NO. 10–2010

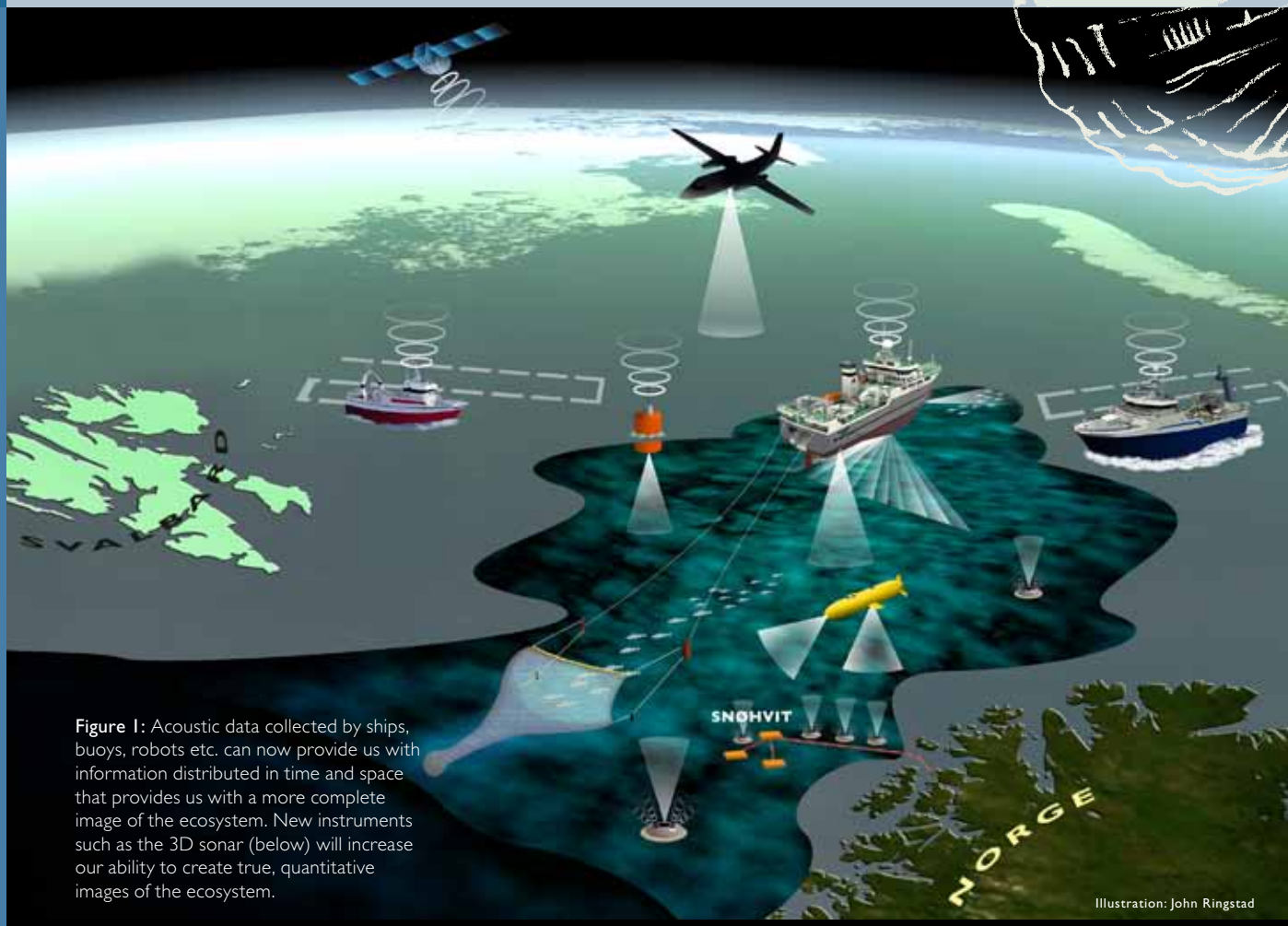


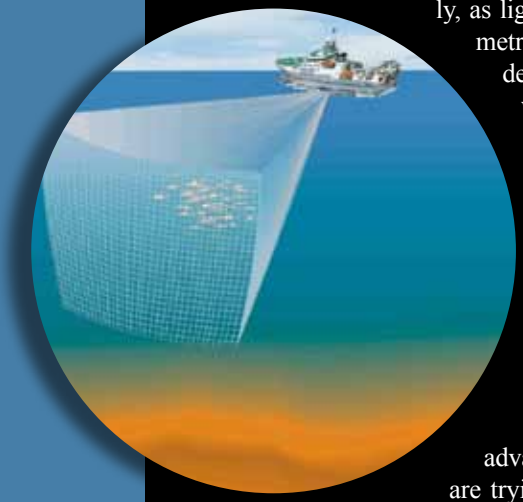
Figure 1: Acoustic data collected by ships, buoys, robots etc. can now provide us with information distributed in time and space that provides us with a more complete image of the ecosystem. New instruments such as the 3D sonar (below) will increase our ability to create true, quantitative images of the ecosystem.

Illustration: John Ringstad

Seing the sea with sound

Whales have developed an advanced biological sonar system that they use to communicate between continents. They also use their sonar for hunting, and once a suitable prey is located, they can catch it even when it is pitch dark by using their excellent "hearing". The new Centre for Marine Ecosystem Acoustics (MEA) aims to become as successful using acoustics as the whales.

BY OLAV RUNE GODØ



Marine life is hard to observe visually, as light only penetrates a few metres down into the water. In deep waters there is no light whatsoever, so artificial light is required, which might either frighten or attract organisms. Sound, on the other hand, which travels much faster through water than through the air, is almost entirely unobtrusive.

By developing new advanced technology, we are trying to achieve skills that whales have developed through evolution over thousands of generations. Norwegian fishermen and scientists were among the first people to use echo sounders and sonar to locate and catch fish. Presently, the ecosystem approach to fisheries management poses several new challenges:

ACCURATE ABUNDANCE ESTIMATES

Determining fish abundance is important. Good estimates help fishermen avoid bursting nets and land a quality product. For scientists, accurate estimates are a key basis for providing good advice on the sustainable harvesting of a resource.

THE RIGHT SPECIES

With a price difference that can be more than NOK 10 per kilo, mistaking mackerel for herring can have significant economic consequences for a purse seiner. New acoustic tools will enable fishermen to differentiate in real time between species.

Seing the sea with sound

THE RIGHT SIZE

Catching the right size of fish increases the value of a catch and is also important for fishing in compliance with management regulations. Determining the correct size of fish prior to catching supports the sustainability of a fishery as well as enhances the quality of scientific management advice. It will also make it easier for scientists to provide good, reliable advice.

CORRECT UNDERSTANDING

For scientists it is essential to properly understand the sea as an ecosystem, including interactions among species and how the physical environment supports the system's dynamics and productivity.

Currently acoustics is underutilized and underdeveloped as a tool for solving the new challenges posed by ecosystem-based management and rapid technological advances. A significant improvement of our knowledge, expertise and technology in this field is required if we are to solve these challenges.

MEA reflects the Institute of Marine Research's long history in acoustics, and we have now established a consortium of the best Norwegian and foreign institutions to help us to achieve these goals. We can currently "see" and survey fish shoals at distances of up to thirty kilometres and observe the swimming patterns of individual krill in deep waters.

There is a much wider range of acoustic frequencies (bandwidth) than is currently used that are capable of collecting information on the acoustic properties of targets. The beam width can be increased by using multi-beam systems, which would provide information about the behaviour of individuals or shoals.

Acoustic instruments can be placed close to objects of interest, and long term deployment would allow studies of ecosystem dynamics over diel as well as seasonal cycles. Over time, new acoustic methods will enable us to collect previously unobservable data, which will help scientists build up a more comprehensive understanding of marine ecosystems and how much can be safely harvested.

MEA was officially established in April 2010. In 2011 we will apply to the Research Council of Norway for recognition as a Centre of Excellence. The challenges we face cannot be solved by the Institute of Marine Research alone. We need both a wide range of competent, cutting-edge expertise in acoustics and ecology as well as in related subjects, such as animal behaviour, oceanography and mathematics. Our partners complement our skills, and together we constitute a unique centre of expertise with the capacity to establish a new methodology that will shed new light on the intricacies and dynamics of marine life.

Currently our partners are: University of Bergen, Christian Michelsen Research, Norwegian Defence Research Establishment, Woods Hole Oceanographic Institution, Massachusetts Institute of Technology, Princeton University and Simrad AS.

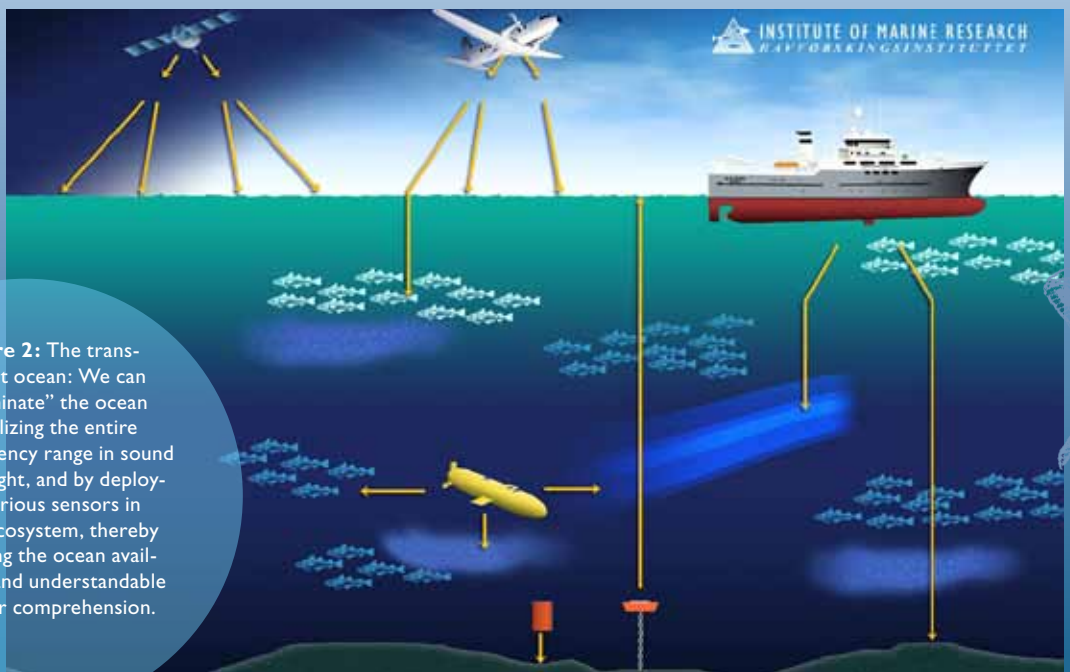


Figure 2: The transparent ocean: We can "illuminate" the ocean by utilizing the entire frequency range in sound and light, and by deploying various sensors in the ecosystem, thereby making the ocean available and understandable to our comprehension.

INSTITUTE OF MARINE RESEARCH
HAVFORSKNINGSINSTITUTTET

INSTITUTE OF MARINE RESEARCH
Nordnesgaten 50
P.O. Box 1870 Nordnes
NO-5817 Bergen – Norway
Tel.: +47 55 23 85 00
Fax: +47 55 23 85 31

www.imr.no

TROMSØ DEPARTMENT
Sykehusveien 23
P.O. Box 6404
NO-9294 Tromsø – Norway
Tel.: +47 55 23 85 00
Fax: +47 77 60 97 01

FLØDEVIGEN RESEARCH STATION
NO-4817 His – Norway
Tel.: +47 55 23 85 00
Fax: +47 37 05 90 01

AUSTEVOLL RESEARCH STATION
NO-5392 Storebø – Norway
Tel.: +47 55 23 85 00
Fax: +47 56 18 22 22

MATRE RESEARCH STATION
NO-5984 Matredal – Norway
Tel.: +47 55 23 85 00
Fax: +47 56 36 75 85

RESEARCH VESSELS DEPARTMENT
Tel.: +47 55 23 68 49
Fax: +47 55 23 85 32

PUBLIC RELATIONS AND COMMUNICATION
Tel.: +47 55 23 85 38
Fax: +47 55 23 85 55
E-mail: informasjonen@imr.no

CONTACT
Olav Rune Godø
Tel.: +47 55 23 86 75
Mob: +47 41 47 91 76
E-mail: olav.rune.godoe@imr.no