

Commentary on the potential effects of oil and gas exploration and drilling activities on the marine environment - Southern Gulf of St. Lawrence, Sydney Bight regions, and Scotian Shelf region

Statement by Dr. Christopher W. Clark, January 2002

My name is Christopher W. Clark and this statement will be read by Neal Livingston. I have been asked on behalf of the Marqaree Environmental Association & the Save Our Seas Coalition to provide expert commentary on the potential effects of oil and gas exploration and drilling activities on the marine environment with particular attention to the Southern Gulf of St. Lawrence and Sydney Bight regions, but including the Scotian Shelf region.

My background: I have formal training and experience in both engineering and biology with a masters degree in electrical engineering and a Ph.D. in Biology. In 1972 Roger and Katy Payne introduced me to the world of whales and in particular the issues relating to the potential impacts of human-made underwater sounds on marine mammals. My Ph.D. research was on acoustic communication in an endangered population of southern right whales. Since completing my Ph.D. I have focused my research on acoustic communication in marine mammals with particular attention to large whales including bowheads in the Arctic, blue, fin and humpback whales throughout the world's oceans, and right whales in the western North Atlantic. A significant amount of that research has included studies on the impact of human-made underwater sounds on marine mammals. Presently I am the I. P. Johnson Director of the Bioacoustics Research Program at Cornell University in NY, USA.

I consider myself extremely fortunate to be a biological engineer studying whales for a living. It is a rather specialized job. However, when you work in the ocean on endangered species, you cannot help but observe the tension that exists between the basic needs of the animals living in the ocean and human society's demands for resources that occur in and beneath that ocean. In every case throughout my 25 years working on whales – off the North Slope of Alaska, off the California coast, off Florida, in the Gulf of Mexico, off the Shetland Islands, in the Mediterranean Sea – in every case there has been a conflict between the basic needs of the natural world and human demands to exploit deposits of hydrocarbons that lie beneath the sea. As a result of these conflicts, I have conducted research on the potential impact of oil and gas development and production on gray and humpback whales. I have served on numerous scientific review boards related to the potential impact of oil and gas development and production on marine life. Over the past 10 years I have also conducted research on the potential impact of other human underwater sound sources on marine mammals. All these sources are intense and low in frequency or pitch.

In this statement I want to address two important topics. These topics are at two different levels of concern. One is immediate to the Scotian Shelf and Cape Breton areas and relates to the issue of harvesting hydrocarbons within shallow coastal habitats. The second topic is more general and relates to issues of ocean resource exploitation and habitat degradation. I would precede this by saying that the decisions made in this particular case will have profound and far reaching impacts, not only on the lives of the people living in these coastal communities today, but on these communities in generations to come. However, by far the greatest impact will be on the communities of animal populations living in the waters

surrounding your lands. As the ocean goes, so goes the land. Destroy the sea, and the land goes with it.

What are my greatest concerns regarding the impact of oil and gas development and production on marine life? First, oil and gas is not a renewable resource. You extract it, you convert it to energy, carbon dioxide, water and byproducts, and you move on to another source site. Second, the process of exploration is by its very nature dirty work. It requires exploring for hydrocarbons. To discover where they are, very short bursts of very high energy noise are exploded within the ocean and injected into the earth. Those acoustic explosions are repeated over and over again, 24 hours a day, for days on end. They are the modern form of exploratory dynamite, controlled explosions going off every 9-12 seconds. They represent the most severe acoustic insult to the marine environment I can imagine short of naval warfare. Lastly, we simply do not know enough about the impacts of exploration and development on such biologically rich areas as the habitats surrounding Nova Scotia and Cape Breton. We don't know enough about the short-term impacts, and we certainly do not know enough about the long-term and cumulative impacts to accurately determine the effects on fish populations, on lobster populations, and on other populations of critical species. You folks here have far greater knowledge and experience than I do with the cultural and economic value of the coastal regions around Nova Scotia and Cape Breton. Here there is a choice between the costs and benefits. What is the potential cost from loss of a productive habitat? What loss is tolerable and what is intolerable? What are the benefits from the exploration and development? Do these offset the costs? Do these offset the costs in the short-term? In the long-term?

I don't have answers to all these questions, but I do have some direct experience with potential short-term impacts, and I have real concerns about the uncertainties related to long-term and cumulative impacts.

Marine animals, whales, dolphins, seals, turtles, and fish, are at risk from oil and gas exploration and production activities. Reactions are not always consistent and seem to depend on context – that is, a feeding or breeding animal will tolerate much higher levels of acoustic noise exposure than resting or traveling animals. Reactions vary between species. Predictions of total avoidance have not been shown. However, predictions of no-impact have been false as well. From experimental research conducted almost 20 years ago on gray whales off California, we know that migrating whales show obvious and dramatic avoidance responses when exposed to explosions from seismic airgun arrays. Mothers and calves move rapidly into the breaking surf close to the coastline, adults hide in acoustic shadows behind large rocks, and groups of animals split apart and appear disoriented. From more recent research off Alaska, bowhead whales almost totally avoid coming within 20 km (12 miles) of seismic airgun activity. The bowhead situation is interesting because it involves a case where claims by native Alaskans that industrial activities were changing whale behavior were ignored or not given much credence, but later proven by extensive research. Sometimes native intuition is valuable and the most direct passage to a reasonable solution.

In the short-term, animals will often tolerate high levels of harmful exposures – in some cases they are so intent on a critical activity such as breeding or feeding that they tolerate the harmful exposure, or they simply cannot move away from the harmful exposure. In the longer-term, especially for animals that migrate in and out of an area, animals will avoid returning to an area with persistent or high levels of noise.

Persistent or high levels of noise are characteristic of both exploration and production activities associated with oil and gas. I have been monitoring coastal habitats with and without oil and gas industrial activity and the comparative contrast is profound. In areas, such as off the west coast of Africa or around the British Isles, it is not an exaggeration to describe the environments as urbanized. In cases where there is seismic activity, the noise is so loud that it drowns out whale songs and contact calls, as well as the calls of fish. It is important to note that there are no vertebrate animals that are deaf. They all hear. Such high noise levels drastically shrink the distances over which marine animals can communicate. Animals normally in contact are no longer able to hear each other. In cases where the sounds are critical for breeding or defense against predators, the results can be disastrous. For whales, which are long lived and breed once every few years, the impact would take years to accumulate. For most fish, the impact would be much quicker.

One of the very important aspects of high levels of noise and any resultant acoustic impact is the spatial and time scales over which impacts can occur. When it comes to spatial scale, I'm not talking about a few square miles. I'm talking about tens of thousands of square miles, areas the size of the Norwegian Sea! When it comes to time scale, I'm not talking about a few hours every now and then. I'm talking about significant portions of the year - May through October. The deceptive aspect about acoustics is the misconception that just because everything looks peaceful at the surface this is not representative of what it is like in the ocean. Sound travels very effectively in the water and in the earth's crust. Over the past two years as I and others have been acoustically monitoring the western North Atlantic, we easily hear the seismic activities occurring along the Scotian shelf. I easily detect the Scotian airgun explosions off Cape Cod 100 miles away, while other instruments detect the same explosions over a thousand miles away on the mid-Atlantic ridge. These are not trivial acoustic events. They are intentionally designed to be intense and repetitive. During seismic surveys and other industrial activities entire ecosystems over extensive regions are exposed to high levels of noise for extended periods of time. Whales are air breathing mammals and big enough to follow and observe reacting to such exposures. Smaller, non air breathing species, such as fish, are not easily observed responding to such sounds. But the sounds are audible to the fish, and most fish species have air bladders making them susceptible to physiological effects.

What does this mean in the short-term? Maybe all it means is that animals that live in the waters around Nova Scotia and Cape Breton will have a hard time making a living over the next few years while exploration is happening. Is that acceptable? I would predict that some animals will tolerate the poor conditions others will leave and not return. Which species can tolerate the habitat loss? Whales can move out of the area and probably find other feeding areas. Whales are long-lived and can probably tolerate the acoustic insults for a few years. What about the fish?

What does it mean in the long-term? Basically it means the loss of habitat that once lost can never be recovered. The slow, degradation of an environment over time