



PSA-015a-Seismic Operations

How do we save coral reefs?

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Oil and gas explorers use seismic surveys to produce detailed images of the various rock types and their location beneath the Earth's surface and they use this information to determine the location and size of oil and gas reservoirs.

Sound waves are bounced off underground rock formations and the waves that reflect back to the surface are captured by recording sensors. Analyzing the time the waves take to return provides valuable information about rock types and possible gases or fluids in rock formations. This is similar to the use of ultrasound in medicine.

Marine

In marine operations, a specialized vessel tows a "seismic streamer", or a collection of cables with seismic sources and hydrophones attached. The seismic sources use compressed air to produce acoustic energy. The hydrophones capture the returning sound waves.

Capturing Data

Hydrophones and geophones are highly sensitive. They are deployed in clusters to optimize the reception and recording of sound waves. This provides information about rock types and possible oil or gas deposits.

Onshore

Onshore seismic operations usually use specialized trucks that carry a heavy plate that is vibrated to generate a seismic signal. Onshore seismic has been used in sensitive locations — including central Paris — without damaging buildings or the environment.

SEISMIC PROCESSING

Seismic processing requires powerful computers,—————sophisticated software and specialized skills

Once the seismic has been processed, it must be interpreted by geophysicists. The results will be compared with other data (such as rock samples, regional well/drilling results and known geology) to enhance the accuracy of the interpretation. This often produces detailed understanding of geology to depths of more than 10km.



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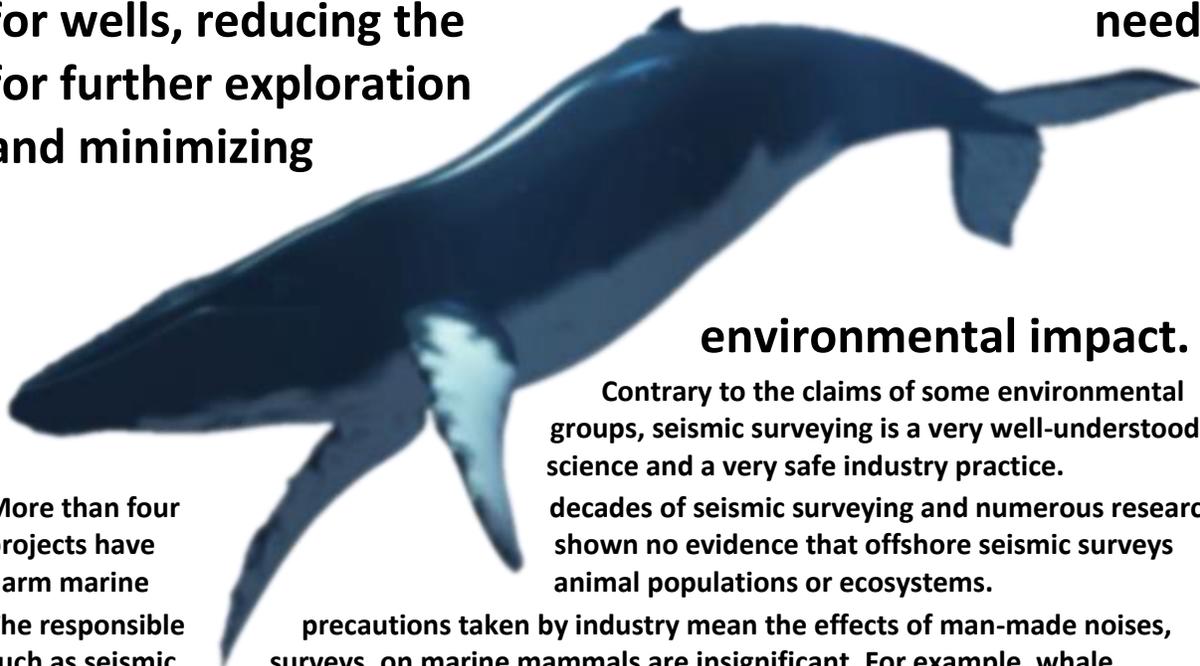
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ENVIRONMENTAL IMPACT

Seismic information is used to accurately plan locations for wells, reducing the need for further exploration and minimizing



environmental impact.

Contrary to the claims of some environmental groups, seismic surveying is a very well-understood science and a very safe industry practice.

decades of seismic surveying and numerous research shown no evidence that offshore seismic surveys animal populations or ecosystems.

More than four projects have harm marine

The responsible such as seismic

precautions taken by industry mean the effects of man-made noises, surveys, on marine mammals are insignificant. For example, whale populations can be found all along Australia's coastlines and seismic operators employ extensive precautions to minimize any disturbances to these animals. Whale populations in Australia continue to thrive — humpback whale populations are increasing at close to their biological maximum, more than 10 per cent a year.

There is much more offshore oil and gas activity on Australia's west coast than on its east coast, but the rates of humpback population increase are almost identical. There is no evidence that seismic surveys off Western Australia have harmed Australia's humpback whale populations

HOW NOISY IS A MARINE SEISMIC SURVEY?

The sound from seismic surveying is comparable to many naturally occurring marine sounds — including those made by animals themselves.

SOURCE	SOUND INTENSITY & PRESSURE (dB re 1µPa @ 1m)	FREQUENCY (HZ)
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Undersea earthquake

272

50



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Seafloor volcanic eruption	>255	Varied
Lightning strike on sea surface	250	Varied
Seismic acoustic source	230 - 255	<200
Sperm whale click	Up to 235	100 - 30,000
Bottlenose dolphin click	Up to 229	Up to 120,000
Ship sound (close to hull)	200	10 - 100
Breaching whale	200	20
Blue whale vocalization	190	12 - 400
Ambient sea sound	80 - 120	Varied

Adapted from: Swan, JM et al, 1994 environmental implications of offshore oil and gas development in Australia, APPEA, Australia

HOW ARE MARINE SEISMIC SURVEYS DONE?

The oil and gas industry uses extensive environmental management plans to ensure all offshore operations are conducted safely and responsibly.

Seismic surveys cannot begin when certain species are too close to the sound source. Once the survey does begin, the seismic sources are turned up slowly during a 'ramp-up' period of about 30 minutes, so that marine animals are not startled and can move away.

The slow approach of ships (generally only a few knots) provides further time for marine animals to move. Survey timing, observation zones, low-power zones, acoustic monitoring and many other measures further reduce any interactions with – or effects upon – marine species.

HISTORY & SCIENCE

For more than four decades, seismic surveying and countless research projects (both in Australia and world-wide) have shown no evidence to suggest that sound from oil and gas exploration activities in normal operating circumstances has harmed marine species or marine ecological communities.



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Nor have studies found any significant disruption of marine animal behaviors that would affect survival or reproduction.

One of the most comprehensive research studies carried out anywhere in the world was conducted by Woodside in 2007 in and around Scott Reef off the north-west of Australia.

This extensive research was done by leading researchers from all over the world who studied the impacts of a seismic survey on marine life. They concluded that the survey caused:

no significant, long-term impact on fish behavior_____ in either caged or wild fish

no hearing impacts (temporary or permanent) _____found in fish

no evidence of coral damage

no physiological damage to fish as a result of the _____seismic survey

no long-term effects on fish or coral populations

no observed physiological effects or mortality in _____other marine fauna.

Video: Maxima Seismic Survey Video

Many other studies have been conducted by various organizations around the world. In Canada in 2004, teams of scientists prepared major literature reviews of the primary and secondary literature that reported on experimental studies and field monitoring of the effects of sound, particularly seismic sound, on marine organisms. These have been published as Review of Scientific Information on Impacts of Seismic Sound on Fish, Invertebrates, Marine Turtles and Marine Mammals.

These studies have not found evidence that suggests any link between seismic surveys and adverse impacts on marine life.

[Read the review](#)

NOPSEMA

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