

An introduction to the increasing threats posed by underwater noise pollution.

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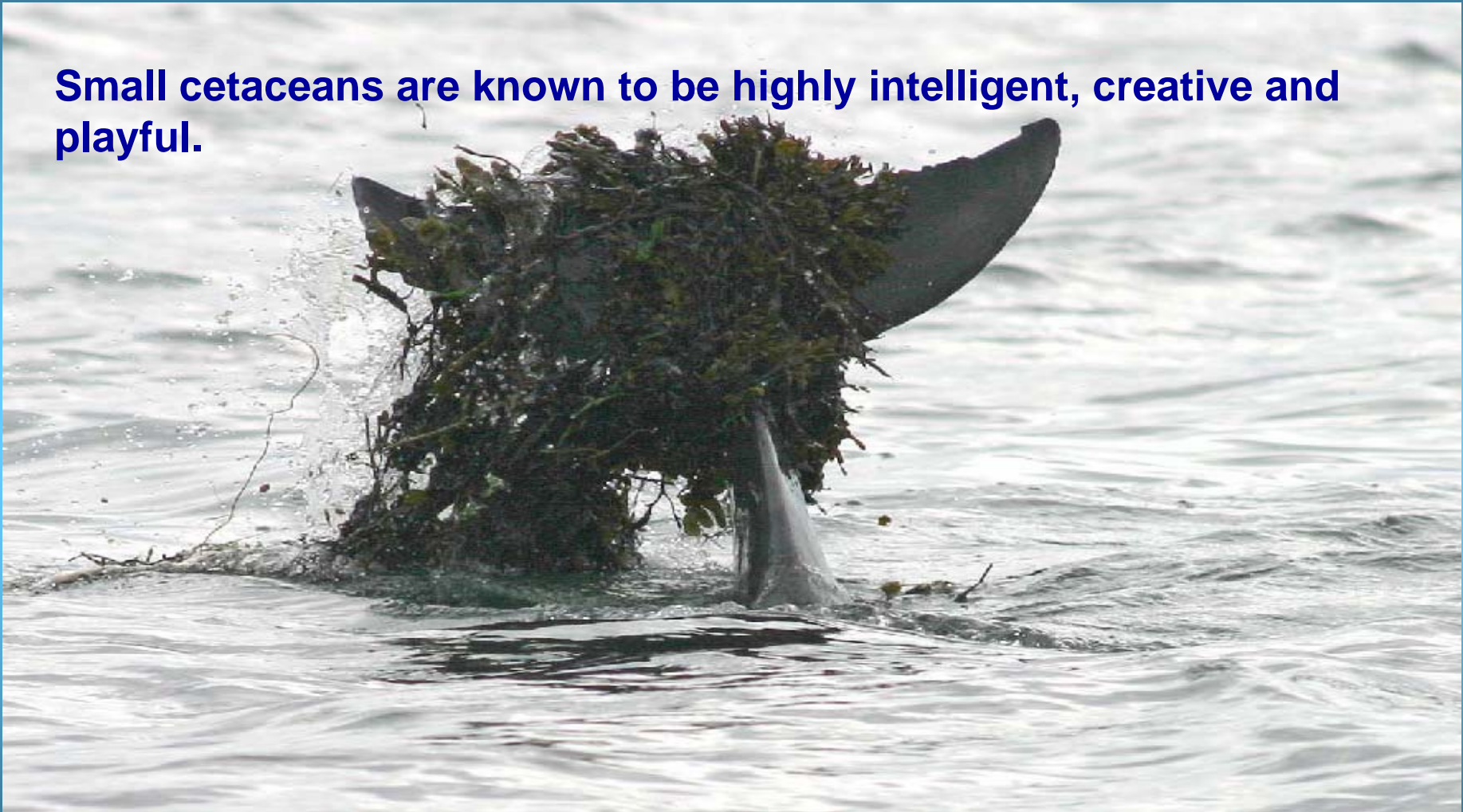




**Two themes: The special nature of the
animals concerned**

Threats and mitigations

Small cetaceans are known to be highly intelligent, creative and playful.



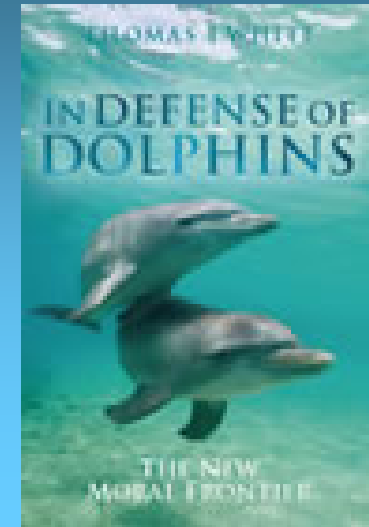
Bottlenose Dolphin – Moray Firth Scotland

Photo: copyright Charlie Phillips/WDCS

A recent review of the evidence for higher cognitive functioning in cetaceans revealed the following:

- High level of encephalisation, including very well developed cerebellum in many species
- Long lives and long periods of parental care
- Ability to learn complex behaviours and solve problems (Predators of patchy unpredictable prey)
- Ability to improvise
- Tool use (but not tool manufacture)
- Vocal and behavioural imitation
- Ability to learn artificial languages (limited vocabulary but understand grammar and syntax)
- Many species exhibit closely co-ordinated behaviours
- Many species have complex social interactions
- Evidence of self awareness, awareness of others and emotional responses
- Exhibit cultural transmission of information

And this new and very important book:



The book argues that dolphins have intellectual and emotional abilities sophisticated enough to grant them “moral standing”; that they should be regarded at least as “nonhuman persons”; and that the current state of human/dolphin interaction (characterized by the deaths and injuries of dolphins in connection with the human fishing industry and the use of captive dolphins by the entertainment industry for therapeutic purposes and by the military) is ethically indefensible.

For more information see:



Available online at www.sciencedirect.com

ScienceDirect

Applied Animal Behaviour Science 100 (2006) 103–116

www.elsevier.com/locate/applanim

APPLIED ANIMAL
BEHAVIOUR
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Into the brains of whales[☆]

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Available online 15 May 2006

Abstract

Whilst studies on cetaceans have focused on a few populations of just a few species, various complex behaviours and social structures that support the notion that cetaceans should be regarded as intelligent animals have been revealed. The evidence to support this is reviewed here and is best developed for some odontocete species, although recent studies on minke whales show that the behaviour of baleen whales may be more complex than previously thought. As one consequence of high intelligence, the potential impacts of whaling and other removals may be far greater than they appear and a new approach to the conservation of these species – which takes into account their intelligence, societies, culture and potential to suffer – is advocated.

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Keywords: Cetaceans; Dolphins; Whales; Intelligence; Culture; Conservation; Welfare; Management

The notion of treating dolphins as 'non-human persons' may go too far for some (although you are encouraged to view the evidence) but, at the least, we need to accept that these highly intelligent, 'acoustically specialised' and highly social animals require special consideration in terms of their conservation management. In particular we need to bear the following in mind:

- Intelligent, social mammals
- Primary sense = acoustic – needed for social and sensory biology
- 'Standard requirements' – adequate prey and adequate, safe and 'healthy' habitat.

Other requirements –

- need to be able communicate (at distance);
- need time to socialise, learn and play;
- need to be able to pass information across generations ('Cultural transmission' of information)

Whale sounds

- Mysticetes (baleen whales) produce low frequency sounds that are mostly around 10-2,000 Hz which can travel over larger distances of around 100 or more kilometres.
- Odontocetes (toothed whales and dolphins) are more mid- and high-frequency specialists, using principally frequencies of 1-150 kHz (some though bio-sonar or echolocation clicks can go as high as 250 kHz).
- Sperm whale clicks can be detected over ranges of almost 10 km.



a sperm whale click may be as loud as some naval sonars, however it is very brief and extremely directional!

Major Noise Sources

- Commercial Shipping
- Airguns used for fossil fuel exploration/geophysical survey
- Military Sonars
- Acoustic Deterrent Devices
- Marine Industry

Some 26 windfarms are currently under development in the UK and 8 further sites have been awarded – many more are planned for the rest of Europe.



Potential range of impact

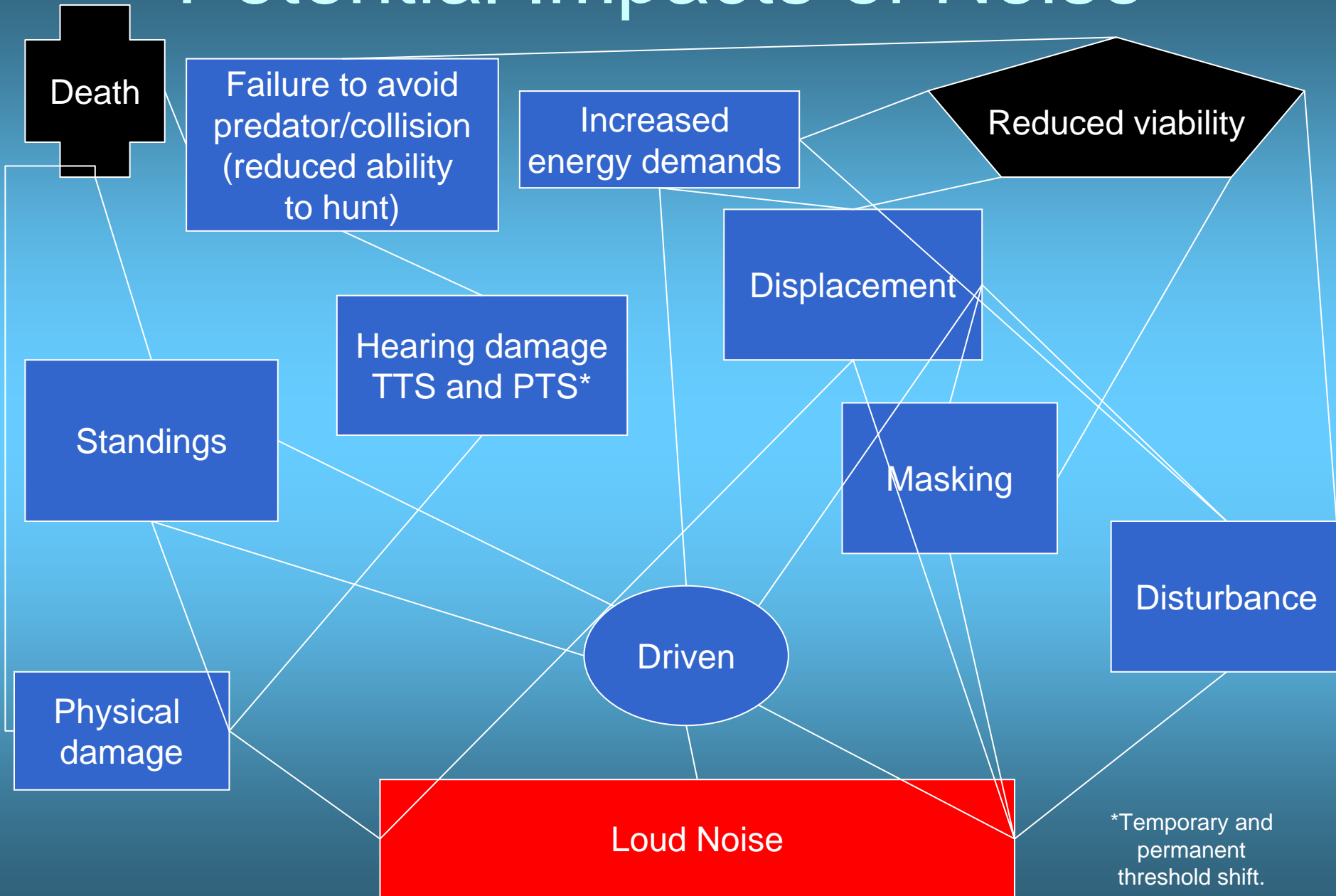
The U.S. Navy's Low Frequency Active (LFA) Sonar has a potential estimated area of impact for cetaceans (i.e. over which received levels of 120 dB and above can be heard) around 3.9 million km²

Noise from a single seismic survey (which may be continuous for days at a time) can cover a region of almost 300,000 km², raising noise levels two orders of magnitude (20 dB) higher than normal.

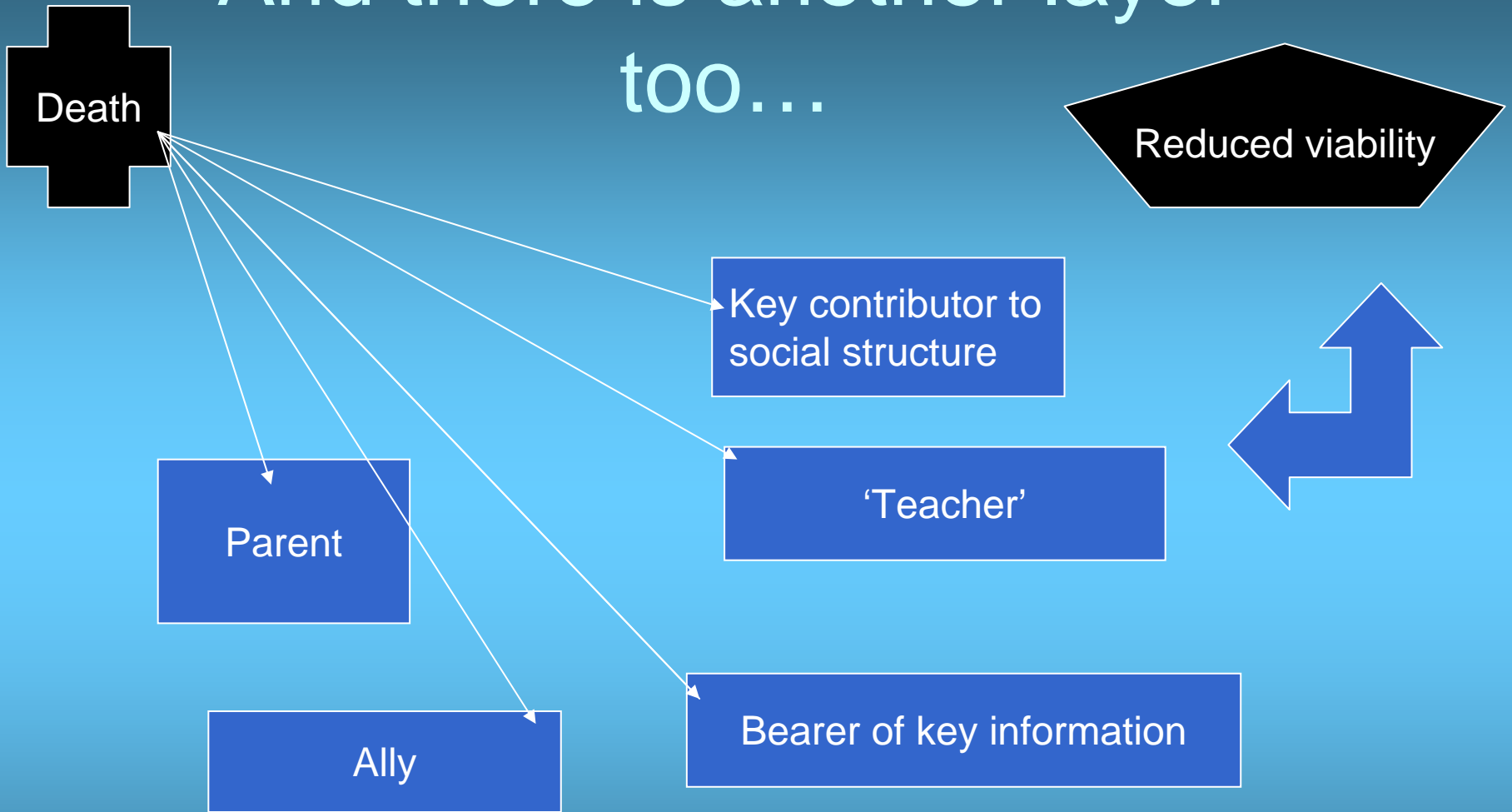
Ocean background noise levels have doubled every decade for the last several decades in some areas, probably as a result of increases in commercial shipping.

After Weilgart – in press.

Potential Impacts of Noise



And there is another layer too...



(And there could be a third layer if we considered impacts on prey!)

Potential acute and chronic impacts

ACUTE

- Strandings (and non-strandings) of damaged animals
- Organ and ear damage

CHRONIC

- **Masking** (background noise levels so high that communications/ echolocation/ other signals cannot be discerned - this adversely affects the cetacean social units/co-operation causing impaired co-operation/information transfer)
- **Disturbance** (interrupts normal behaviours – feeding, breeding, socialising, resting etc. and creates increased energy demands)
- **Displacement** (moves animals from optimal habitat e.g. primary feeding, breeding, resting or calving grounds)

In recent years, unusual mass strandings of beaked whales – many known to be associated with military activities - have become the focus of considerable concern and research.



The most recent such stranding – Almeria, Spain, 2006

A list of beaked (and non beaked) whale strandings can be found in the acoustic reports on the website of the Marine Mammal Commission.

Defining the problem

“The problem is one of isolation and lack of awareness between humans who use the sea and marine mammals that inhabit the sea.

Increased use of the sea for commercial shipping, geophysical exploration and advanced warfare has resulted in a higher level of noise pollution over the last few decades.

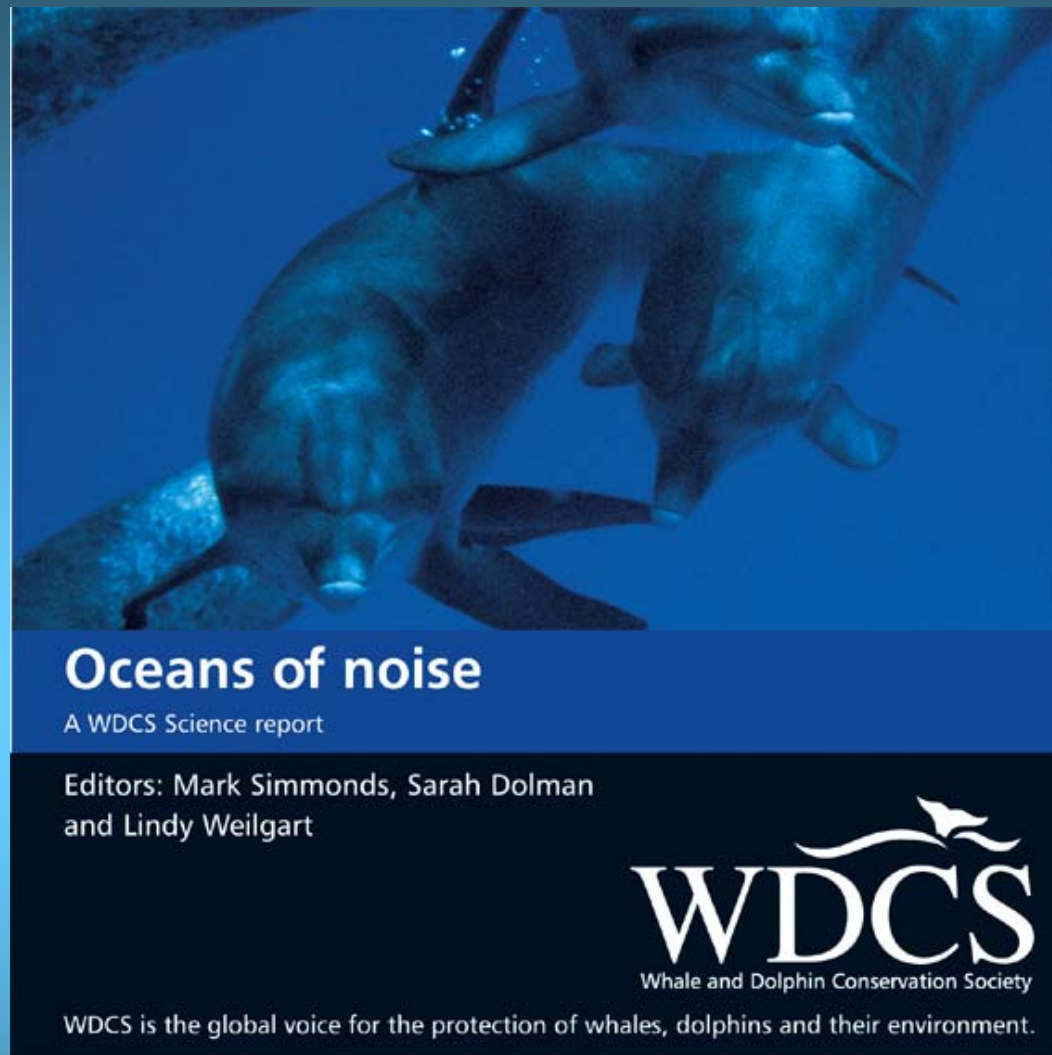
Informed estimates suggest that noise levels are at least 10 times higher today than they were a few decades ago.”

**Professor John Hildebrand
Scripps Institute of Oceanography, San Diego.**

A few years ago WDCS published a substantive review on noise pollution on its website. This also contained a series of recommendations:

THE WDCS MARINE NOISE ACTION PLAN

Noting the scale of the potential threat to cetaceans and other marine wildlife posed by marine noise, WDCS believes that some urgent actions are required at this time. We make the following six recommendations that we hope others will now heed if we are going to both adequately understand and react appropriately to this threat:



<http://www.wdcs.org/dan/publishing.nsf/allweb/48A0C8D9C559FA0680256D2B004027D4>

1. That attention is given to the development of international law to regulate marine noise pollution – we call either for
 - an international treaty dedicated to this issue; or
 - the development of comprehensive regulation through existing regimes;

2. That an independent body should be established to initiate, promote, monitor and fund marine noise research;

3. That all major developments in the marine environment – including those of an industrial or military nature – are;
 - subject to full environmental assessment in terms of their input of noise pollution to the wider environment;
 - that this process takes due regard of the precautionary principle; and
 -
 - that wherever it occurs, environmental assessment is subject to full public scrutiny;

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- subject to full environmental assessment in terms of their input of noise pollution to the wider environment;
- that this process takes due regard of the precautionary principle; and
- that wherever it occurs, environmental assessment is subject to full public scrutiny;

4. That these same major developments;

- make a public commitment to mitigate their effects relating to noise; and
- employ effective mitigation measures **and develop alternative technologies to address this issue;**

5. We urge the navies of the world seek to effectively mitigate their noise-producing activities, avoid the deployment of powerful sonars and ideally develop a treaty that means that powerful sonars are not required; and

New publication:

6. That the boundaries and management regimes of Marine Protected Areas and Sanctuaries are developed to take noise pollution and its propagation beyond those declared boundaries.

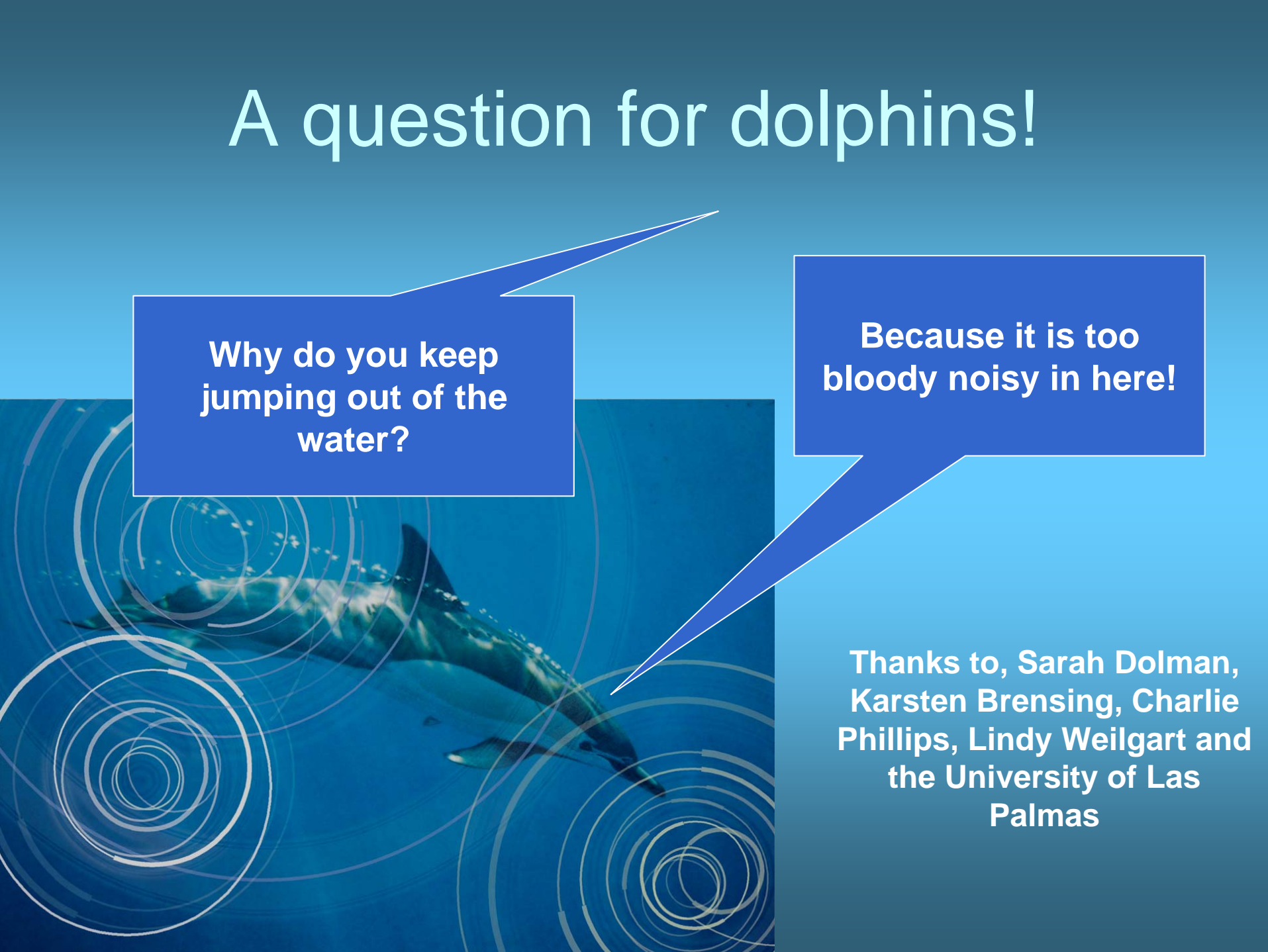
The report notes that very few MPAs are currently large enough to reduce exposure of cetaceans to anthropogenic noise. The participants therefore outlined an effective framework for identifying key cetacean habitat on a regional scale for management of noise pollution through spatio-temporal measures. This framework... considers the value of the different areas and habitats for the protection of each species, susceptibility of the various species in question, socio-economic value and available resources.

The report is available at:

http://www.cetaceanhabitat.org/view_news.php?select=22



A question for dolphins!

A dolphin is shown leaping from the water, with several concentric white circles around it representing sound waves. The background is a gradient of blue, transitioning from a lighter blue at the top to a darker blue at the bottom.

**Why do you keep
jumping out of the
water?**

**Because it is too
bloody noisy in here!**

**Thanks to, Sarah Dolman,
Karsten Brensing, Charlie
Phillips, Lindy Weilgart and
the University of Las
Palmas**