INSTITUTE OF MARINE RESEARCH
HAVFORSKINGSINSTITUTTET

Knowledge and advice for rich and clean oceans

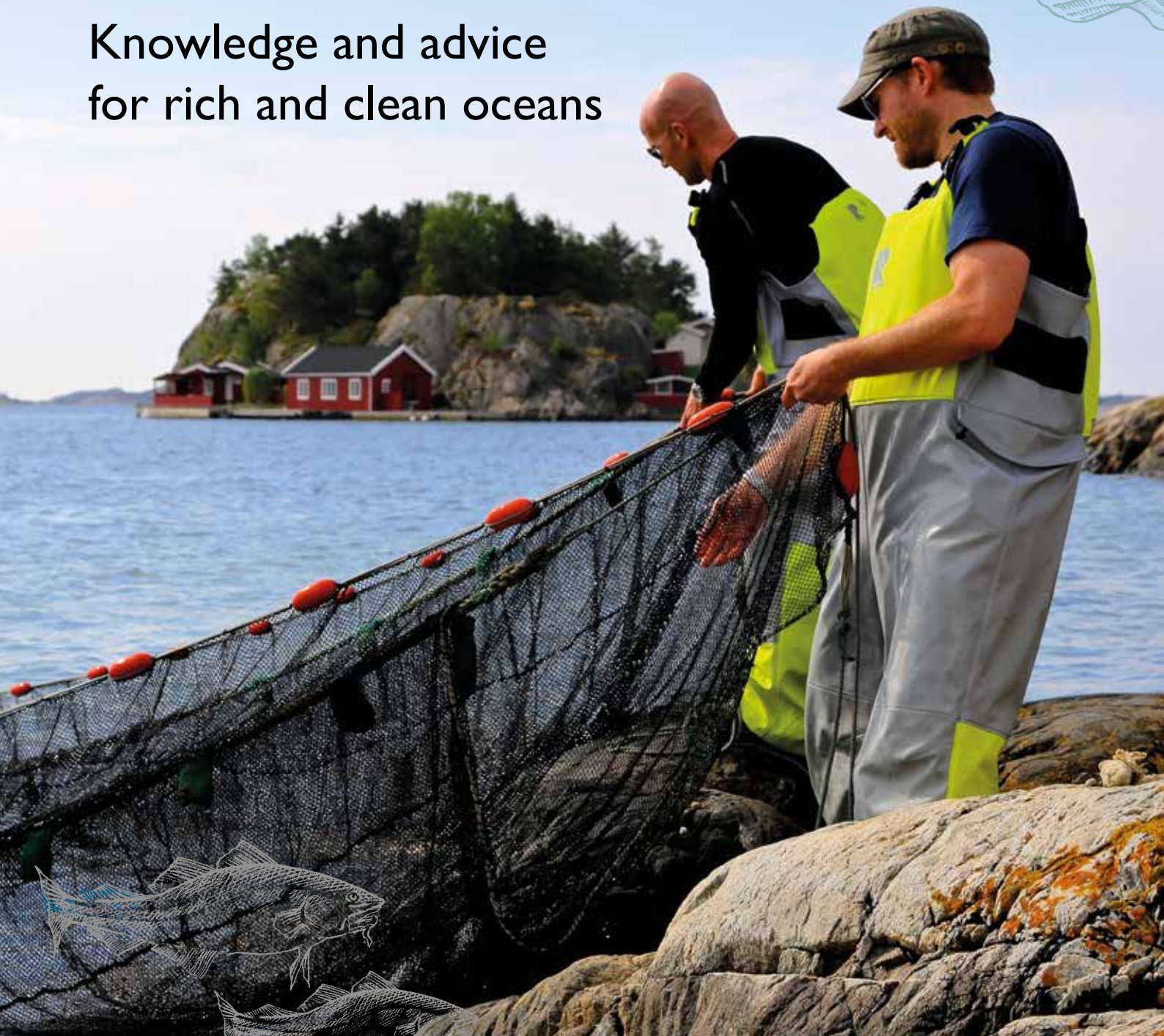

Illustration: John Ringstad

VISION

Knowledge and advice for rich and clean marine and coastal regions.

RESPONSIBILITY TO SOCIETY

The Institute of Marine Research shall establish a scientific basis for the sustainable management of the natural environments and resources found in marine ecosystems.

ACTIVITIES

Carrying out research, monitoring and advisory functions related to marine ecosystems and aquaculture.

We shall:

- explore the natural environment and biology of the oceans and the coast
- provide advice to the Ministry of Fisheries and Coastal Affairs, Directorate of Fisheries, Norwegian Food Safety Authority, other government agencies, the fishing industry and other stakeholders on questions relating to the management of the marine and coastal environment, including its biological resources
- make the results of our research available to the relevant authorities, businesses and society in general
- develop fishery technology

The institute shall always have complete scientific freedom and independence.

Photo: Frame from videorecording

RESEARCH TRAWLING

Underwater ecosystems are highly varied. From tiny algae to huge whales, from spawning to harvesting, from the surface to the seabed, from fjords to open seas, from local currents to climate change – the Institute of Marine Research needs to know about all of them.

We send vessels on research surveys, place a variety of instruments in the sea to collect data, and take samples using dip nets and trawls. We perform experiments at fish farms and at our laboratories, in order to learn more about what is happening in the sea and at the fish farms.

In this brochure you can read about some of the species that we are studying, and get a sense of the wide range of work that is done at the Institute of Marine Research.

Photo: Tanja van der Meeren

STORING CO_2 IN THEIR SLEEP

After growing nice and fat in the autumn, the *Calanus finmarchicus* spends the winter hibernating in deep waters. Working with Danish scientists, we are investigating its role in the sea's biological carbon pump, with the help of our research vessels. As this species is very common in our waters, it is important to understand what role it plays in the transport of carbon from the surface to deep water. The annual biomass production of the *Calanus finmarchicus* is well over 75 million tonnes, and it is the main food source for mackerel, herring, capelin and blue whiting. It does best in temperatures of three to eight degrees. The cold-water species *C. glacialis* and *C. hyperboreus,* which live in Arctic waters, are even more nutritious than the *Calanus finmarchicus*. Other members of the copepod family – which the above species all belong to – are better adapted to warmer waters, but they are not as nutritious.

The timing of when the *Calanus finmarchicus* awakes from its hibernation to spawn can have a big impact on how well its spawning season coincides with the cycles of other species, and hence on the productivity of the seas.

The Institute of Marine Research

- *Monitors climate change and investigates how it will affect fisheries and aquaculture*
- *Has a number of long data series on currents and temperatures*
- *Collects, manages and shares data*
- *Develops new fishing gears and traps*

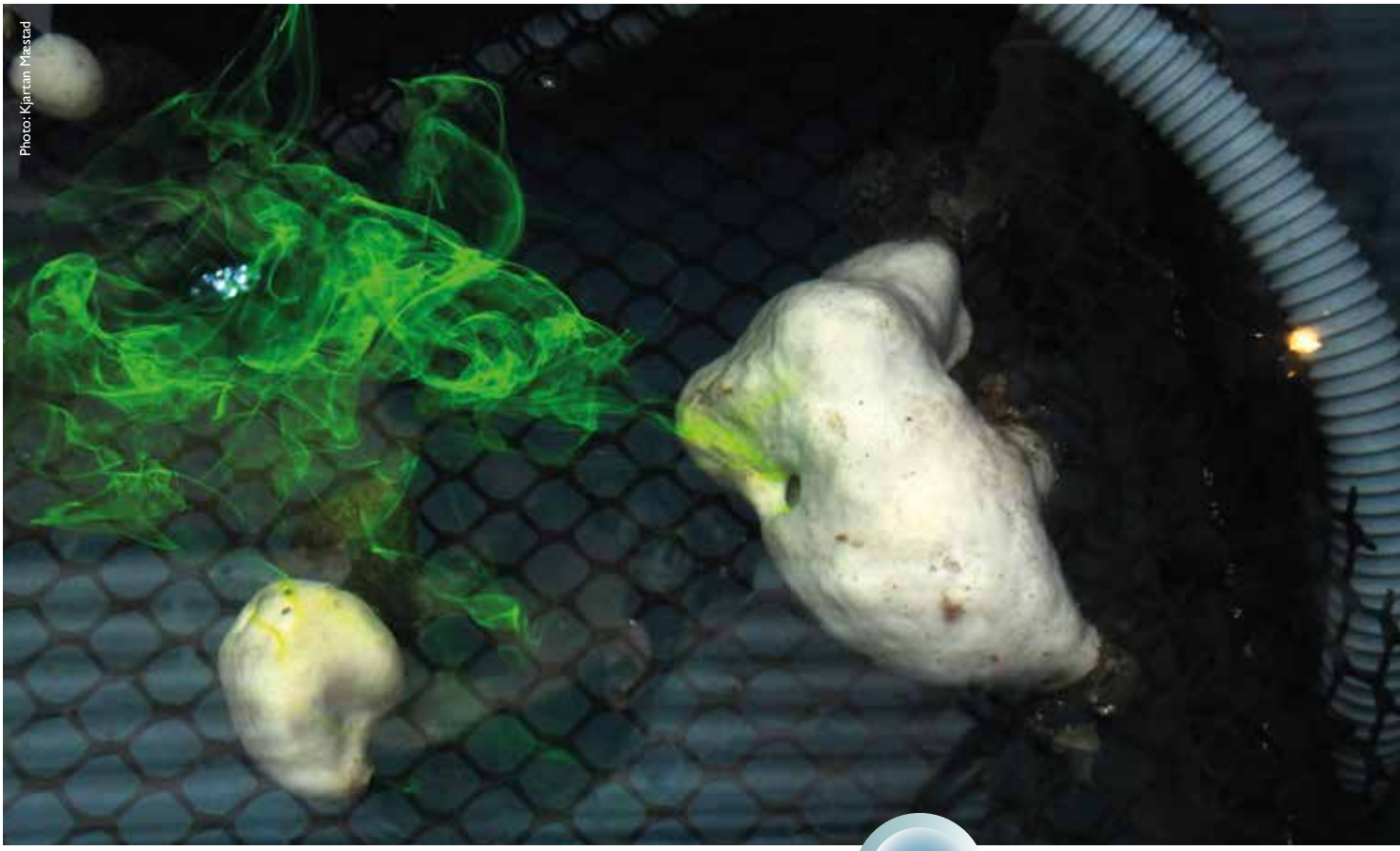

Photo: Kjartan Mæstad

BACTERIA GUZZLERS

Scientists aren't quite sure whether sponges should really be called organisms. They are really just a collection of cooperating cells – a colony, if you like. But they cooperate very effectively. Every single kilo of sponge can filter 1,000 litres of water per day, removing up to 95 per cent of the bacteria in the water. Without this filtering process, there would be far more bacteria in the sea. Colouring has been added to the common sponge (*Geodia barretti*) in the photo, so that we can see the water flowing out of it.

These simple life forms are an important part of the seabed fauna, but there are many gaps in our knowledge about their role in the ecosystem. Sponges, and particularly the common sponge, are found all along the Norwegian coast and far up into the Barents Sea.

The Institute of Marine Research

- *Looks at how sponges can be used to study the impact of the oil industry*
- *Surveys the seabed fauna, monitors pollution and measures sea currents*
- *Helps to map and define the habitats on the sea bottom*

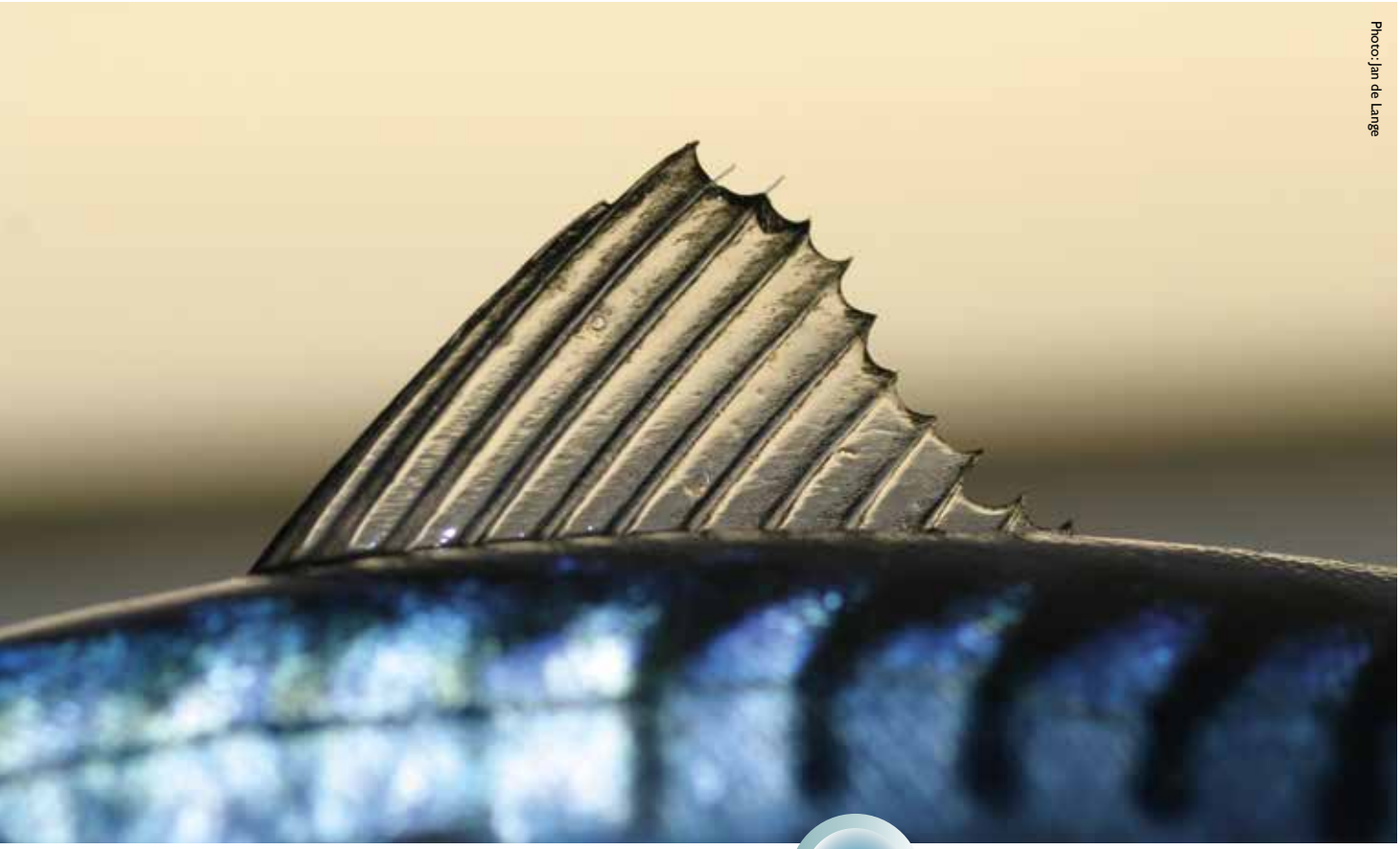

Photo: Jan de Lange

THE TIRELESS HUNTER

Northeast Atlantic mackerel lack swim bladder, and to avoid sinking they are more or less always on the move. This constant activity makes it a greedy eater. The large mackerel population is expanding its distribution range to new and formerly unknown areas: now it is present from the Gibraltar Strait in the south to Bear Island in the north, from the coast of Finnmark in the east to far west including Greenland waters.

Mackerel eat almost anything – including individuals of their own species – but their favourite food is small crustaceans such as copepods. The fast-moving mackerel has an advantage in the battle for food in the Norwegian Sea, where it feeds on the same zooplankton as herring and blue whiting. Mackerel are very competitive due to their fast swimming speed, endurance and their ability to both filtering small sized prey with their mouth wide open and effectively chase larger prey.

The Institute of Marine Research

- *Monitors over 40 fish stocks in Norwegian waters, using its own research vessels and hired fishing vessels*
- *Gives annual recommendations on quotas for these stocks. The vast majority of these recommendations are the result of collaboration in the International Council for the Exploration of the Sea (ICES)*
- *Uses and develops echo sounders and sonar, which are important tools for monitoring fish stocks*
- *Monitors currents, temperatures and salinity in the sea, in order to understand changes to ecosystems*
- *Studies all of the elements of coastal ecosystems, from the smallest plankton to marine mammals*

Photo: Jan H. Sundet

A NEWCOMER TO THE NORTH

We are recording increasing numbers of snow crabs in the Barents Sea. The snow crab is normally found in waters between Japan and the Bering Strait, and along the north-east coast of Canada north to western Greenland.

In the mid-90s, the Russians caught snow crab for the first time in the eastern Barents Sea. Scientists are unsure whether the crab is naturally spread from the Chuchi Sea, north of the Bering Strait, or was introduced to the Barents Sea in ballast water. The Institute of Marine Research has until now recorded a few hundred individuals in Norwegian waters, while model estimates indicate a much larger snow crab stock than king crab in the Barents Sea.

Now scientists are waiting with bated breath to see what impact the snow crab will have on the Barents Sea ecosystem, where previously there were only small populations of the stone crab and Arctic lyre crab. Compared with the king crab, the snow crab lives at deeper waters and prefers lower environmental temperatures.

The Institute of Marine Research

- *Is the leading polar research institute in Norway*
- *Has been cooperating with Russian marine scientists since 1957*
- *Is carefully monitoring the consequences of warmer waters in the far north*
- *Studies how introduced and invading species are affecting Norwegian ecosystems*
- *Studies the ecosystems in all of our major seas*

PICKING SEA LICE OFF SALMON

In Norwegian waters there are six main species of wrasse. They are chiefly found along the coast of Skagerrak and in western Norway, but some have reached as far north as the Lofoten islands. Wrasse generally live in kelp forests, and adults are normally sedentary, feeding on invertebrates living on the seabed. However, some species are cleaner fish: the goldsinny wrasse, corkwing wrasse and ballan wrasse clean parasites off other fish, and are therefore ideal for keeping farmed salmon free of lice.

Although wrasse can help to solve that particular problem, the consequent increase in harvesting of wrasse may also have unwanted effects on coastal ecosystems.

The Institute of Marine Research

- *Performs annual risk assessments for Norwegian aquaculture: Sea lice and fish escaping from fish farms are the biggest threats to the sustainability of the industry*
- *Has developed models to help us understand how and how quickly everything from sea lice to pollution and fish eggs spread around our fjords and coastal waters*
- *Has mapped the sea louse's genetic material (genome), which can be used to develop new treatments for sea lice*
- *Is doing research into the development conditions for fish, and into their general welfare*
- *Will investigate whether it is possible to develop a treatment to prevent farmed fish from reaching sexual maturity*
- *Is doing research into wrasse farming, in response to the big increase in the number harvested*

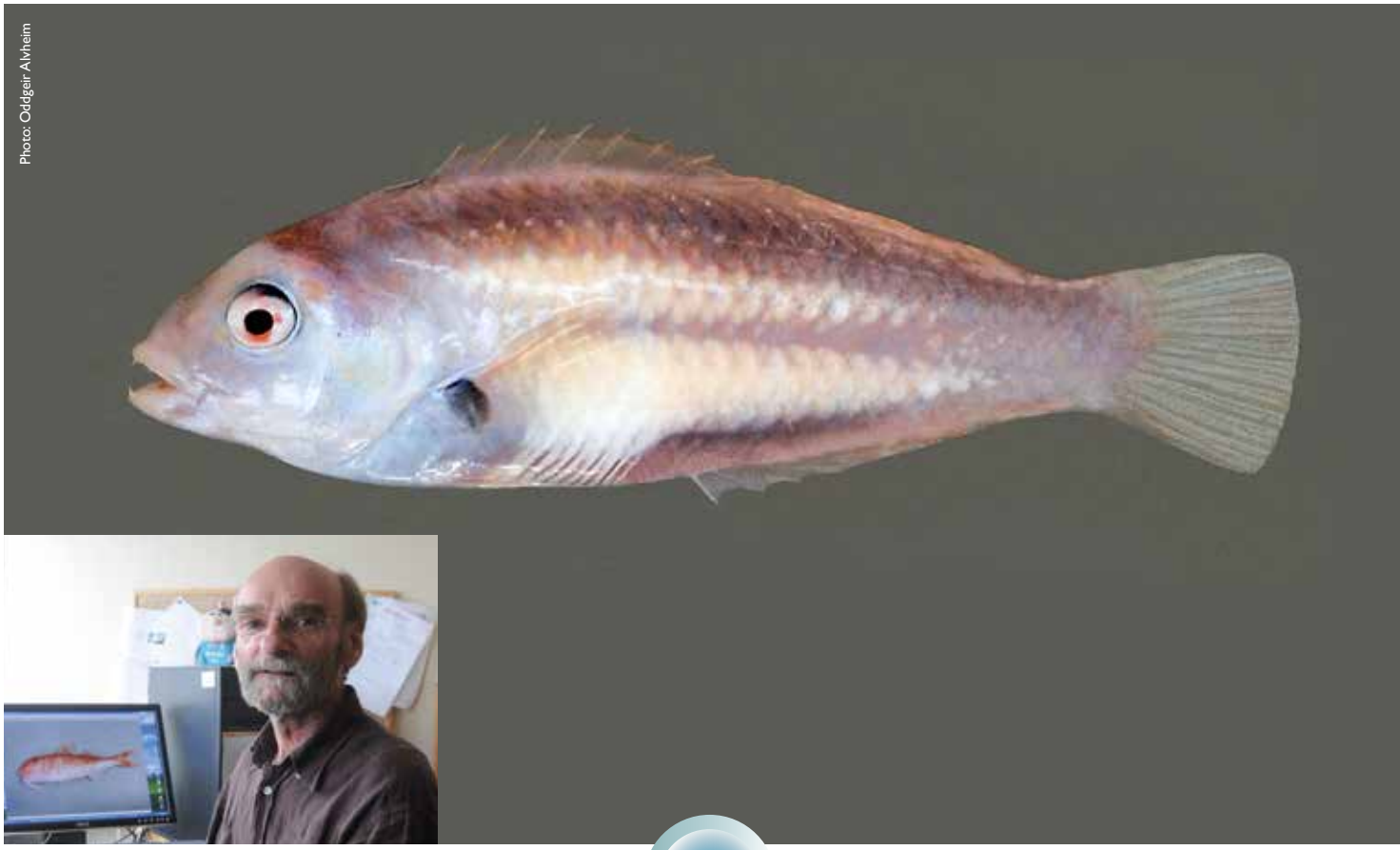

Photo: Oddgeir Alvheim

SHARING KNOWLEDGE ABOUT THE SEA

A few years ago, during an expedition with the RV "Dr. Fridtjof Nansen" between Mauritius and the Seychelles, our colleague Oddgeir Alvheim came across a type of wrasse that he had never seen before. Now it has been confirmed that this is a new species, and it has been named after him – *Novaculops alvheimi.*

For thirty years "Dr. Fridtjof Nansen" has been at the forefront of our work to map marine resources and promote sustainable management in more than 60 developing countries, particularly in southern Africa. This programme is financed by Norad, and involves close collaboration with the Food and Agriculture Organization of the UN (FAO).

We also collaborate extensively with organisations in Norway and overseas on monitoring and data management activities.

The Institute of Marine Research

- *The Institute of Marine Research's Centre for Development Cooperation in Fisheries (CDCF) works with the Directorate of Fisheries, NIFES, the Norwegian Veterinary Institute and the Norwegian Food Safety Authority to coordinate aid projects*
- *It mainly provides aid in the fields of fisheries, aquaculture and oil/fish/the environment*
- *The aid programme, which is financed by the Norwegian Ministry of Foreign Affairs/Norad, currently covers fourteen countries in Africa, Asia and Latin America*
- *Namibia was one of our main partners up until 2005. Now Namibia is ranked the fifth best country in the world in terms of sustainable fisheries management*
- *A replacement vessel is being planned, and will be ready in 2016*

Foto: Anders Thorsen

FROM EGG TO ADULT COD

This is the start of a cod. Here the larvae are close to hatching from their eggs. At one point in their lives, all Northeast Arctic cod look like this. And there are lots of them. Each female can spawn up to 50 million eggs during her life. When the Northeast Arctic cod population – the biggest cod stock in the world – arrives off Lofoten to spawn, dense clouds of eggs occur in the sea. The densities have been measured at about 16,000 eggs per square metre of sea surface. Despite the success of the Northeast Arctic cod, other cod populations along the coast and in many fjords are not doing so well.

The vast majority of fish eggs – whether of cod or other species – never become adult fish. It is, therefore, important to understand what factors affect the recruitment, reproduction and health of fish, both in the wild and in fish farms.

The capelin is the cod's favourite food. That's why it is being managed from an ecosystem perspective, which means that it can only be fished if there are enough capelin for cod to feed on.

The Institute of Marine Research

- *Studies how everything from climate change to pollution affects marine life, including recruitment*
- *Collaborates successfully with Russian marine scientists to monitor the Barents Sea*
- *Recommends that the area around the Lofoten and Vesterålen islands should not be opened for oil exploration, amongst other reasons because 70 per cent of Norway's most important fish stocks visit the area at an early stage of their development*

RESEARCH VESSELS

The Institute of Marine Research's vessels are most important. They enable us to monitor and collect data on marine resources and environments.

G.O. SARS
Built: 2003
4,067 gt
77.5 m

JOHAN HJORT
Built: 1990
1,851 gt
64.4 m

G.M. DANNEVIG
Built: 1979
171 gt
27.9 m

HÅKON MOSBY
Built: 1980
701 gt
47.2 m

DR. FRIDTJOF NANSEN
Built: 1993
1,444 gt
56.8 m
Owner: Norad

LOCATIONS AND STATIONS

Holmfjord in Porsangerfjorden

Tromsø Department

Matre Research Station

Parisvatnet in Øygarden

Bergen

Austevoll Research Station

Guddalselva in Kvinnherad

Flødevigen Research Station

- The Institute of Marine Research has over 750 employees
- The annual budget is around NOK 1 billion
- We spend more than 2,000 days at sea each year, both in our own vessels and hired ones, for the purposes of research, monitoring and data collection
- The Institute of Marine Research operates five research vessels, which are also used by other Norwegian and international scientists
- We are an important partner of the High North Research Centre for Climate and the Environment (Fram Centre) and Bjerknes Centre for Climate Research
- We have world-class research facilities – and an office on Svalbard

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Pictured is Sonal Patel, who has been selected for the "Young aquaculture scientist" programme. (Photo: Beate Hoddevik Sunnset)
The photo on the front cover shows a beach seine haul in southern Norway. This haul has been performed each year since 1919. (Photo: Espen Bierud)