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CRISP

A novel approach to
sustainable fish capture



Improving commercial trawling and purse seining practices

CRISP

As head of a groundbreaking effort in fishing research, **John Willy Valdemarsen** aims to streamline industrial techniques. Here, he outlines progress to date and his hopes for the future of trawling and purse seining



Firstly, could you outline the purpose and goals of the Centre for Research-based Innovation in Sustainable fish capture and Processing technology (CRISP)?

CRISP is first and foremost a constructive research and development mechanism aimed at providing scientific assistance to SMEs in order to develop the advanced

technical solutions needed to exploit marine resources in a sustainable manner in the future. The Centre aims to develop technical solutions that bring the highest fish quality to consumers using smart technologies consisting of proper instruments and modern fishing gears.

Since its launch on 1 April 2011, what research activities have been initiated at the Centre?

Several research activities have already been initiated. Some are related to the development of new instruments that provide fishers a clearer idea of what they are catching and how both the fish and fishing equipment are behaving during the capture process. Other innovative developments relate to how best to catch cod with a trawl while significantly reducing the interference with the sea floor as well as to optimise fish quality compared with catch taken with present trawling practices. Development of trawl doors where depth can be adjusted independently during fishing is an essential part of this development. Behaviour studies of fish in the capture phase of trawling are another primary area of research among staff at the Centre.

How do you plan to assist Norwegian fisheries-based companies to become leading suppliers of equipment and seafood? Have you been successful in this endeavour to date?

CRISP consists of companies and research institutes that prior to its establishment had plenty of experience of working together in research and development. By signing up as partners to the Centre, the companies confirm that they are committed to developing systems and products identified as sustainable by the consortium. The variety of skills and approaches within CRISP – which include finding, catching and handling the fish – make it unique globally, and should put us in the best possible position to create really innovative solutions. One example of this is the development of manoeuvrable trawl doors, where a mechanical company required assistance from an electronics company in order to realise a workable product.

To what extent is this work multidisciplinary and at what stage are your efforts currently?

Density, sizes and species of fish targets, fish behaviour during capture, gear monitoring



instrument and fishing gear designs are all key elements in fishing activities with trawls and purse seines. Such knowledge and equipment are normally generated by specialised institutions and companies. Behaviour knowledge is generally the field of researchers, whereas fishing instruments are produced by electronics companies and the gears by fishing gear companies. The Centre aims to bridge these various disciplines to develop fishing systems that are holistic. A trawling system designed to maximise the capture of the specified target species is presently in development. This method uses information about fish behaviour in the capture process so that trawl design and its operation create minimum drag and thus fuel consumption while fishing. Instruments that monitor the fish and gear, and which can also control the gear's performance while fishing, are central to that system.

What activities will you be focusing on in the coming months to achieve your scientific objectives?

Field testing of prototype products developed by our partners onboard research and commercial vessels are core activities for CRSIP. Included in such field tests is the study of fish behaviour during trawling, as such knowledge is essential in modifying the trawl design and fishing operation to achieve the sustainability objectives. Verifying the volume of shoals and the size of fish using new sonars with real catches is another priority activity in such field tests. Another major challenge is to develop an integrated system for controlling and manoeuvring the adjustable trawl doors. In 2013 we also aim to finalise the development of a device called DeepVision, which uses high quality images taken inside of a trawl to identify species and sizes of fish while towing. In addition to this we plan to continue our studies into how alternative fish-handling techniques during capture, and once the fish are onboard the vessel, can improve fish quality.

A cross-disciplinary consortium

Combining industry and research expertise to improve all aspects of Norway's commercial trawling and purse seining, **CRISP** is making significant headway in achieving a more sustainable paradigm for the sector

NORWAY HAS A lengthy coastline, off which lie some very profitable fishing areas. As a result of this rich resource, the country is the biggest fishing nation in Europe. But as world populations grow and the demand for fish continues to increase, fishing industries worldwide are striving to make their operations more efficient, profitable and sustainable. The Centre for Research-based Innovation in Sustainable fish capture and Processing technology (CRISP) was created in April 2011 with this in mind, and is attempting to improve several aspects of Norway's commercial fishing practices. Led by John Willy Valdemarsen, the Centre comprises a unique cooperation between research and industry partners, as well as sponsors.

THE CHALLENGES OF SUSTAINABLE FISHING PRACTICES

Fishing is a complex activity involving everything from finding the fish to bringing quality products to the consumer. In this long and complicated production line, economy for the operators and acceptable environmental impact while fishing are key factors. Most Norwegian vessels are relatively advanced both in terms of the technology available to the crew and their working conditions, but in areas such as fuel efficiency, seabed impact and the number of unwanted fish being caught, there is still much work to be done. The multidisciplinary approach being taken by CRISP reflects the complexity of fishing activities. The organisation is also eager to assist with the training of young researchers and has taken on several MSc and PhD students. Each of these students is gaining a valuable insight into how research can be translated into practical terms, through a study programme which spans a university or a research institute to one or several industry partners. It is hoped that this experience will prepare the students for the practical challenges of working in commercial fishing research.

By uniting the experience and specialisms of the Institute of Marine Research (IMR), Nofima AS, and the universities of Bergen and Tromsø, as

well as Kongsberg Martime AS, Simrad, Scantrol AS, the Egersund Group and Nergård Havfiske AS, it is hoped that better technologies and practices can be developed and introduced to the global fishing industry. In order to ensure their efforts are as focused and effective as possible, Valdemarsen's team has subdivided their aims into specific areas. These focus on every aspect of fishing practice, from pre-catch through to the catch itself, handling and processing of fish, and retrospective evaluation of the whole process.

IMPROVING THE CATCH

The project's first aim is to improve the pre-catch information available to the skipper by developing acoustic technologies which can identify the quantity, size distribution and species composition of a shoal of fish prior to shooting a purse seine. To this end, IMR and Simrad have been collaborating on a new fishery sonar which will facilitate system calibration and thereby more accurate, real-time school biomass estimates. Further, using a new broadband echo sounder, they will try to more accurately estimate the size and species composition of the fish from resolved single targets in the outskirts of the school, during what is defined as the inspection phase of the purse seine catching process. New acoustic equipment for extracting similar information from inside the purse seine after enclosure is also under development.

These technologies will both improve the effectiveness of the fishing process – with less time spent sifting through catches manually and releasing unwanted fish back into the sea – and prove more environmentally friendly, cutting down on the number of unintended mortalities of unwanted fish. The group is also keen to develop visual equipment capable of monitoring the behaviour of fish and fishing gear during the catch. This consists of *in situ* instrumentation which can inform the skipper as to what species and sizes of fish are entering the trawl gears in real-time. This is a groundbreaking development for commercial fishing, and the CRISP team hopes it will lower the energy consumption of vessels,

INTELLIGENCE

CRISP

CENTRE FOR RESEARCH-BASED INNOVATION IN SUSTAINABLE FISH CAPTURE AND PROCESSING TECHNOLOGY

OBJECTIVES

To enhance the position of Norwegian fisheries-related companies as leading suppliers of equipment and seafood to a global market through the development of sustainable trawl and purse seine technology.

PARTNERS

Institute of Marine Research (host)

Kongsberg Maritime AS, Simrad

Scantrol AS

Egersund Group

Nergård Group

Nofima AS

University of Bergen

University of Tromsø

Norges Sildesalgslag

Norges Råfisklag

FUNDING

Research Council of Norway – SFI scheme

Partner contribution ~60 per cent

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JOHN WILLY VALDEMARSEN is a senior scientist with nearly 40 years of experience in fishing technology research including management of national and international (FAO) research groups. He specialises in the development of trawl gears and mitigating the impact of fishing on the environment.

facilitate targeted fishing and help the skipper to formulate a decision as to whether fishing in a particular area should continue or abate.

IMPROVING TRAWLER GEAR

Alongside this work, CRISP is also targeting two basic areas of fishing practice which are widely considered unsustainable. As a result of the design of trawl gear which is presently in use in the commercial fishing industry, the seabed often becomes impacted, sometimes significantly affecting its sensitive habitat and the creatures that live there. The gear is often heavy and unwieldy, creating drag on the vessel which greatly increases the fuel needed to propel the ships. In response, CRISP is developing a trawling system known as semi-pelagic trawling with less bottom contact and drag than presently used trawl gears. An essential requirement for semi-pelagic trawling is to keep both trawl doors at the same distance from the seabed whilst towing. The Egersund Group are in the process of developing a mechanism which enables the upper hatch of the trawl door nearest the sea bed to be opened while towing, bringing this trawl door in line with the other, higher one. Such a development would enable appropriate contact with the seabed by all parts of the trawl itself, maximising the vessel's catching potential.

EFFICIENCY AND EVALUATION

Valdemarsen and his collaborators are also making developments in other areas which, though less pioneering, are of great importance to CRISP's overall goals. The first of their aims is adding value to product quality by developing

the standard for capture, transfer, transport and pre-processing procedures in general. For Valdemarsen and his team, profitability is of enormous importance, and any advances which can be made in these areas to improve fish quality are hugely beneficial. This is also reflected by the final area of focus: "We are also analysing the economic benefits to the fishing industry of converting to more sustainable capture techniques," he outlines. This involves CRISP's constituent parts collaborating on a comprehensive report which will use data from their operations to evaluate the benefits of their technological advances. Overall, the

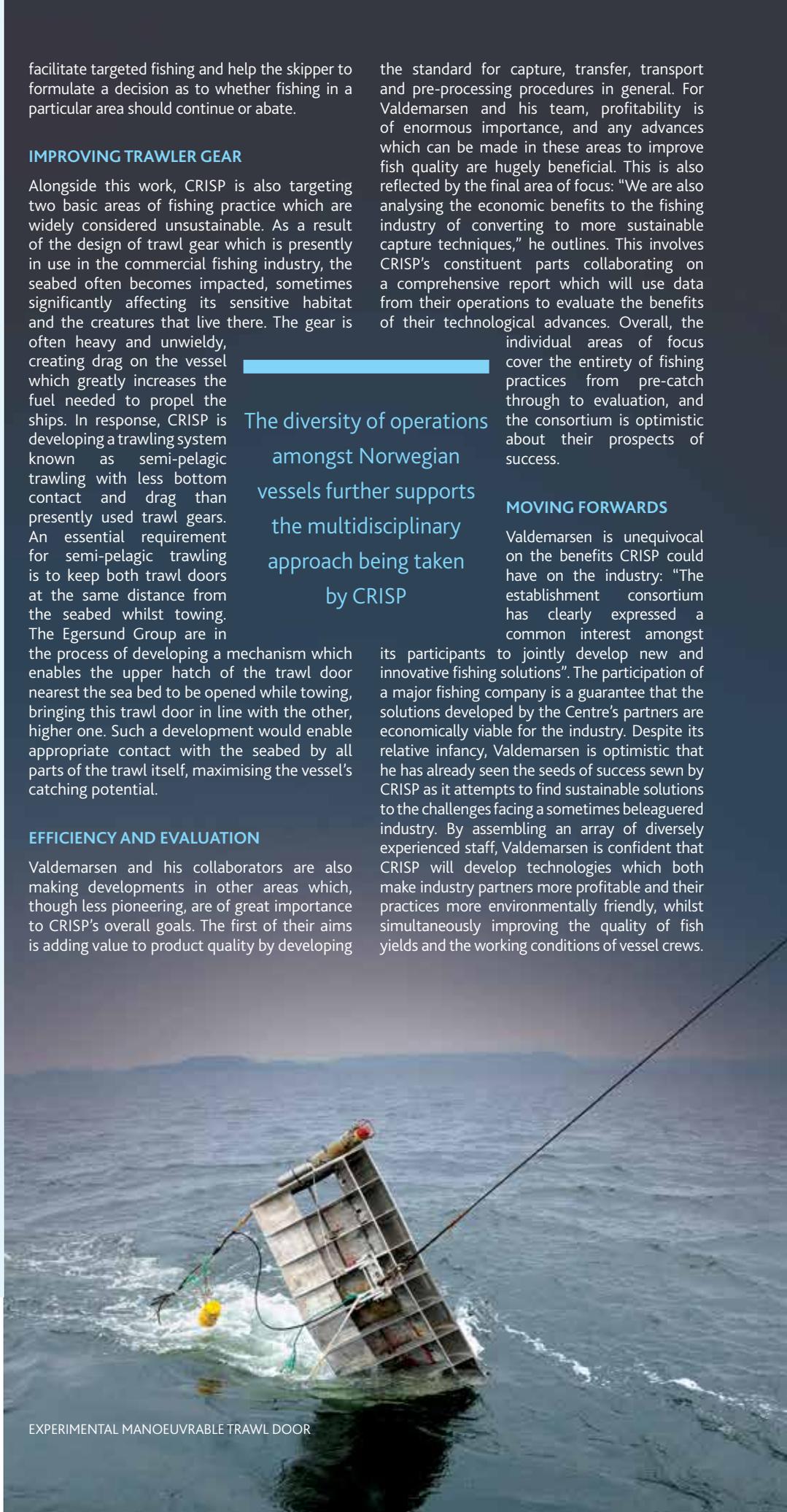
individual areas of focus cover the entirety of fishing practices from pre-catch through to evaluation, and the consortium is optimistic about their prospects of success.

MOVING FORWARD

Valdemarsen is unequivocal on the benefits CRISP could have on the industry: "The establishment consortium has clearly expressed a common interest amongst

its participants to jointly develop new and innovative fishing solutions". The participation of a major fishing company is a guarantee that the solutions developed by the Centre's partners are economically viable for the industry. Despite its relative infancy, Valdemarsen is optimistic that he has already seen the seeds of success sown by CRISP as it attempts to find sustainable solutions to the challenges facing a sometimes beleaguered industry. By assembling an array of diversely experienced staff, Valdemarsen is confident that CRISP will develop technologies which both make industry partners more profitable and their practices more environmentally friendly, whilst simultaneously improving the quality of fish yields and the working conditions of vessel crews.

The diversity of operations amongst Norwegian vessels further supports the multidisciplinary approach being taken by CRISP



EXPERIMENTAL MANOEUVRABLE TRAWL DOOR