HYDROCARBON EXPLORATION AND ALBACORE TUNA FISHERIES - A CLASSICAL EXAMPLE FOR THE ROLE OF BCC IN JOINT AND TRANS-BOUNDARY MANAGEMENT OF THE BCLME -

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Marine seismic surveys are the most important tool for authorities and the petroleum industry for mapping potential deposits of oil and gas under the seabed. These surveys are conducted by sending sound waves into the seabed. The time it takes for these waves to be reflected back from the formations, as well as the energy content in the reflected signals, provides a basis for evaluating the properties of the deposits.
Seismic Surveys: 2D

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Seismic Surveys: 3D

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Air guns: Air at 140 atmospheres pressure is routed into a chamber. A pressure wave is created in the water when the air is released quickly through the gun portals. Putting several air guns together into an extended air gun array increases the strength of the resulting seismic signal, thus achieving a focusing of the sound energy transmitted down into the ground.

The sound bursts - at decibel levels in the 200-250 range at source - are repeated every 6 to 10 seconds. Each has a duration of 10 to 30 milliseconds. The (mostly) downward pressure pulse of the sound waves has a frequency between 10 and 300 Hz.
The airgun arrays are towed approximately 50 meters behind the vessel and can be up to 8 km long, and operation of such large arrays requires relatively calm waters. Operating in rough seas is not only dangerous, but also reduces the quality of the data generated.
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Sound travels four times faster in water than in air. Transmission loss in water is much lower. In a study, the catch rates during seismic shooting were found to decrease over an area of 18 nautical miles (33 km) out of the seismic area. The magnitude of any effects will be inversely proportional to the distance from the sound source.
History of Seismic Acquisition in Namibia
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**Effect on Tuna Fisheries**

Marine fish and mammals depend on sound for:

- avoiding predators / hazards (noise pollution)
- navigation
- reproduction
- communication with group members and young
- food-finding
- sensing their environment

Documented Noise Impacts on Fish:

- Disruption in schooling and migration
- Disruption of homing or orientation
- Masking of mating calls
- Decreased feeding efficiency
- Reduced catch rates of 40-80% up to 30 km from seismic surveys
Migratory Route of Tuna

October - April

September - January

August - December

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Recent Seismic Acquisition in Namibia

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A simple correlation between seismic acquisition in Namibian waters and reduced tuna catches can not be inferred from the data available, and more in depth research is required.
Possible other Impacts on Tuna Catches

- Seismic surveys affecting the migratory route outside Namibian waters (e.g. South Africa)
- Climate change: stronger than usual winds, swells, as well as currents and water temperatures, availability of nutrients during the fishing season
- Albacore tuna is overfished (http://www.worldwildlife.org), classified as near-threatened by IUCN and placed on seafood red list by Greenpeace because of overfishing
- Catches in international waters: There are no records of landings of Albacore during its migratory cycle through international waters before it reaches our waters again. Large volumes off the school could be caught
- Abundance of feed around the fishing grounds, fish is not hungry
Knowledge Gaps and R&D Needs

- Improve statistics of catches for better interpretation
- Develop a methodology for extension of the fact base on behavioural changes
- Conduct direct measurements before, during and after seismic surveys
- Model sound distribution in water
- Study the scare effect on migratory pathways
- Study the scare effect in relation to distance from source
- Study the time from the end of a seismic survey to the return of the area to normal conditions
- Establish more data for the migratory routes
- Research catches in other countries adjacent to the migratory route
- Research the effect of climate change per se and the effect of climate change to the trophic chain with reference to tuna
A CLASSICAL EXAMPLE FOR THE ROLE OF BCC IN JOINT AND TRANS-BOUNDARY RESEARCH & MANAGEMENT

**to promote a coordinated regional approach to the long-term conservation, protection, rehabilitation, enhancement and sustainable use of the Benguela Current Large Marine Ecosystem, to provide economic, environmental and social benefits.**

*Article 2, Benguela Current Convention*