

Harbour Porpoise Population Management: Swansea, Gower and Carmarthen Bay



Rationale

- ▶ IWC (1991) – concern for declining populations of harbour porpoises *Phocoena phocoena*
- ▶ Declining numbers across its range (Culik, 2003; Reid *et al.*, 2003)
- ▶ Baseline data



Research Question: Can the decline be reversed/better managed?



What do we need to know?

- ▲ Where is it found?
- ▲ Is it a resident species or seasonal visitor?
- ▲ Population size?
- ▲ Where are its critical habitats?
- ▲ What does it eat?
- ▲ Where does it breed and when?
- ▲ What are its threats?



Today's Workshop

▲ Aim:

- ▲ Create a spatial conflict map for the harbour porpoise

▲ Objectives:

- ▲ Collate coastal user information
- ▲ Map HP habitat dynamics data (temporal and spatial)
- ▲ Identify and map likely vessel hotspots
- ▲ Assess fishing activity



What is a Cetacean?

- ▶ Collective term for whales, dolphins and porpoises
- ▶ *Cetus* and *ketos*
- ▶ 94 species (Perrin, Wursig and Thewissen 2002; IUCN, 2024)
- ▶ Smallest – Hector's Dolphin *Cephalorhynchus hectori*
- ▶ Largest – Blue Whale *Balaenoptera musculus*



Threats

- Direct exploitation
- Incidental capture
- Culling operations
- Pollution
- Habitat loss (Noise)
- Climate Change (IUCN The World Conservation Union 2010)



Vulnerability

- ▲ Low reproductive rate
- ▲ Complex social structure — epimeletic behaviour (Mann *et al.*, 2000)
- ▲ Dependency on underwater acoustics
- ▲ Conflict of interest
- ▲ Bioaccumulation (Castello 2016)



Harbour Porpoise *Phocoena phocoena*

- ▲ Apex predators
- ▲ Genetically distinct groups
- ▲ 1.5-2.0 m
- ▲ 76-89% subsurface (Reed *et al.*, 2000)
- ▲ 70% dives <20m
- ▲ Air breathers
- ▲ Echolocation



Threats

- ▶ Bycatch
- ▶ Aggregate Dredging
- ▶ Noise
- ▶ Pollution
- ▶ Climate Change
- ▶ Predation



Swansea and Gower

- ▲ High energy environment
- ▲ Large tidal range (16.4m)
- ▲ Tourism – 4.7 million pa (2023) (CCS, 2004)
- ▲ Construction & industry
- ▲ Aggregate Dredging – 150,000 tonnes next 7 yrs
- ▲ Fishing – 90% <10m
- ▲ Carmarthen Bay and Estuaries European Marine Site



Key Points to consider

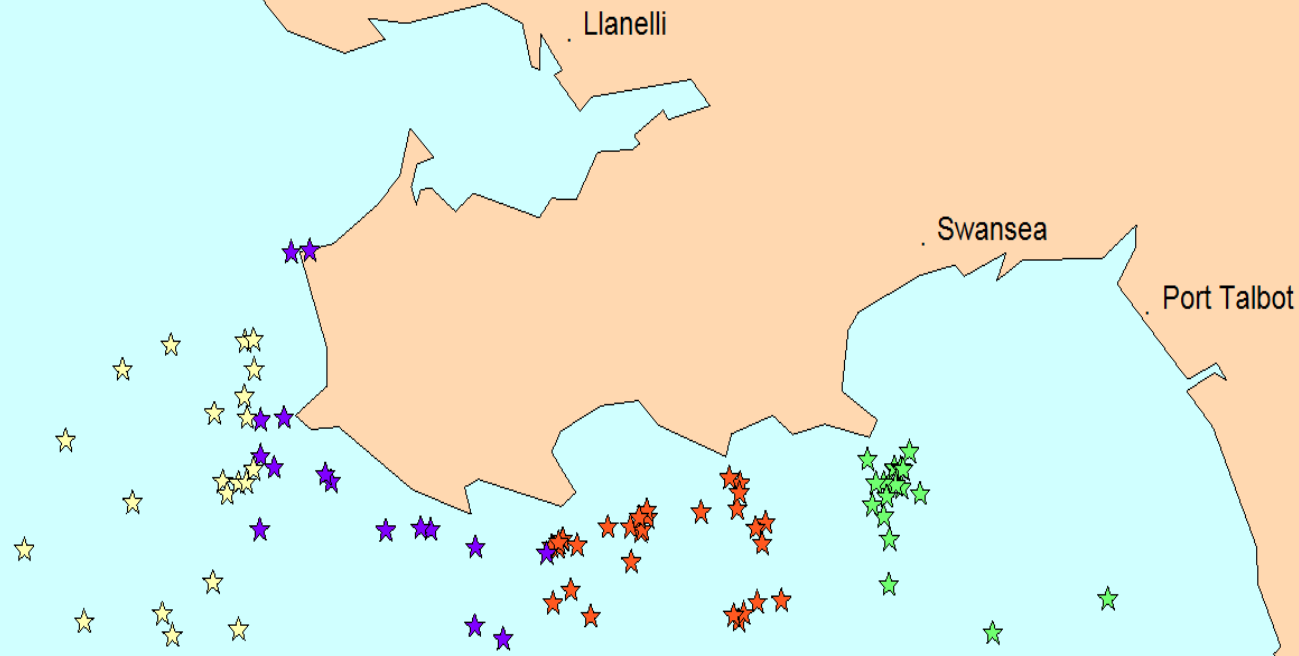
- ✦ Resident inshore population
- ✦ Affinity with 20m depth
- ✦ Site variation in usage
- ✦ Negative response to boats



Vessel-based Observations 2002-2005

KEY

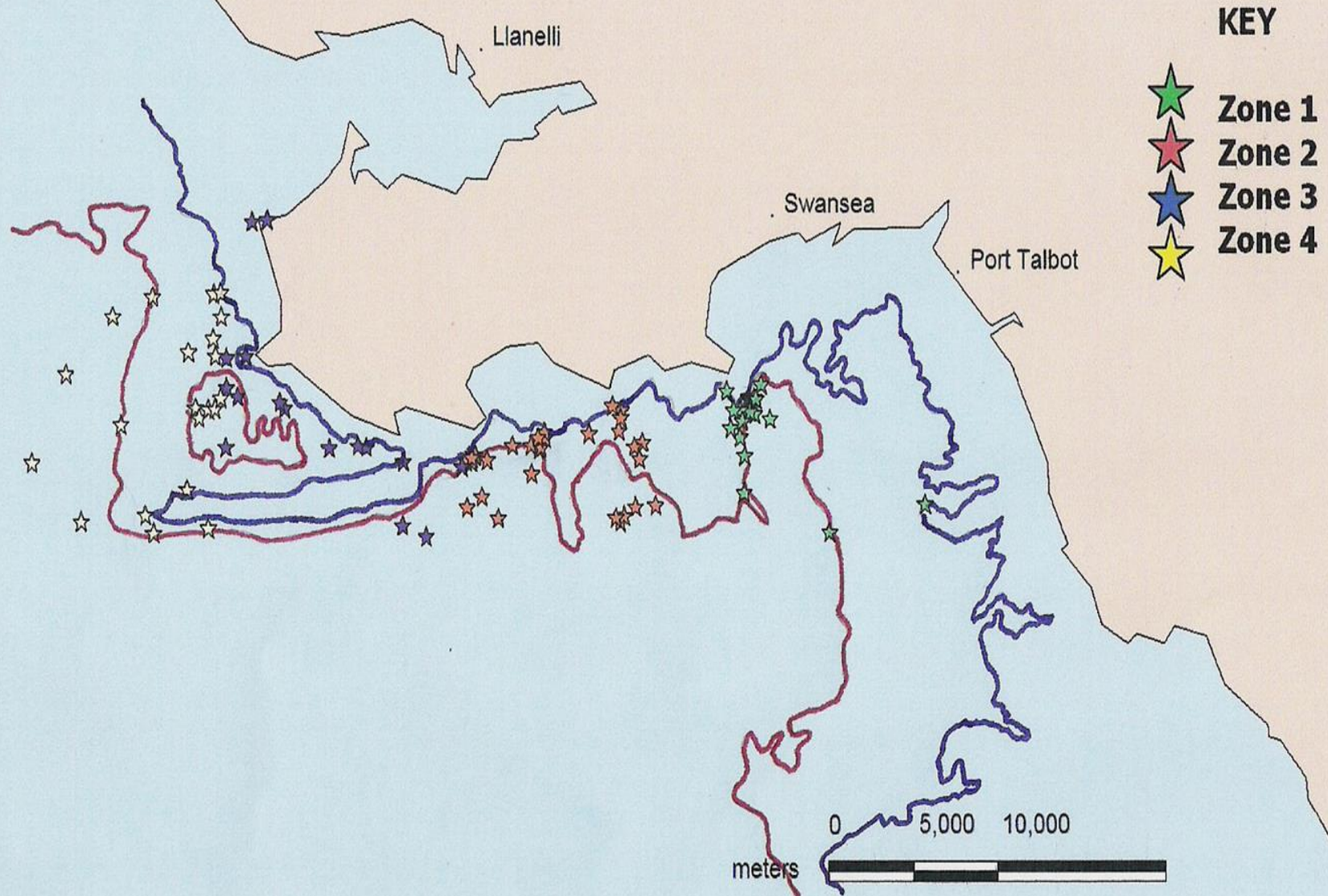
-  **Zone 1**
-  **Zone 2**
-  **Zone 3**
-  **Zone 4**



0 5,000 10,000
meters

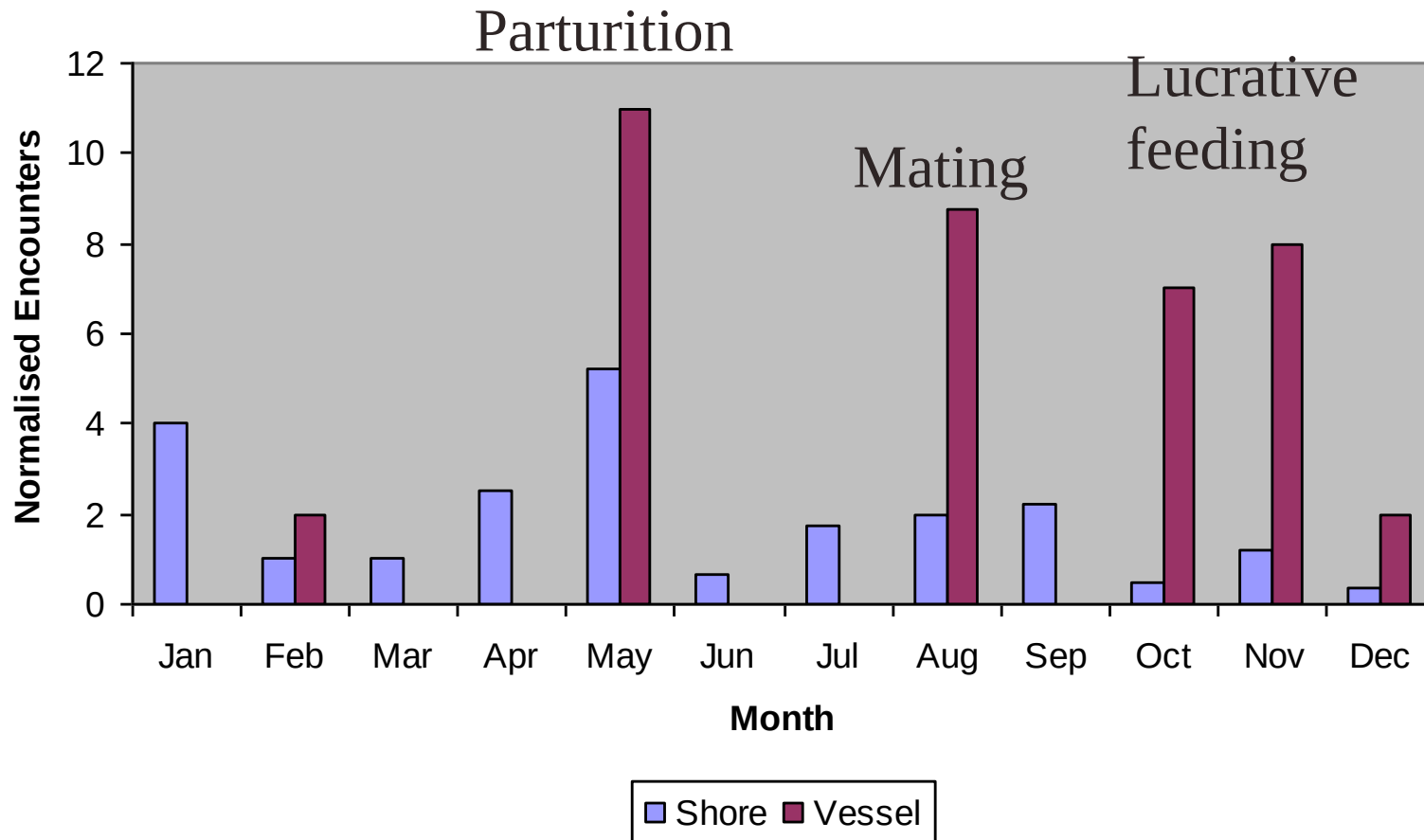


Vessel-based Observations 2002-2005



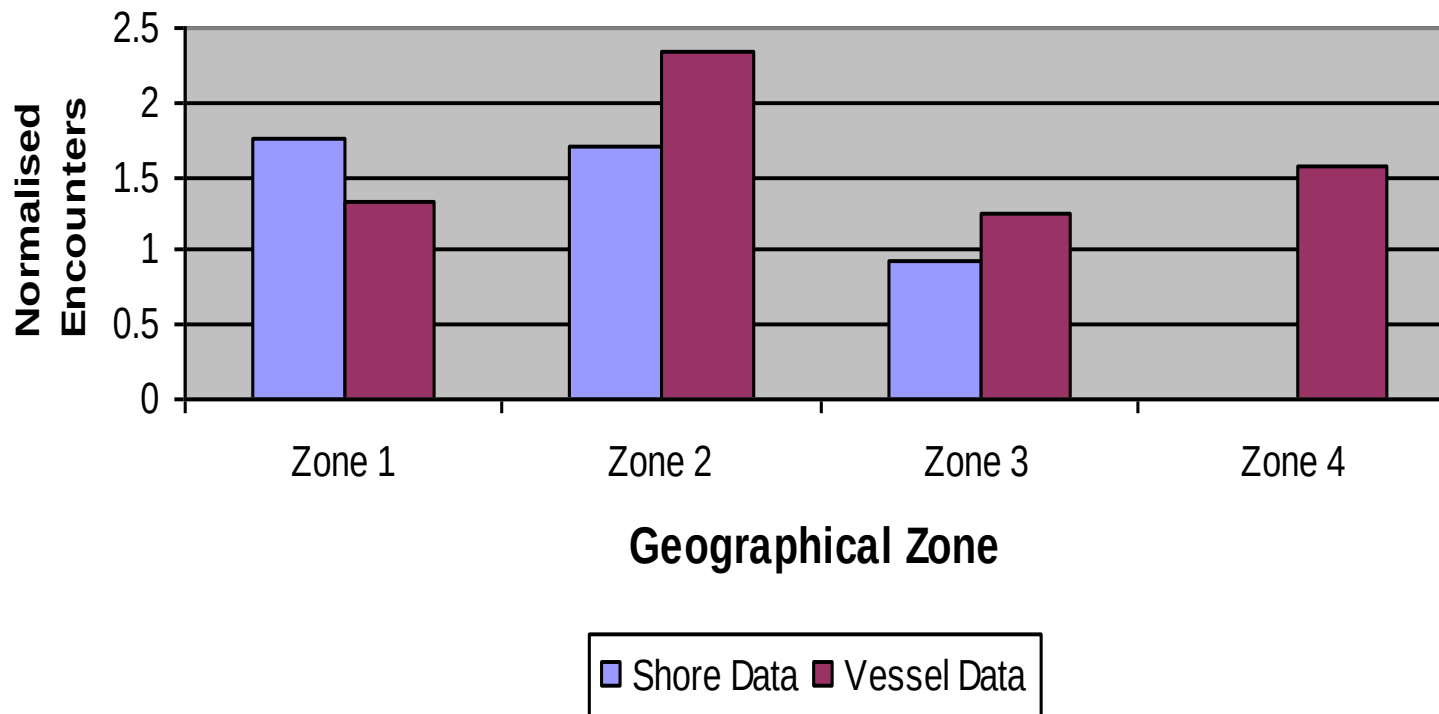
Temporal: Geographical Distribution

Temporal distribution of porpoise encounters (2002-2005)



Spatial Distribution

Shore and Vessel Encounters (2002-2005)



Behavioural Analysis

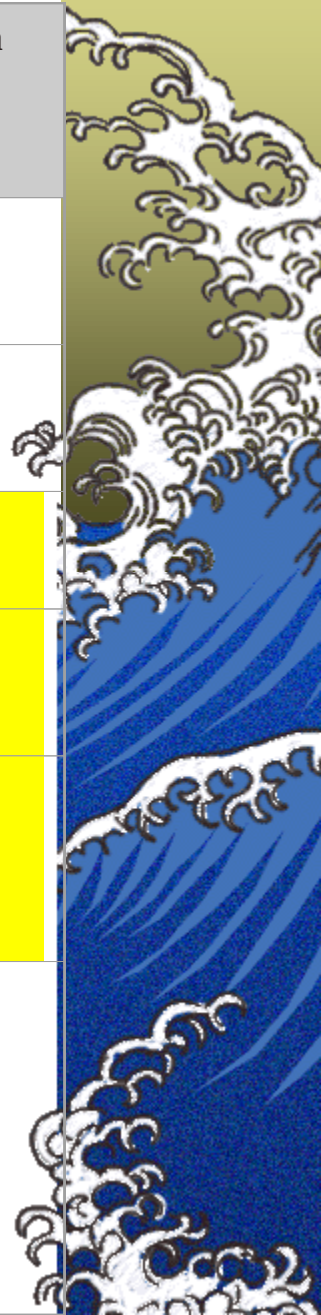
- ▶ Mumbles (Zone 1) – events indicative of foraging and feeding
- ▶ Oxwich (Zone 2) – events indicative of resting
- ▶ Limekiln Point (Zone 3&4) – events indicative of socialising and feeding

- ▶ Porpoises spend 90% of their time feeding/foraging
- ▶ Known to ‘switch off’ echolocation when feeding
- ▶ Key lifecycle periods:
 - ▶ April/May – giving birth
 - ▶ August – mating



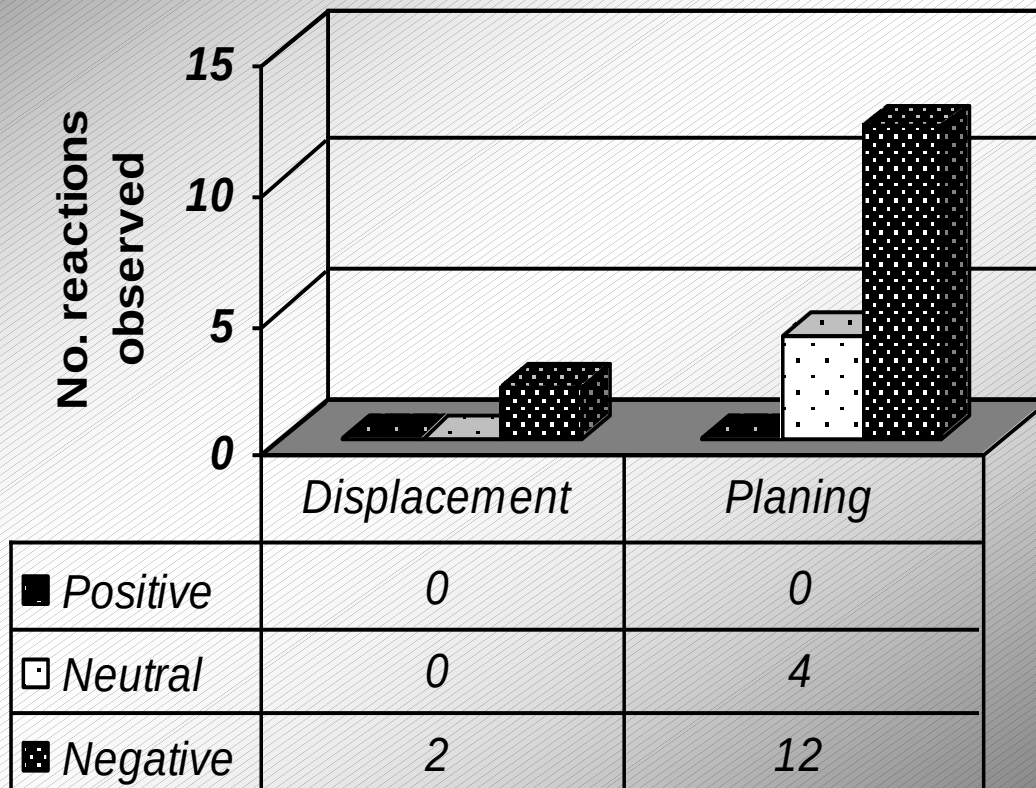
Site Comparisons

Zone 1: Mumbles	Zone 2: Oxwich	Zone 3: Port Eynon & Limekiln Point	Zone 4: Carmarthen Bay
Sediment: muddy sand	Sediment: sand → gravel offshore	Sediment: sand → gravel offshore	Sediment: sandy
Mean Depth at peak encounters: 22.65m	Mean Depth at peak encounters: 28.45m	Mean Depth at peak encounters: 19.97m	Mean Depth at peak encounters: 25.70m
Boat activity: High	Boat activity: High	Boat activity: High	Boat activity: Low
Peak activity: Jan, May, Aug	Peak activity: Aug, Nov	Peak activity: May, Aug, Nov	Peak activity: May, Aug, Oct
Predominant Behaviour: Foraging	Predominant Behaviour: Socialising, resting and rearing	Predominant Behaviour: Transient & opportunistic feeding	Predominant Behaviour: Breeding & nursery area
Notes: Increase in circling behaviour as year progresses. Summer encounters negatively correlated with survey effort. Importance of 20m contour	Notes: Increase in circling as year progresses. Sibling agonistic behaviour seen as well as parental teaching.	Notes: Dominant flood tide to north of Helwick, ebb tide dominant to south – porpoise encounters positively correlated with dominant tidal direction. Importance of 20m contour	Notes: Incidents of stranded individuals more prominent than other zones.



Reaction to Moving Vessels

Reaction of porpoises to moving vessels of various categories





Harbour Porpoise – Caswell Bay.
15/12/14

Harbour Porpoise Strandings Data 1994-2012 for the survey area

Site	No. Harbour Porpoise	Months	State of Carcass						Gender			Age				
			F	S	M	A	U	L	M	F	U	N	C	J	A	U
Port Talbot: (Aberavon, Briton Ferry)	32	April, May, June, July, August, September, October, November, December	2	1	7	13	5	4	4	11	18	3	3	4	10	13
Swansea Bay: (Crymlyn, Jersey Marine, The Slip, Black Pill)	17	January, February, March, June, July, September, October	6	3	5	4	1		4	10	5	4	1	4	5	5
Mumbles: (Rotherslade, Caswell, Langland)	10	April, May, June, July, August, September, October, December	2	1	3	4		1	3	2	6	1	3	1	2	4

Key:

State of carcass: Fresh (**F**); Slight decomposition (**S**); Moderate decomposition (**M**); Advanced decomposition (**A**); Unknown status (**U**); (**L**) Live

Gender: Male (**M**); Female (**F**); Unknown (**U**)

Age: Neonate <90cm (**N**); Calf 91-110cm (**C**); Juvenile 111-129cm (**J**); Adult >130cm (**A**); Unknown (**U**)

Today's Workshop

1. In pairs, take your location map and roughly plot porpoise activity (where found and what they are doing)
2. Map porpoise strandings
3. Map fishing activity where info is available.
4. Using Ketchum's checklist, attempt to identify hotspots of activity, mapping against porpoise usage.

How would we mitigate against likely impacts?



Coastal Users Analysis

- ▲ Ketchum (1972):
 - ▲ Commercial and Industrial
 - ▲ Residency and Recreation
 - ▲ Agriculture, Aquaculture and Fishing
 - ▲ Military and Strategic
 - ▲ Conservation
 - ▲ Waste Disposal (See worksheet)

- ▲ Harbour porpoise habitat usage:
 - ▲ Feeding
 - ▲ Breeding
 - ▲ Resting
 - ▲ Socialising
 - ▲ Migrating corridors between critical habitats



Mitigation

✦ Industry:

- ✦ Avoid piling during calving season
- ✦ Soft starts
- ✦ Air bubble curtains

✦ Fisheries:

- ✦ Good working relations
- ✦ Transparency → Bycatch → alerting devices

✦ Tourism:

- ✦ Voluntary Codes of Conduct
- ✦ Speed restrictions → 20m contour
- ✦ Restricted access

