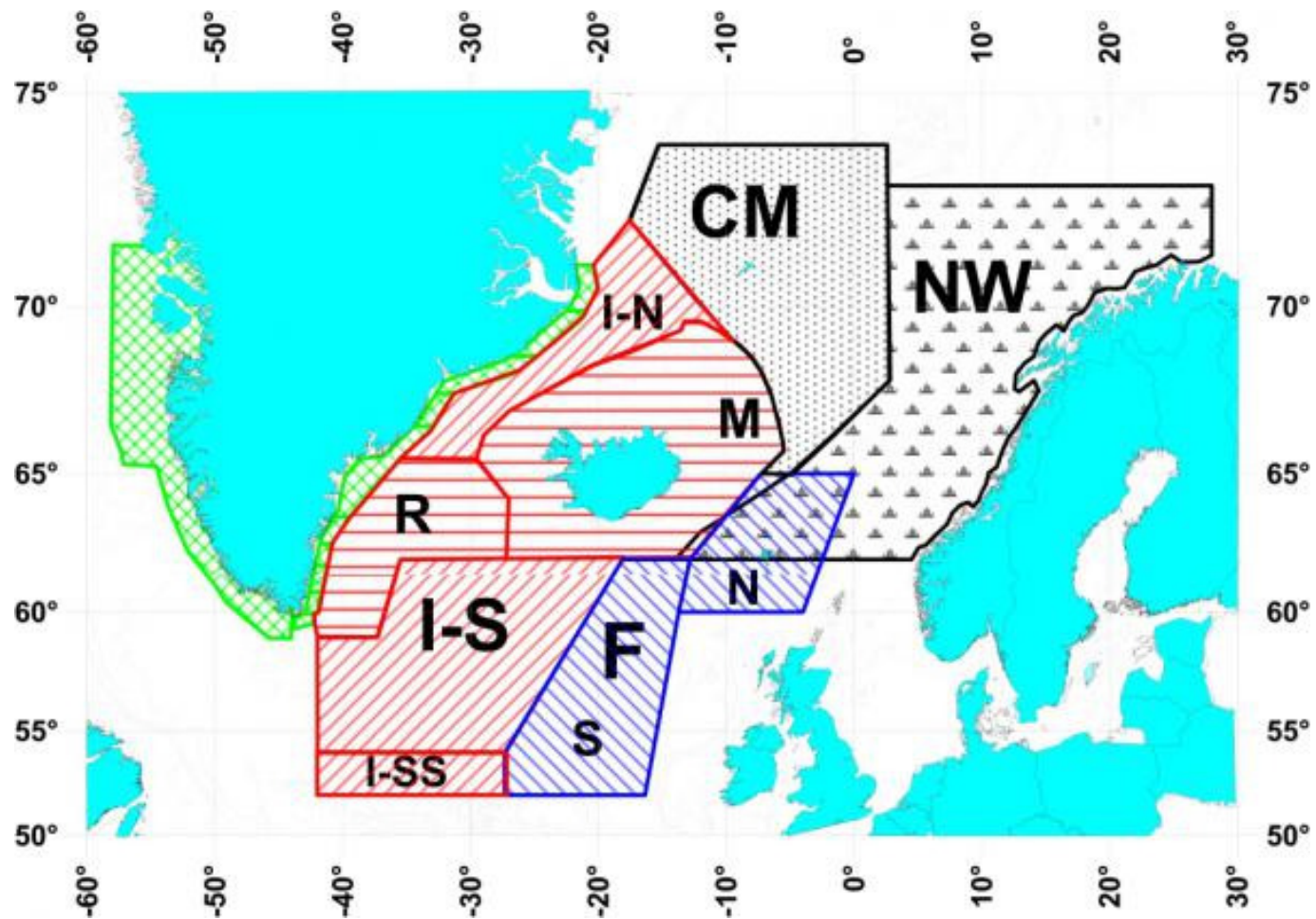


IWC Sub-Committee on Small Cetaceans (2009) identified several potential reasons for the observed changes in density/distribution, Including;

- (1) differences in sighting conditions (e.g. sea state);
- (2) uncertain species identification (as other dolphin species were sighted);
- (3) a true reduction in common dolphin density;
- (4) ship effect and
- (5) interannual distributional shifts.

Due to poor weather conditions during T-NASS 2007, some of the planned survey tracks were not covered.

T-NASS 2015



Fishing gear of concern

- Gillnets
- Pelagic trawls
- Purse and beach seine nets
- Long-lines

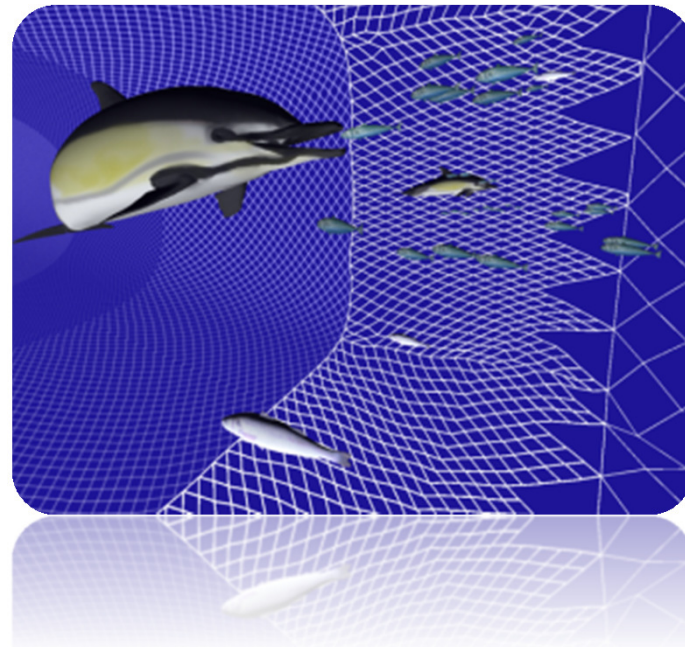


Table 3 Annual estimates of total by-catch of common dolphin *Delphinus delphis* in ICES areas VI, VII and VIII (1990–2009)

Fishery	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Drift nets																				
Irish, UK & French tuna ^a	243	390	608	1347	1580	666	546	947	1706	2101	1589	0	0	0	0	0	0	0	0	0
Pelagic trawls																				
French and Irish tuna ^b														133 ¹						
French tuna (ICES VI, VII, VIII) ^{c-#}					95 ²												60	13	120	900
French sea bass (ICES areas VII and VIII) ^{b-d,h}					25 ²									489 ³				290 ⁴	300	
French sea bass (ICES areas VII) ^{c-#}																				40
French sea bass (ICES areas VIII) ^{c-#}																				300–400
French pelagic trawl (ICES area VIII) (various species) ^h																				13
French midwater otter trawl (ICES areas IV, VII, VIII) (bass, horse mackerel, mackerel, herring and sardine) ^f																	57			
UK sea bass (ICES IIV.1 and ICES IIV.2) ^{g,j-1}												190	38	115	439	139	84	50–100 ⁶	7	4 ⁸
Dutch horse mackerel ^c					101 ²															
French hake pelagic trawls ^c					203 ²															
Spanish blue whiting ^m												394	394							
<hr/>																				
Irish & UK bottom-set gill nets (Celtic Sea) ^a				234																
UK set-net and tangle fisheries (ICES area VII) ^{k,l,o}																253	554	114	594	237
French set nets (Bay of Biscay) ^{f,h}																			100	
Spanish hake set nets (ICES VII and VIII) ^{g,h}																			23	773
Total minimum annual estimate	243	390	608	1581	2004	666	546	947	1706	2101	1589	584	432	737	439	392	755	492	1137	2317

^a Rogan & Mackey (2007); ^bNorthridge et al. (2006); ^cTregenza & Collet (1998); ^dBerthou et al. (2008); ^eDemaneche et al. (2010); ^fICES SGBYC (2010); ^gICES WGBYC (2011); ^hICES (2010); ⁱSMRU (2008); ^jNorthridge & Kingston (2009); ^kSMRU (2009); ^lNorthridge & Kingston (2010); ^mFernández-Contreras et al. (2010); ⁿTregenza et al. (1997); ^oNorthridge et al. (2007).

¹ Data from France were from 2003, and data from Ireland were from 2004.

² By-catch data obtained by the EU BIOECO project (see Morizur et al. 1999 for further information) and extrapolated by Tregenza & Collet (1998), although these values are only a rough estimate of actual by-catch due to poor sampling during the project as a result of low observer coverage in France.

³ French bass fleet effort for the 2003–2004 winter season (October 2003–September 2004), including some striped and Risso's dolphins.

⁴ Revised estimate.

⁵ Not annual data but fishing season, starting from 2000–2001 winter season.

⁶ Pinger trial commenced, which continued until the 2008–2009 fishing season.

⁷ Fishing effort low, and no observations carried out.

⁸ All (46) hauls in this fishery were observed.

Minimum annual bycatch estimates (see Table 3, Murphy et al. 2013)

	90	91	92	93	94	95	96	97	98	99
Total	243	390	608	1581	2004	666	546	947	1706	2101

	00	01	02	03	04	05	06	07	08	09
Total	1589	584	432	737	439	392	755	492	1137	2317



Driftnet ban

Only a min estimate - lack of sampling in some fisheries and limited in others

European - tuna driftnets in NE Atlantic

E. Rogan, M. Mackey / Fisheries Research 86 (2007) 6–14

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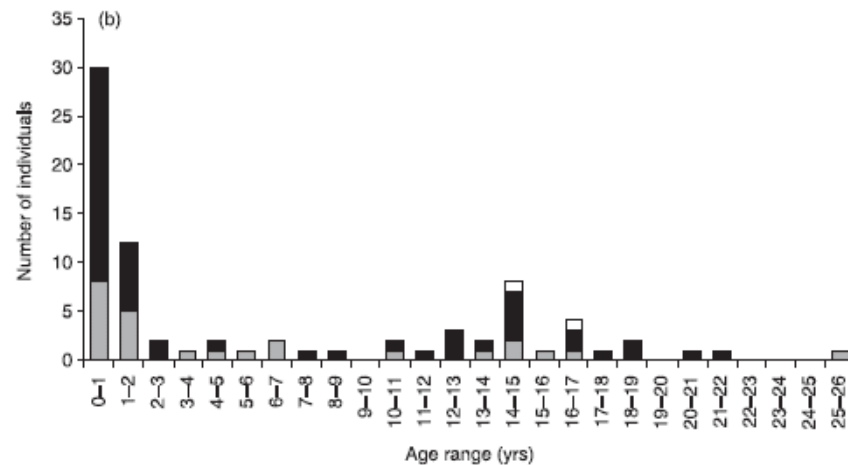
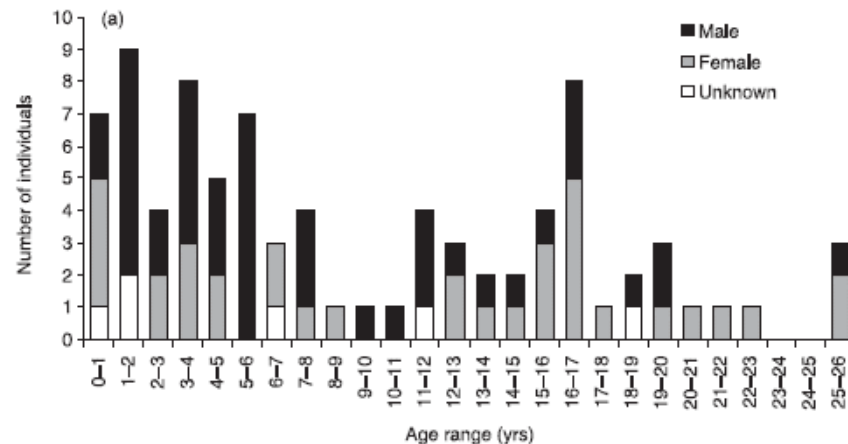
Table 2

Total landings of albacore tuna (m tonnes) caught using surface driftnet by country for the NE Atlantic (data from ICCAT website) and estimated total numbers of blue sharks, common and striped dolphins caught each year from 1990 to 2000 by the three fleets

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
France	2,268	3,660	4,465	4,587	3,967	2,400	2,048	1,717	2,393	2,799	2,354
UK	0	0	59	499	567	196	49	33	36	41	14
Ireland	40	60	451	1,946	2,534	918	874	1,913	3,639	4,523	3,374
Total albacore (m tonnes)	2,308	3,720	4,975	7,032	7,068	3,514	2,971	3,663	6,068	7,363	5,742
Blue shark	38,694	62,395	74,825	104,150	94,463	54,256	43,800	49,067	62,242	94,675	99,884
Common dolphin	243	390	608	1,347	1,580	666	546	947	1,706	2,101	1,589
Striped dolphin	612	987	1,294	1,793	1,755	888	709	774	1,225	1,473	1,124

1990-2000	Estimate (95% CI)
Blue shark	778,452 (622,520–934,384)
Common dolphin	11,723 (7670–15,776)
Striped dolphin	12,635 (10,009–15,261)

European - tuna driftnets in NE Atlantic



- High tendency for common dolphin calves to become entangled in driftnets
- Comprised 37% (≤ 1 year old) of the aged common dolphin by-catch sample
- Common dolphins ≤ 2 years and/or ≤ 165 cm comprised 51.2% of the whole common dolphin sample

European - tuna driftnets in NE Atlantic

E. Rogan, M. Mackey / Fisheries Research 86 (2007) 6–14

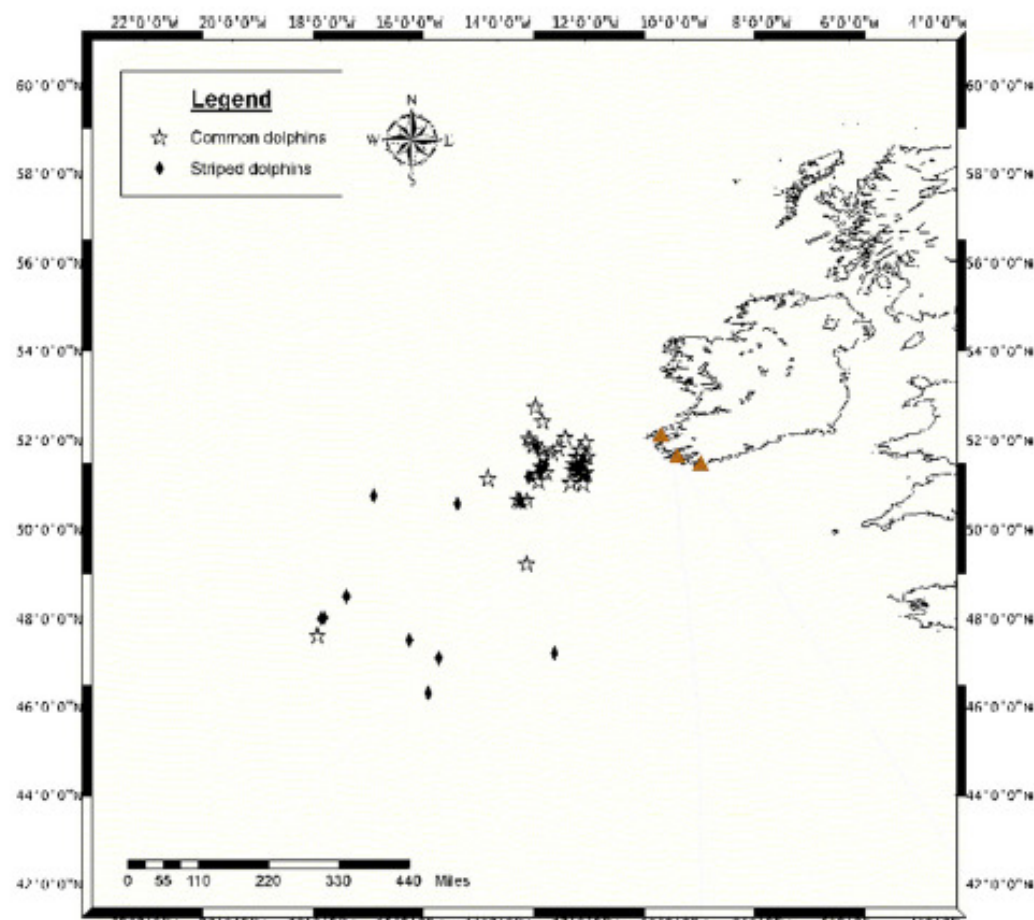
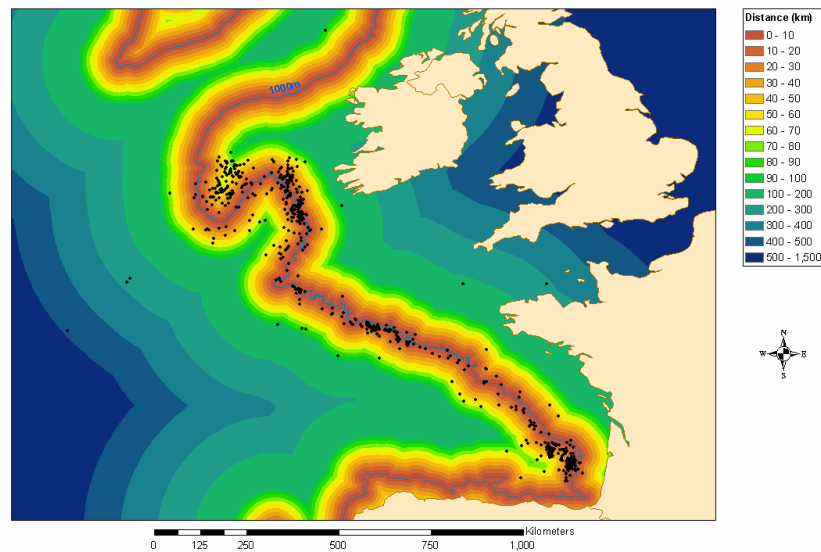
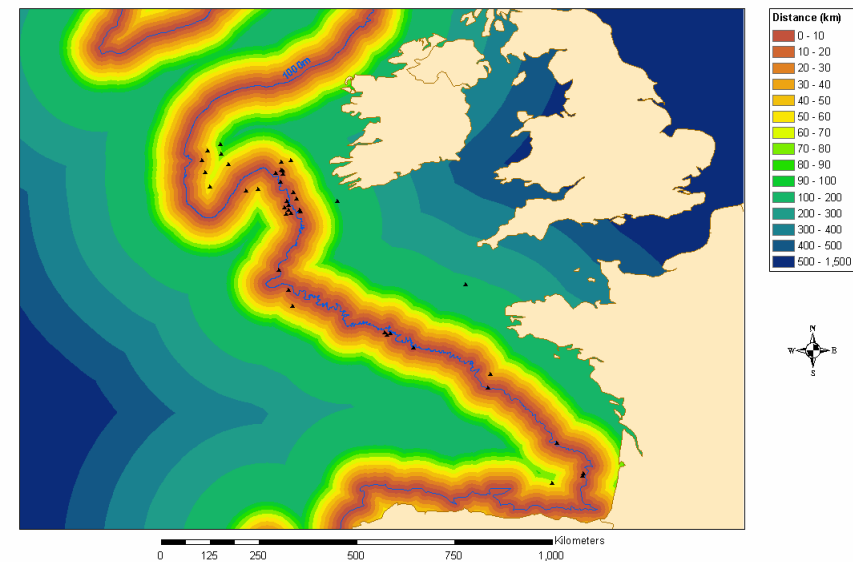


Fig. 2. Location of striped and common dolphin entanglements during fishing operations.

European – Irish tuna pelagic trawls



The observed position of mid-water paired trawl albacore fishing positions in late summer (July to October) 1998, 1999, 2002 and 2003 (BIM 2005)



The observed positions of dolphin bycatch in relation to the 1000m depth contour in late summer (July to October) 1998, 1999, 2002 and 2003 (BIM 2005)

European – Irish tuna pelagic trawls

	Year				
	1998	1999	2002	2003	2004
No. of observed hauls	144	330	113	55	35
No. of cetacean bycatch incidents					
Common dolphins	12	23	5	1	1
Striped dolphin		4			
Atlantic white-sided dolphin		1			
Long-finned pilot whale		4			
Total	12	32	5	1	1
Mean no. of incidents per haul	0.08	0.10	0.04	0.02	0.03
Sum of cetacean bycatch	Number of bycaught animals				
Common dolphins	44	125	16	1	2
Striped dolphin		10			
Atlantic white-sided dolphin		2			
Long-finned pilot whale		8			
Total	44	145	16	1	2
Mean no. cetaceans per haul	0.31	0.44	0.14	0.02	0.06

No cetacean bycatch observed since 2005 (Murphy et al. 2013)

- Possible due to more powerful sonar
- Cessation of fishing activities when dolphins were near
- Extinguishing stern lights while towing at night
- Lowering the trawl headline to several meters below the surface

Observed data, not extrapolated

PETRACET project (2003-2005)

Factors influencing incidental capture in UK and French bass pelagic trawl fisheries

Stepwise model

Batch ~ Month + Towing speed + Start Hour + Area +
Water Depth + Year

But only explains 32% of the deviation (d.f.= 30)

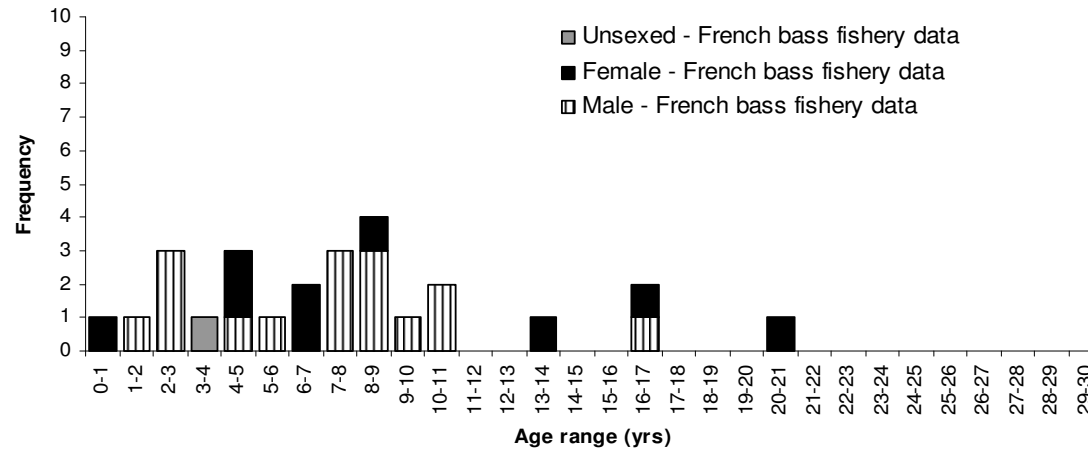
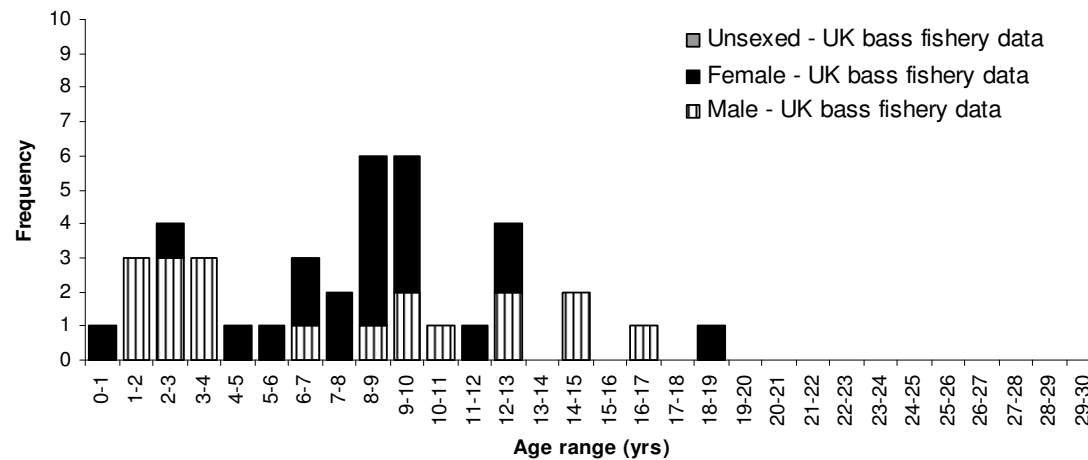
No sign. effect: Tow duration, day/night variable, distance between vessels, sea state, degree of fish conc.

Observed bycatch events were clumped in both space and time

75 dolphins recorded in 13 tows of the French component of the sea bass fishery, of which 8 were recorded in a relatively small area off Brittany

Individuals caught in bass nets

Predominately juveniles and young adults

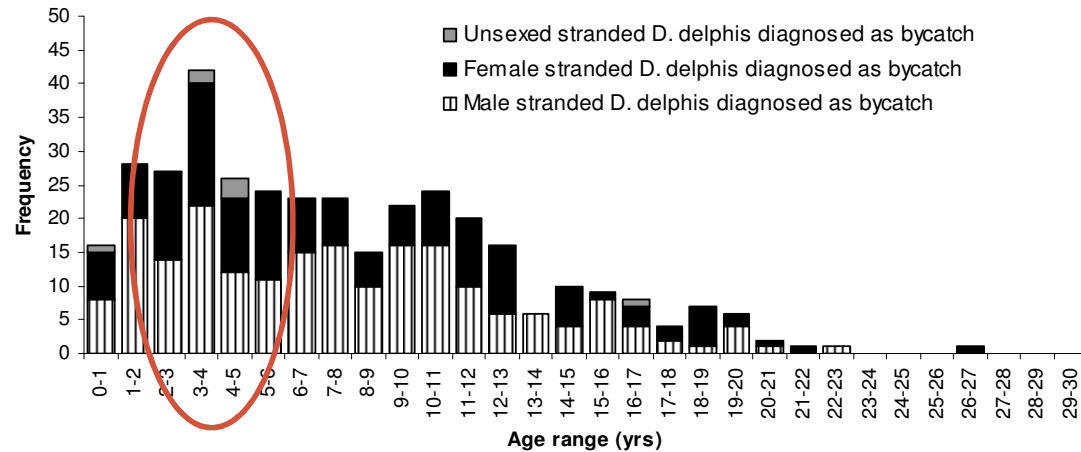
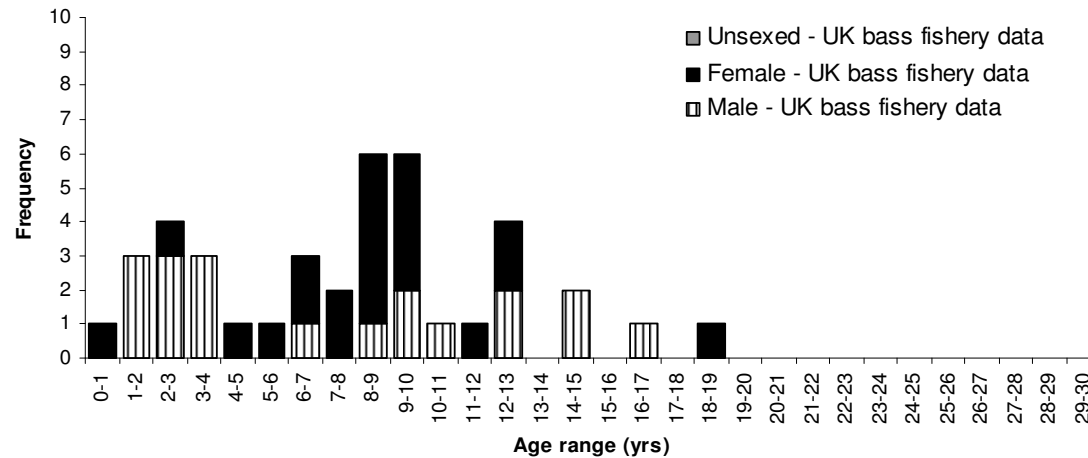


(Murphy et al., 2007)

Bycaught *D. Delphis* – UK fisheries & strandings

Strandings data –
dolphins diagnosed
as bycatch:

- peak in the 3-year old
age class



(Murphy et al., 2007)

WGBYC - Review of national reports for the years 2009-2013

Subarea	Gear type métier level 4	Monitored (days at sea)	Bycatch events	No. common dolphin	Bycatch rate
27.8	Trammel nets	710	0	0	0.0000
27.9	Midwater pair trawl	1	0	0	0.0000
27.9	Bottom otter trawl	734	2	2	0.0027
27.9	Bottom pair trawl	0	0	0	na
27.9	Pots and traps	0	0	0	na
27.9	Purse-seine	537	44	102	0.1899
27.9	Set gillnet	347	3	3	0.0087
27.9	Set longlines	0	0	0	na
	Total	13746	744	2509	

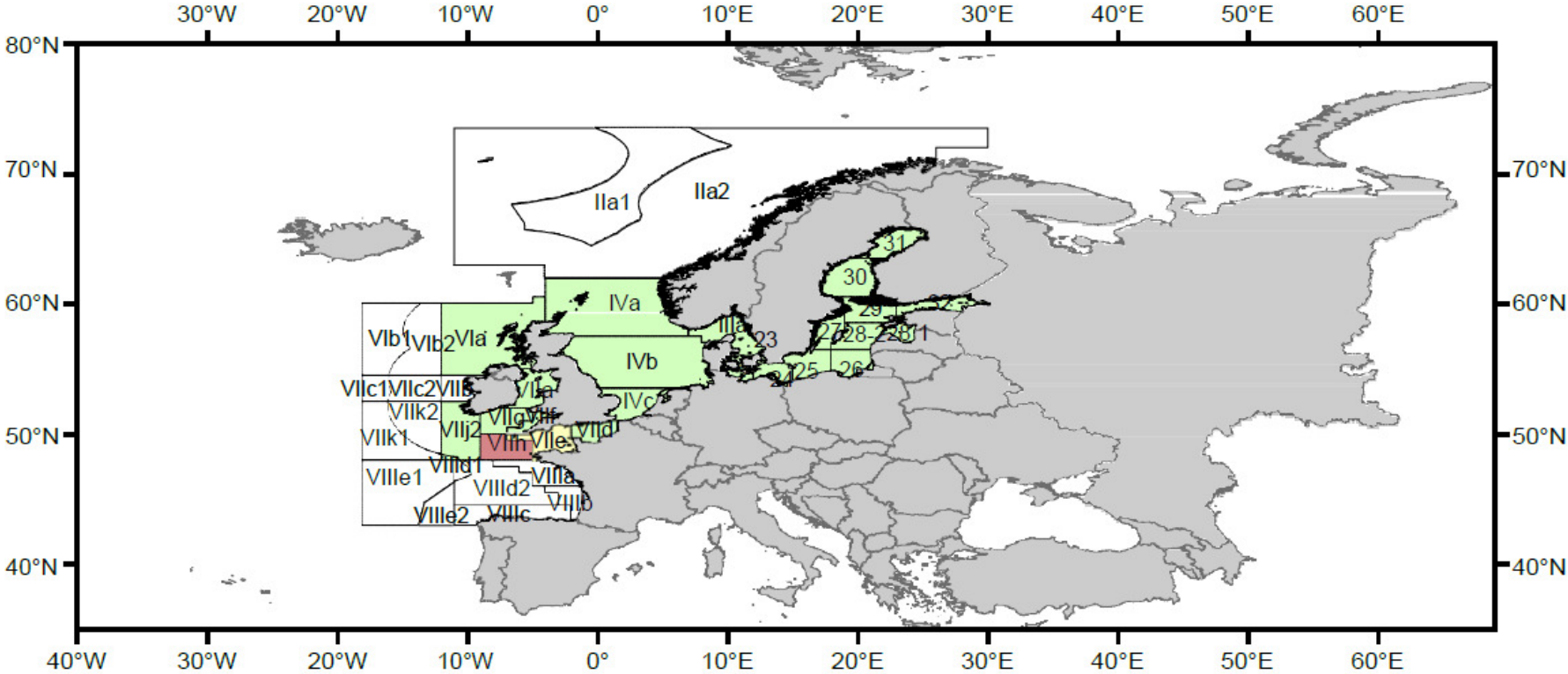
Using abundance estimates for common dolphins for the three subareas and a limit of 1.7% of anthropogenic removals, the total bycatch that should not be exceeded is also calculated (Table 1.6.1.1.3).

Table 1.6.1.1.3 Abundance estimates for common dolphins in subareas 27.7, 27.8, and 27.9.

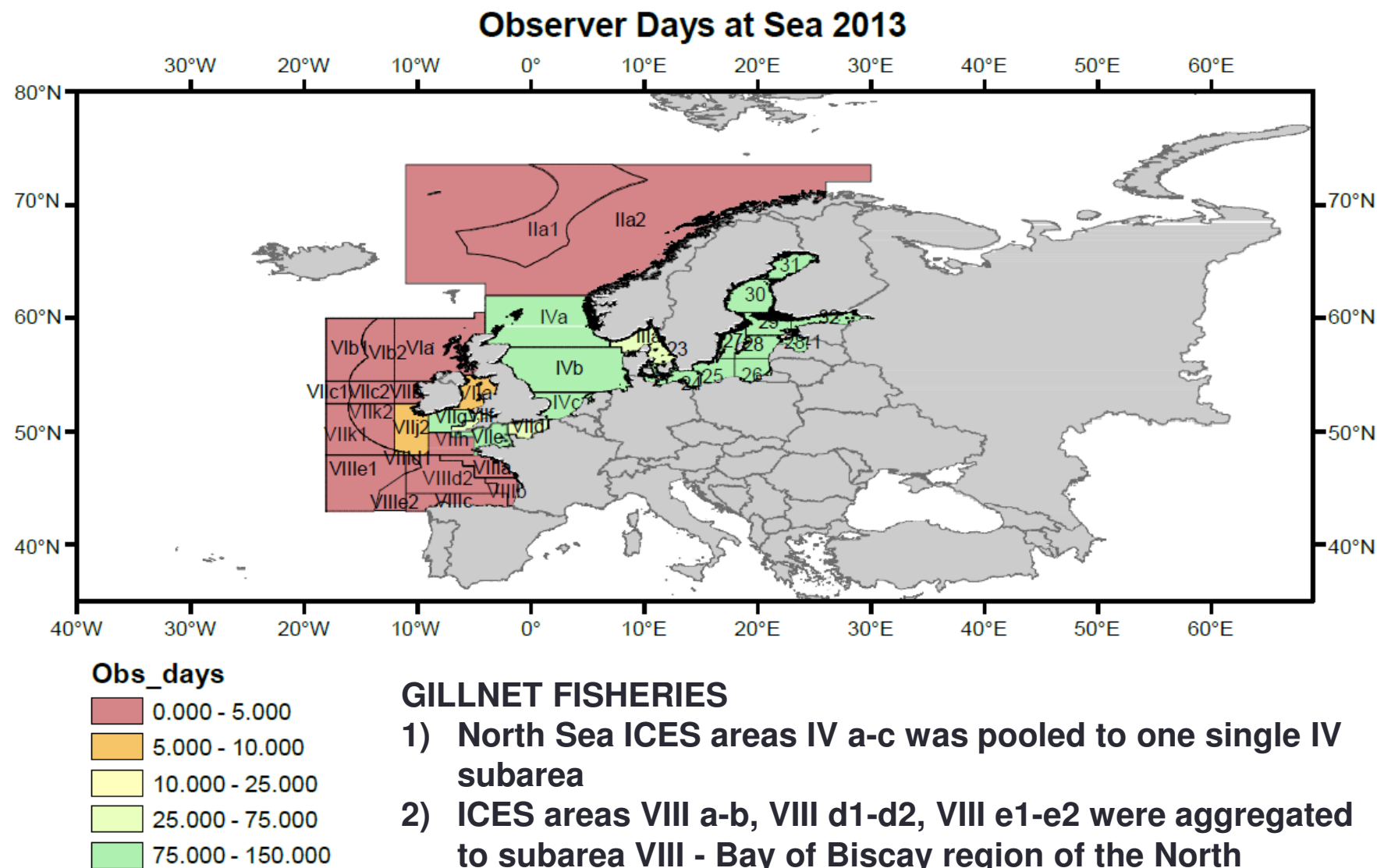
Division	Mean density	Abundance (CV)	1.7% of estimate of best available abundance
27.7	0.05	84390 (0.25)	1434
27.8	0.05	114836 (0.28)	1952
27.9	0.09	59306 (0.24)	1008

- In 2016, ICES advised the European Commission that bycatches of common dolphins may be unsustainable – based on SCANS II & CODA abundance estimate and a review of national reports for the years 2009-2013
- There was uncertainty in the assessment however, due to ambiguities in recording fishing effort, unrepresentative sampling by gear type, and a lack of statutory reporting from some major fishing nations (ICES Advice, 2016)

Common Dolphin Bycatch Rate 2013



Bycatch rates = total number of observed specimens/total number of observed days in each stratum

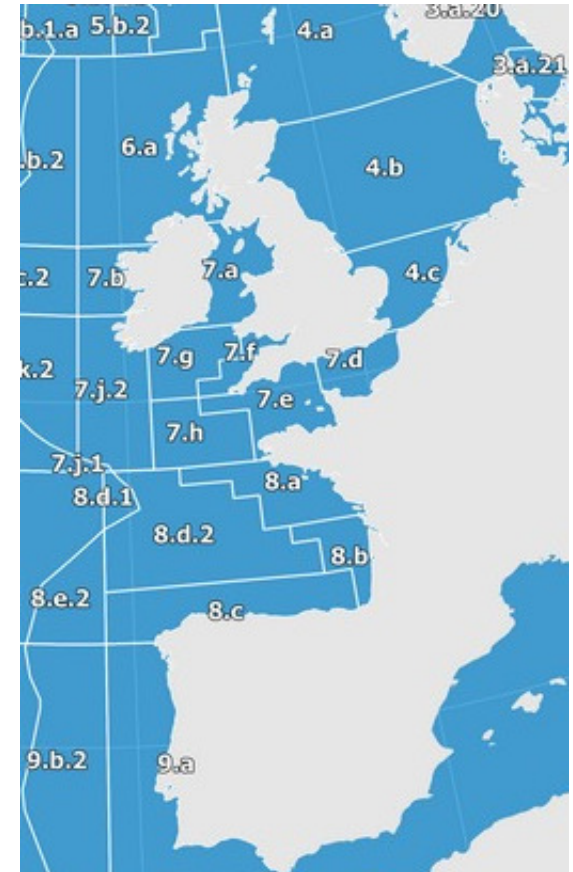


GILLNET FISHERIES

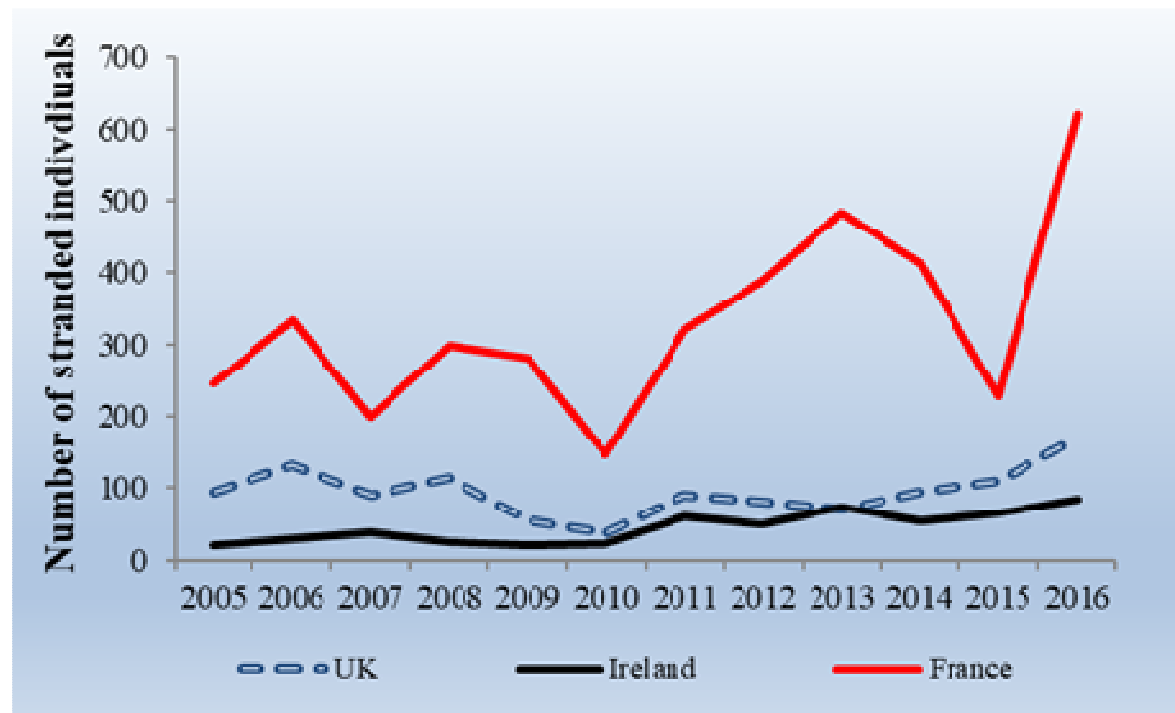
- 1) North Sea ICES areas IV a-c was pooled to one single IV subarea
- 2) ICES areas VIII a-b, VIII d1-d2, VIII e1-e2 were aggregated to subarea VIII - Bay of Biscay region of the North Atlantic (VIII)
- 3) Subdivisions 22-32 in the Baltic Sea were aggregated

ICES Advice (2018)

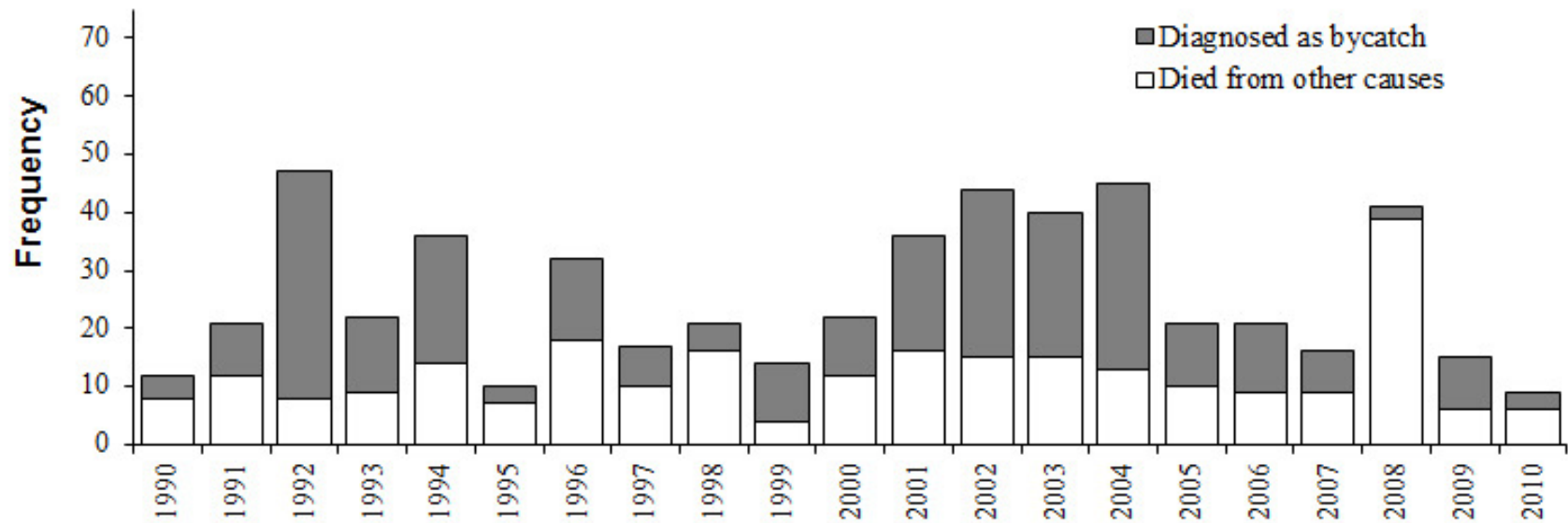
- Total bycatch in mid-water trawls and in nets in subareas 27.7 and 27.8 (southern part of Celtic Seas area and in the Bay of Biscay) for the year 2016 was (likely) between 153 and 904 and between 1607 and 4355 individuals, respectively.
- Combined, these figures represent approx. 0.5% and 1.6% of the common dolphins present in the two subareas. The upper estimate for subarea 27.8 (2.0%) exceeds the threshold of 1.7% of abundance.
- ICES evaluation and external assessments of the numbers of bycaught dolphins recorded on the shores of the Bay of Biscay indicate that a dedicated bycatch observer programme and bycatch mitigation is required for relevant fisheries in this area.



Interannual variation in stranding rates



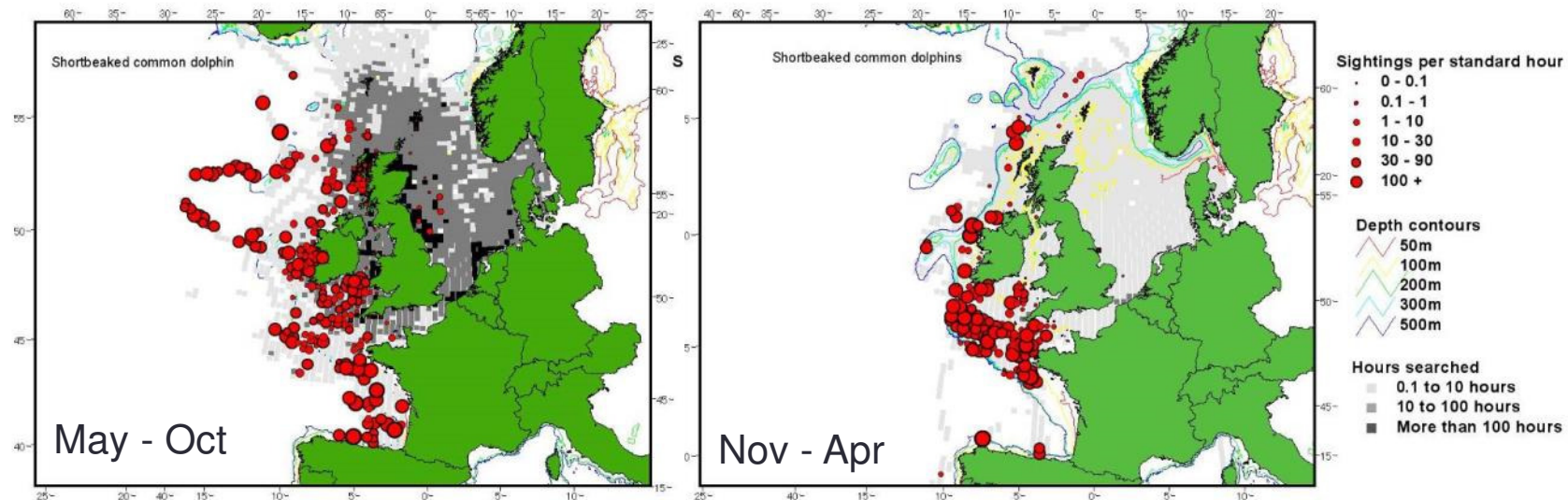
In February 2017, over 200 dolphins, mainly common dolphins, stranded in France. Of 68 animals examined in detail, 85% showed evidence of damage caused by incidental capture in fishing gears (ICES WGMME 2017; Murphy et al in press)



Cause of death for common dolphins necropsied by the UK Cetacean Strandings Investigation Programme ($n = 542$, 1990–2010).

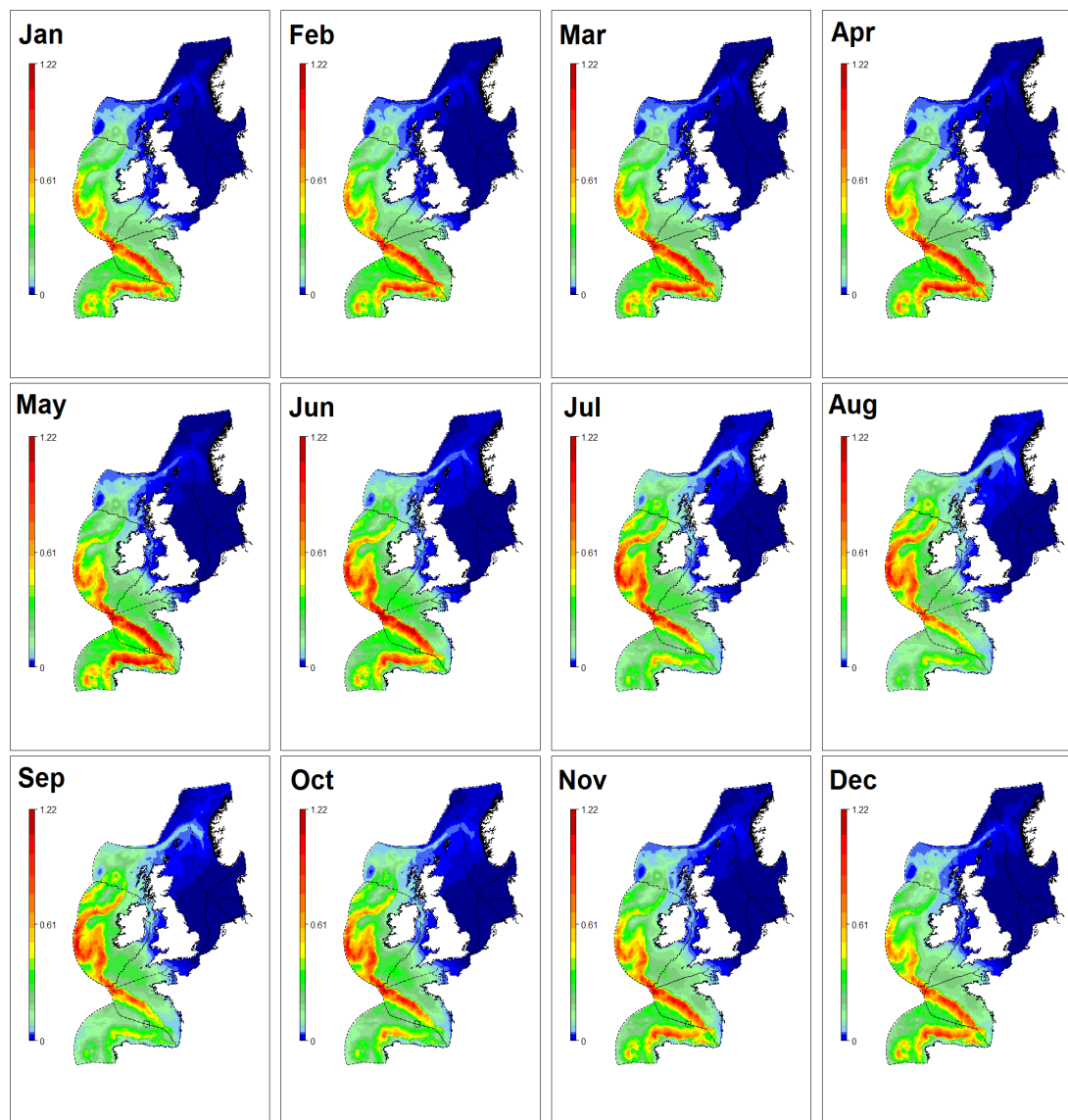
Data for 2008 include 26 common dolphins that died during a mass stranding event in Cornwall (Murphy et al. 2013).

Seasonal Movements in the NE Atlantic (ICES WGMME, 2005; Atlas of Cetaceans data/JCP)



Data obtained 1979-1998

- Summertime (July to October) aggregations were larger in the northern Bay of Biscay, primarily along the shelf slope, than in the western English Channel (Kiszka et al. 2007; 1998-2002).
- May be related to the distribution of their preferred prey species in this area, *Sardina pilchardus* and *Trachurus trachurus* (Meynier 2004, Kiszka et al. 2007, Certain et al. 2011).



Predicted density maps of common dolphin abundance for the NW European region based on 32 years of data (1985-2017).

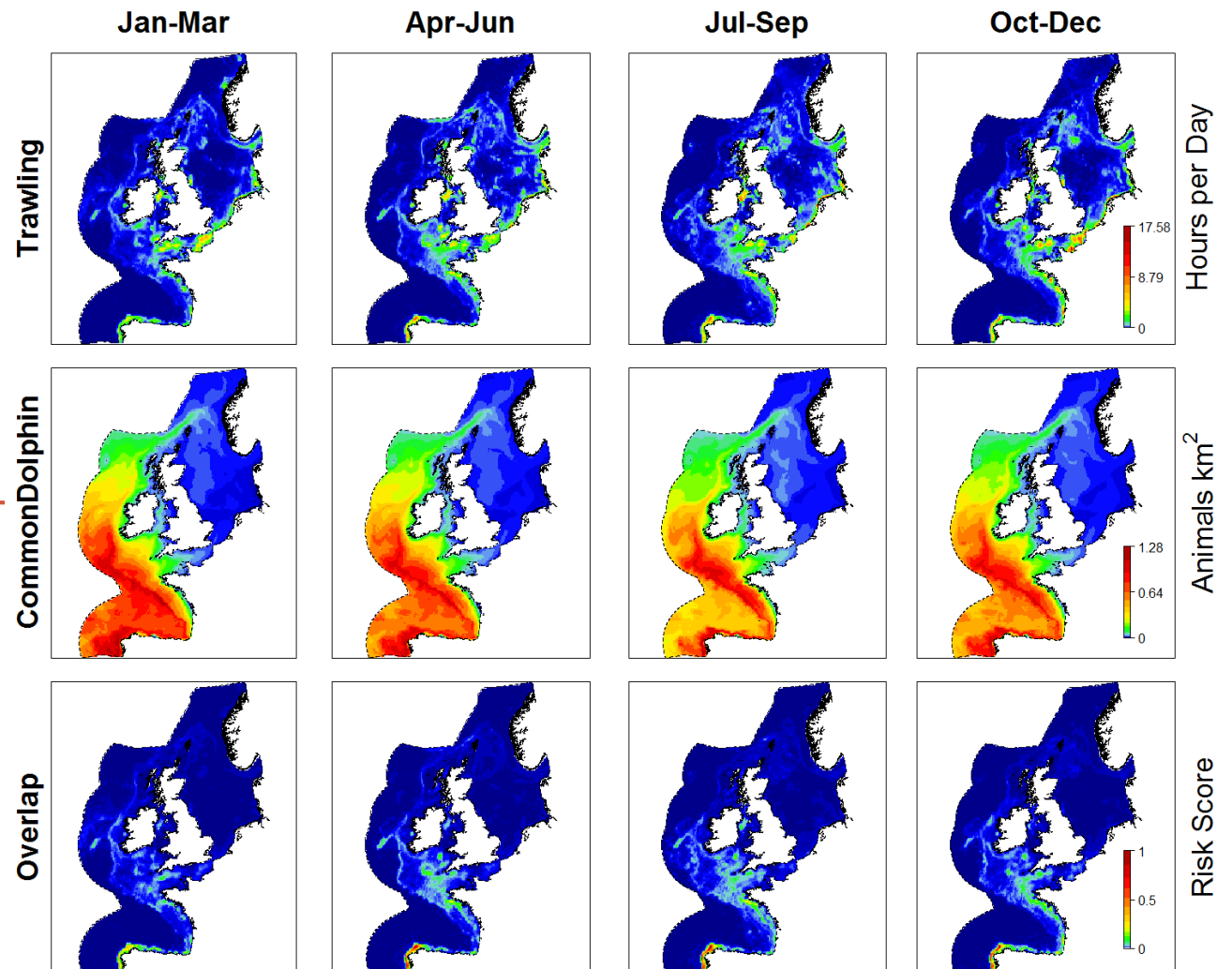
Source: PGH Evans & JJ Waggitt, Marine Ecosystems Research Programme

Risk Mapping: Common Dolphins & Trawling



Main Risk Areas

- Channel Western Approaches
- Northern Bay of Biscay
- Northwest Spain



Risk Mapping: Common Dolphins & Gillnetting



Main Risk Areas

- Southwest of Ireland
- Northern Bay of Biscay
- Northwest Spain

