

# EFFECTS OF SONAR ON MARINE MAMMALS



Photo: Filipa Samara, SMRU

**TNO** innovation  
for life

Powerful sonar systems are needed to combat the underwater threat. However, sonar operations can potentially interfere with the -sometimes vulnerable- marine environment. Dedicated research is required to determine the limits of safe sonar operations. This research programme helps solving this issue in an international context.

## ENVIRONMENTAL IMPACT

It is essential that the Royal Netherlands Navy maintains the ability to operate and exercise at sea. Powerful sonar systems are needed to combat the underwater threat. The Royal Netherlands Navy is taking the responsibility to ensure all sonar operations are executed in a safe way. However, a lot of information on how the underwater sound of sonar systems is interfering with the marine environment is lacking, and international coordinated research is required to address this, in order to ensure environmentally responsible use of sonar.

## CONTROLLED EXPOSURE EXPERIMENTS

In order to determine the safe limits of sound exposure, so-called Controlled Exposure Experiments or Behavioural Response Studies (CEE/BRS) are executed in Norwegian waters. These experiments consist of three stages: find whales, place a sensor unit (Digital tag or DTag) on animals with suction cups, and expose these animals to sound with a realistic naval source. During these stages, the whale is followed by expert biologists, monitoring the behaviour of the whales. For finding whales passive acoustic technology is used and improved to find and follow whales for the experiments. This technology can also be used for future mitigation options.

# ASSESSING THE ENVIRONMENTAL IMPACT OF NAVAL SONAR SYSTEMS



Photo: Rune Hansen, FFI

## INTERNATIONAL CONTEXT; THE 3S-PROJECT

The field experiments are high-cost operations and a multi-year effort is required to obtain sufficient data in order to be able to draw conclusions from the analyzed field observations and publish these results. The present program is co-funded by Naval authorities of the Netherlands, Norway and USA. The experiments are organized in the 3S-project that consists of these partners:

- the Norwegian Defense Research Establishment FFI,
- the Sea Mammal Research Unit SMRU of St. Andrews University,
- Woods Hole Oceanographic Institution WHOI, MA,
- and TNO.

## OUTPUT

Results are used for the mitigation software SAKAMATA, which is embedded in the RNLN guidelines for sonar operations.

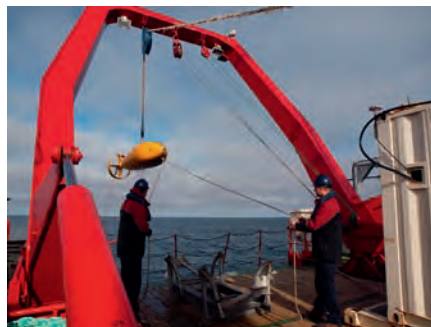


Photo: René Dekeling, RNLN



Photo: Rune Hansen, FF

All experiments take place in a careful and controlled way under a (yearly) Norwegian permit for exposing a limited number of whales to underwater sound. The experimental protocol is reviewed by the ethical board of St. Andrews University.

## PROGRAMME

### SUPERVISOR

M.M.B. Kiphardt, MSc  
Ministry of Defence,  
Directorate of Spatial Planning,  
Environment and Infrastructure Policy  
(DRMV)

### MANAGER

Dr F.P.A. Lam  
TNO Defence, Safety and Security

### PROGRAMME NUMBER

V1026

### SCHEDULE

2010 - 2014

**TNO.NL**

## TNO

TNO is an independent innovation organisation. TNO connects people and knowledge to create innovations that sustainably boost the competitive strength of industry and the welfare of society.

TNO focuses its efforts on seven themes including Defence, Safety and Security: TNO works on a safe and secure society by creating innovations for people working in defence organisations, the police, emergency services and industry.

## CONTACT

Dr Frans-Peter Lam

Oude Waalsdorperweg 63  
2597 AK Den Haag  
the Netherlands

E Frans-Peter.Lam@tno.nl  
P +31 8886 64119