

## **ExxonMobil Marine Mammal Study and Protection Programs**

ExxonMobil is committed to operating in an environmentally responsible manner everywhere we do business, and we undertake to plan our operations based on both a scientific understanding of the environments in which we operate and the potential effects of our operations. For many years we have been the leading international oil and gas company in conducting and sponsoring research of marine mammals. These research results guide mitigation measures to reduce any risk of effects during offshore operations.

### Sound and Marine Life

A large number of academic research studies are funded by ExxonMobil through the Sound and Marine Life Joint Industry Program (JIP). This JIP is governed through the International Association of Oil and Gas Producers, London, UK. ExxonMobil initiated this JIP in 2005.

The JIP has permanently grown to include twelve companies. To date, these companies have collectively funded \$55 million of academic research studies. This has resulted in significant scientific progress through 70 contracts and more than 20 peer-reviewed, published manuscripts.

The JIP objectives are to:

- Understand and define environmental risks,
- Decrease regulatory uncertainty,
- Develop cost effective, credible mitigation measures, and
- Improve planning for offshore project development.

Scientific results from these studies guide industry planning and mitigation measures during operations. Academic and government research expeditions using sound sources to map the seafloor or the subsurface also benefit directly from these studies. These results also help regulators develop science-based regulations that have gone through the peer-review publication process.

In the last few decades, the following marine mammal studies have been funded by ExxonMobil:

- Research into sound impact on marine mammals carried out by Professor Paul Nachtigall at the Hawaii Institute of Marine Biology, University of Hawaii and Dr. Alexander Ya Supin at the Institute of Ecology and Evolution of the Russian Academy of Sciences.

This research has been conducted on Bottlenose Dolphins, Beluga Whales, Harbor Porpoises, and False Killer Whales – all showing a 15 dB protective sensitivity hearing shift. The research also resulted in a discovery that odontocetes (toothed whales) can self-regulate their hearing.

- Evaluating the effects of satellite tagging on humpback whales carried out by the National Fish and Wildlife Fund (NFWF) with Dr. Jooke as Director. This research was aimed at finding better tags for tagging of large whales.

- Whale tagging studies conducted in 2014 by Professor Bruce Mate and his fellow researchers at Oregon State University. The most research work was done on Sperm Whales in the Gulf of Mexico. Data is still being processed, but we now have more detailed

maps of migration routes and key calving areas as well as the specific nature of dive behavior when foraging for giant squid. Sperm whales are at the apex of their food web, and are an excellent indicator for the its health.

We have applied these findings to our operations programs such that we minimize the potential for impacts on Sperm Whales.

### Sakhalin Island, Russia

Exxon Neftegas Limited has been funding research on the western gray whales (WGW) off Sakhalin Island since 1997. These studies have led to a solid understanding of this small but important population. During these studies, every known gray whale in the area was monitored, photographed and cataloged. These studies and resulting peer-reviewed publications have significantly increased the scientific knowledge of the health of individual animals. Monitoring their population has demonstrated not only that our actions have minimized impact on the whales and their habitat, but also that their population is increasing.

The Gray or North Pacific Gray whales (*Eschrichtius robustus*) consist of a large (19,000) eastern (Chukchee-Californian) population and a small (ca. 155) western (Okhotsk-Korean) population. Genetic comparisons between eastern and western gray whales have indicated that the populations are distinct. However, in recent years, satellite tagging and photographic and genetic matches have provided evidence of overlap of the migration routes of the eastern and western populations and raise questions as to whether these whales are distinct populations.

In 2005, ENL proposed Sakhalin Energy (SEIC) to join and co-sponsor tagging studies of EGWs off North America, in Russia in 2005 and 2006, and 2009 again off North America as pilot studies to test tags and procedures that could potentially be used on WGWs. The risk to the animals as a result of these studies was deemed low, and the value of information resulting from a tagging program was high.

Therefore, in 2010, the Companies provided funding to the International Whaling Commission (IWC), who further developed the WGW tagging program and acted as the managing entity of the program. The program was led by scientists from the A.N. Severtsov Institute of Ecology and Evolution of the Russian Academy of Sciences (IPEE RAS) and Oregon State University (OSU) Marine Mammal Institute. The program targeted healthy adult-male whales in 2010 and, with IWC approval, expanded to include both healthy adult male and female whales in 2011.

A total of seven whales were tagged during the two field seasons (one in 2010; six in 2011). Three of these transmitting tags remained on the animals after they departed the northeast Sakhalin feeding area and tracked the whales across the North Pacific to the west coast of North America.

As a result of the whales' remarkable journeys and the resulting new insights/revelations on WGW migratory patterns, the international scientific community initiated a series of Pacific-wide collaborative studies to investigate additional links between the WGW and EGW populations. Comparisons of photo-ID catalogues from the western and eastern populations have resulted in six matches. All six whales had been sighted off Sakhalin prior to being sighted in the eastern North Pacific. These matches, combined with satellite telemetry data, provide additional evidence that some individuals considered to be part of the WGW population utilize EGW migratory routes and breeding/calving grounds off the Baja California coast.

ENL, through its own initiatives and in the ENL-SEIC Joint Monitoring Program, has conducted real-time monitoring of project-specific activities and led the development of an annual acoustic monitoring plan for offshore northeast Sakhalin Island. The programs are making it possible to gather extensive information on natural and anthropogenic sounds at the boundaries and within WGW feeding areas. Propagation of sound into the WGW feeding areas from potential industrial sources (e.g., geophysical surveys, installation / operation of oil and gas platforms, installation of underwater pipelines, drilling, etc.) have been estimated taking into account regional bathymetry and hydrology. These results are calibrated with acoustic monitoring of the industrial activities. The data from the acoustic programs have been used in multivariate analyses to better understand potential behavioral impacts to gray whales during exploration and development activities. Mitigation measures for underwater sound are also included in the marine mammal protection plans.

ENL has applied the scientific and operational knowledge gained over 17 years to ensure that our 2015 geophysical studies program caused the least amount of impact to the WGW's. The primary mitigation measure was to start early (before any significant numbers of WGW's arrived offshore Sakhalin from their migration from the Pacific coasts of Mexico, USA and Canada). We were able to start geophysical surveys in the near shore areas of Sakhalin as soon as the ice cleared in early June and before mother-calf pairs arrived to feed. The Odoptu and Chayvo field surveys, as the northern-most survey area, began immediately after the ice fields broke and was completed as early as possible to reduce the number of potential encounters with returning WGWs.

Additionally we constantly monitored an exclusion zone around the sound sources to ensure that no whale entered the zone. After July 1, there was an increased likelihood of encountering WGW's close to the shore (based on multi-year observations). As planned, this coincided with our final near-shore line acquisitions. In a few instances, WGW's did approach the exclusion zone. In each of these cases the sound source was shut off and the whales allowed to pass through without acoustic disturbance.

Operations by ENL and SEIC were conducted in such a way that a key part of the feeding area remained undisturbed.

ENL's 2015 geophysical survey plan and marine mammal protection plan were reviewed, as per Russian regulations, with the Interdepartmental Working Group on Western Gray Whale under the Russian Federation Ministry of Natural Resources and Environment Protection (Moscow), and the Sakhalin Biodiversity Conservation Working Group led by the Sakhalin Ministry of Natural Resources and Environment Protection (Yuzhno-Sakhalinsk). Our 2015 program was also reviewed by world renowned experts on marine mammals and sound. We also contracted with several marine mammal and acoustic experts to assist with on-site field operations.

The wealth of scientific information gathered and the strength of the mitigation measures were praised as "*best-in-industry*" and the program "*of a quality for submission to a well-regarded peer-reviewed journal*". After reviewing ENL's program in May 2015, Dr. William Ellison, Chief Scientist of Marine Acoustics, Inc., and one of the leading scientists in this field, stated "*I will state without reservation that the Sakhalin Island effort as described to me over the last 7 years meets both the spirit and the specifics of the processes I proposed as a broad standard for industry activities in the ocean environment. The only other projects that come close to encompassing the spatial and temporal goals of these processes is the broad range of research*

*activities focused on the Bowhead Whale in the Beaufort and Chukchi, as well as Right Whale studies on the US East Coast.”*

As part of the joint industry research program ExxonMobil has sponsored Professor Dan Costa and his fellow researchers at the University of California, Santa Cruz, to conduct bioenergetics research to help evaluate the potential biological consequences that disturbance may have on marine mammals. This work makes it possible to make significant advances in understanding potential biological effects resulting from reduced feeding efficiency for different species.

ExxonMobil and Shell have co-sponsored the group developing an energy assessment framework based on data from eastern gray whales.

ENL mitigation and monitoring strategy was based on learnings from not only the research from the past 17 years on Western Gray whales, but also on results and recommendations from previous geophysical studies, timing of historical whale migration into different parts of the feeding area, and what we have learned from research sponsored in the JIP and the energetics framework developed by UCSC.

Here are some of the key specifics of ENL studies:

- ENL had over 100 people in the field.
- ENL had a command post with geophysical, acoustics and biology expertise to manage Marine Mammal Protection real-time in the field.
- ENL had 13 distribution stations with Marine Mammal Observers observing all day.
- ENL placed containerized housing in the field so that the observations could be conducted during the entire daylight time increasing the observations during good weather. This required a significant logistical load to conduct safe and effective operations during the cold beginning and end of the season.
- ENL conducted benthic sampling at 403 locations (335 conducted to date). The sampling of food resources was quite expansive to improve our ability to understand the potential impacts from any observed behavioral effects related to the geophysical operations.
- ENL deployed 40 autonomous acoustic recorders in 50 different locations and 10 real time systems.
- ENL had 9 Photo-ID teams (5 behavior, 2 roving onshore, 1 zodiac offshore and one vessel based).
- The best source array characteristics were evaluated, and a source design developed that minimized the acoustic footprint from the source.
- Acoustic monitoring was also conducted of other sounds coming into the feeding area.

ENL has invested heavily in promoting a culture of safe operations during the research and monitoring field activities. Significant manpower and resources have been committed to ensuring that strong systems and processes were in place, and training completed before field mobilization.

These efforts led to a strong safety record for the WGW field program and helped establish an important safety culture with the scientists involved in the program that can be applied to other programs.