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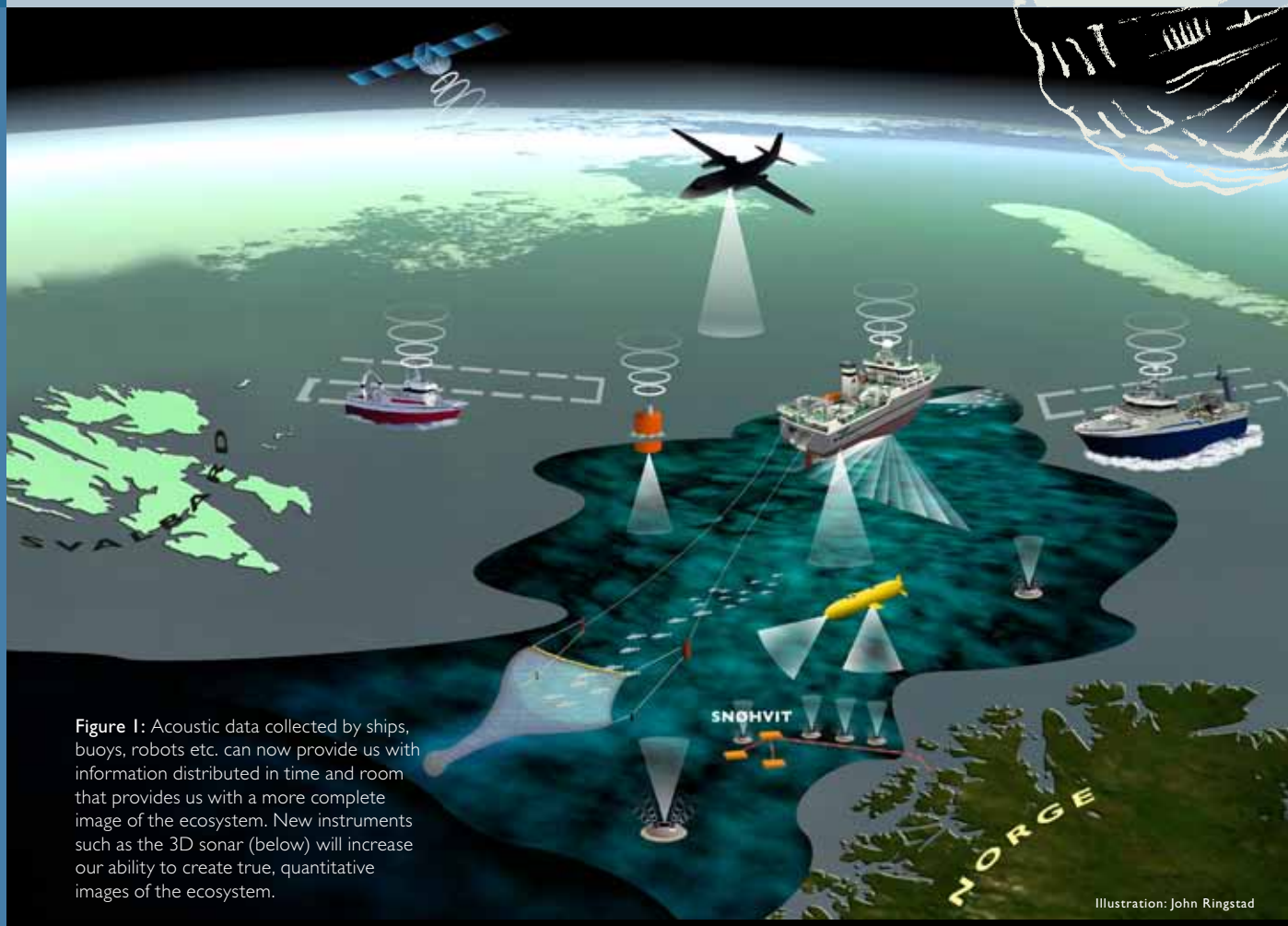


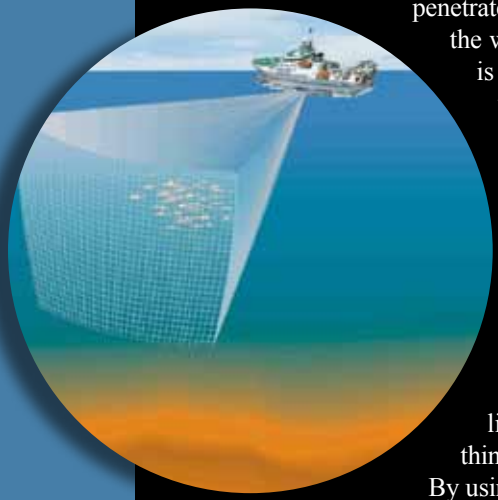
Figure 1: Acoustic data collected by ships, buoys, robots etc. can now provide us with information distributed in time and room that provides us with a more complete image of the ecosystem. New instruments such as the 3D sonar (below) will increase our ability to create true, quantitative images of the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

Illustration: John Ringstad

Seing the sea with sound

Whales have developed an advanced biological sonar system that they can use to communicate between continents. They also use their sonar when hunting prey, and once a delicacy has been located, they can catch them in the pitch dark using their good "hearing". The new Centre for Marine Ecosystem Acoustics, MEA, aims to be able to use acoustics just as successfully as whales.

BY OLAV RUNE GODØ



Life at sea is hard to observe, as light only penetrates a few metres down into the water. In deep waters there is no light whatsoever. If we want to see what is there with our eyes, we are dependent on artificial light, which has a tendency to frighten or attract organisms. Sound, on the other hand, travels much faster through water than through the air, and has little or no impact on the things you want to observe.

By using new technology, we are trying to achieve what whales have developed through evolution over thousands of generations. Norwegian fishermen and scientists were some of the first people to use echo sounders and sonar to locate and catch fish resources. Now there are new challenges, in addition to finding resources, that need solving:

THE RIGHT QUANTITY

Quantification is important as it helps fishers to avoid bursting nets and to land a quality product. For scientists, accurate quantification is the key to providing good advice on the sustainable harvesting of a resource.

THE RIGHT SPECIES

In spring, catching mackerel instead of herring can be a disaster for a purse seiner. With spring prices more than NOK 10 per kilo lower than autumn prices, you don't need a big catch for the losses to mount up. New acoustic tools will help us to differentiate between species and groups.

Seing the sea with sound

THE RIGHT SIZE

Catching the right size of fish greatly increases the price achieved, and is also important in order to follow the regulations. The ability to determine fish size acoustically will benefit the environment and ensure that fisheries are sustainable. It will also make it easier for scientists to provide good, reliable advice.

THE RIGHT INFORMATION

For scientists it is essential to properly understand the ecological connections in the sea. How do different species affect one another, and how does the physical environment create conditions under which fauna and flora can flourish?

Currently acoustics is underused and underdeveloped as a tool for tackling the new challenges we face. Ecosystem-based management and rapid technological advances mean that the time is now more than ripe for expanding our knowledge, expertise and technology in this field, so that we can use it to solve those challenges.

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

There is a much wider range of acoustic frequencies (bandwidth) than is currently used, capable of collecting information about species' acoustic properties. The beam width can be increased by using multi-beam systems that provide information about the behaviour of individuals or shoals. Acoustic instruments can be placed close to the things being studied, and can be left out for long periods at a time, expanding our knowledge about sea life and about what species do over the course of the seasons. Over time, these acoustic methods will collect previously unavailable data at different points in time and space. This completely new tool and data set will help scientists to build up a more comprehensive understanding of marine ecosystems, including how they work and develop, and how much can be harvested for human consumption.

MEA was officially established in April this year. Based on the partners already involved with the centre, 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 competence and cutting-edge expertise in acoustics and ecology, as well as in related subjects such as animal behaviour, oceanography and mathematics. Our partner institutions complement our skills, and together we constitute a unique centre of expertise, with the capacity to establish a new methodology able to shed new light on our understanding of marine life.

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

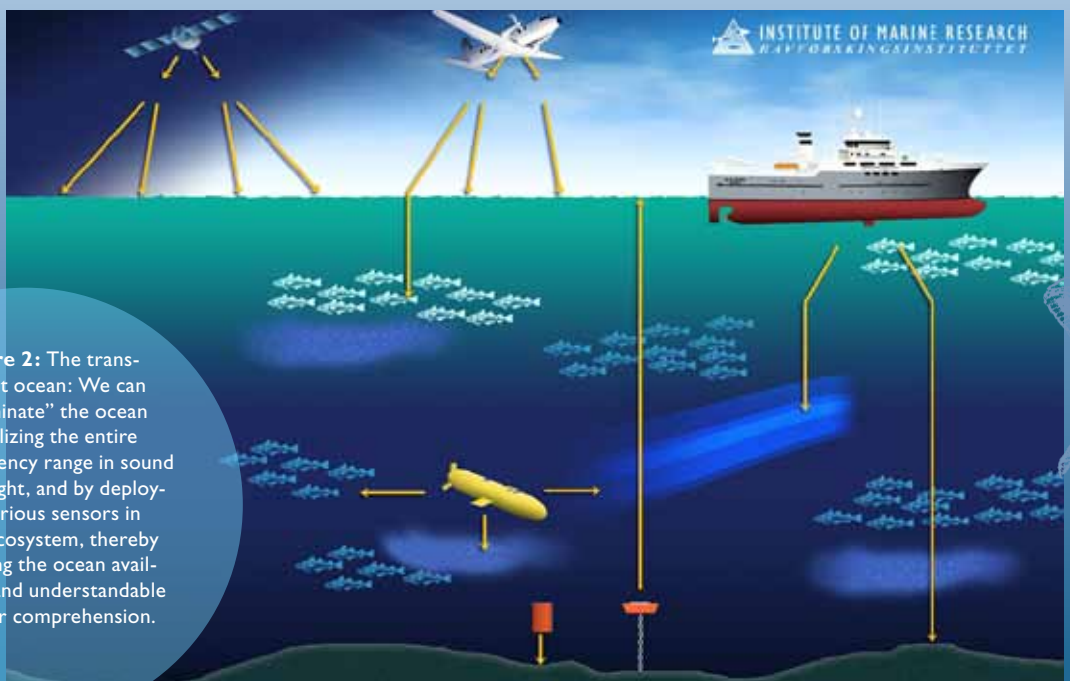


Figure 2: The transparent ocean: We can "illuminate" the ocean by utilizing the entire frequency range in sound and light, and by deploying various sensors in the ecosystem, thereby making the ocean available and understandable to our comprehension.

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