



AUV = selvgående undervannsfartøy; din fremtidige medarbeider for bedre kontroll?

Bjørn Jalving, Kongsberg Maritime



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Kongsberg Maritime Autonomous Underwater Vehicle (AUV) Program

Kongsberg Maritime Divisions



Kongsberg Maritime

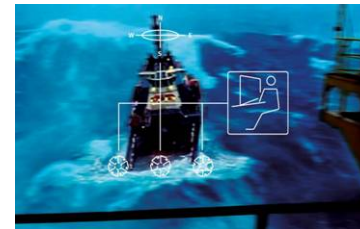
Merchant

Marketing & Sales

Buisness Dev

Offshore

Subsea



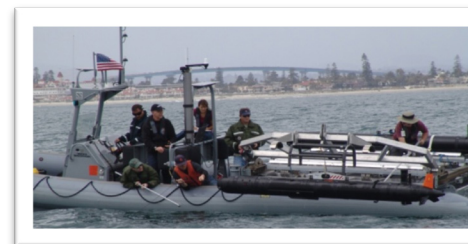
Kongsberg Maritime AUV Program



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- HUGIN dual-use program since 1991
- AUVs for civilian and military applications
 - Commercial operations since 1997
 - Military operations since 2001
 - In NATO exercises since 2003
 - 30+ HUGIN AUVS sold

- REMUS program since 1993
 - 1993: REMUS 100 tested off the shores of NJ for the first time
 - 2003: REMUS 100 supports Operation Iraqi Freedom - Clearing Umm Qasr
 - Large customer bases in defense and marine research
 - Approx. 230 REMUS AUVs fielded

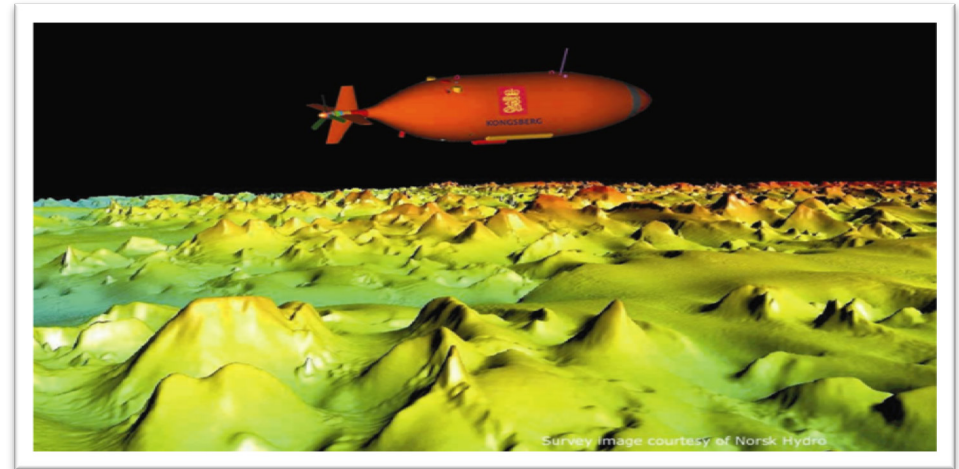


Offshore and Hydrography AUV Applications

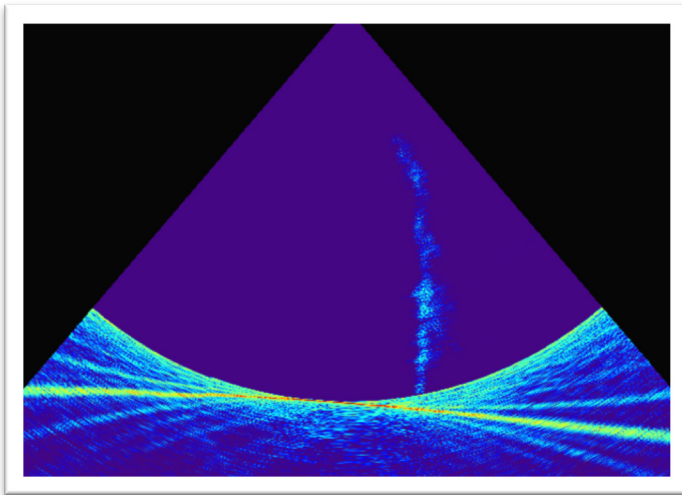


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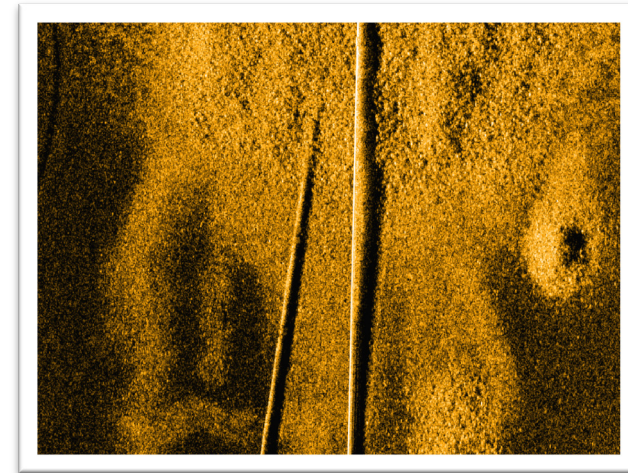
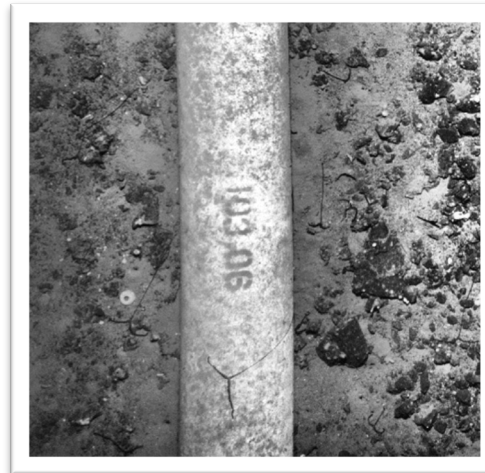
- Geophysical survey
- Hydrographic survey
- Pipeline inspection
- Environmental monitoring



HUGIN Bathymetry Data



Gas Leak Detection with Acoustics



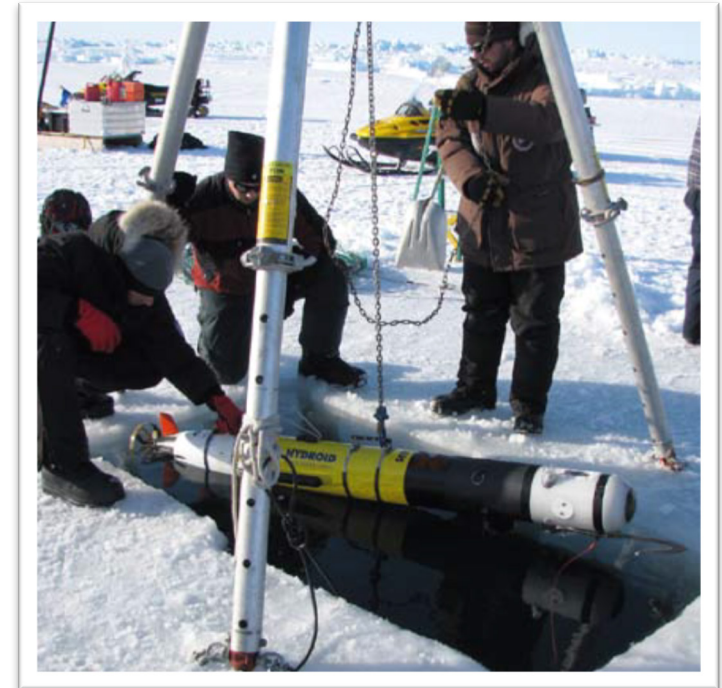
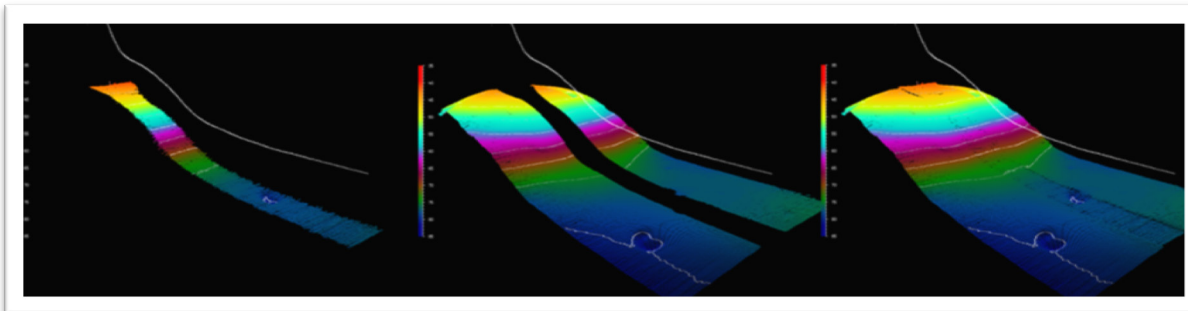
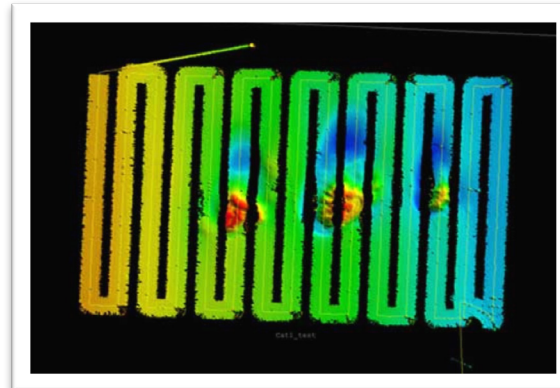
HUGIN Pipeline Inspection Data Products

Marine Research AUV Applications



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- Environmental monitoring
- Physical oceanography
- Archaeological survey
- Arctic exploration
- ...



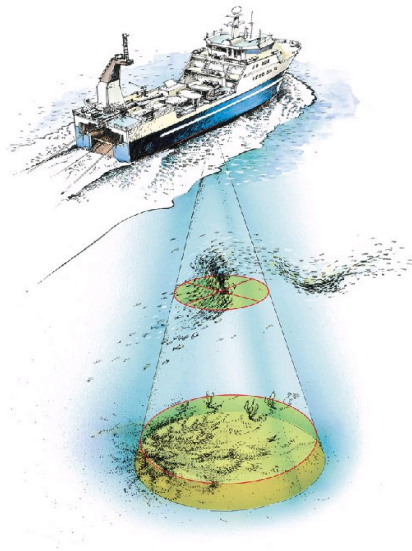


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Kongsberg Technology for Fishery and Fishery Research

Simrad Core Technology

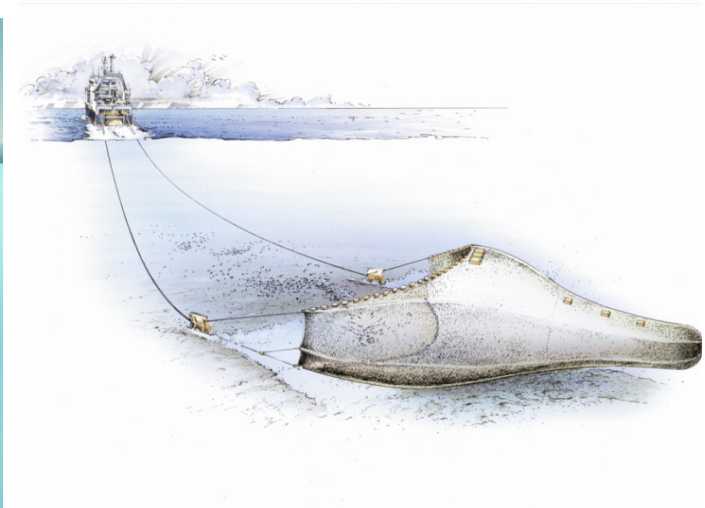
Echosounders



Sonar



Catch monitoring



Established 1947

World leading manufacturer of acoustic instrumentation for fisheries and fisheries research

Science and Environment



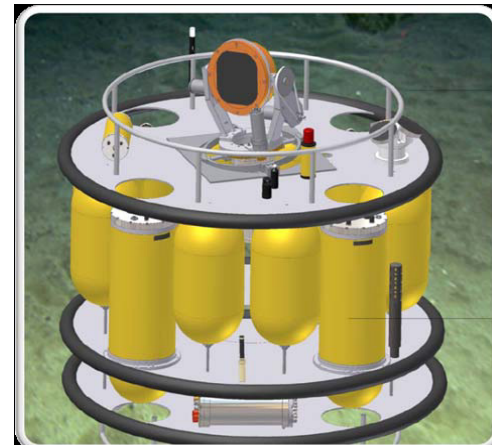
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- Quantitative echosounders for assessment of fish biomass and size
- Multifrequency acoustics for species ID of fish and plankton
- Acoustic technology for environmental monitoring

R/V GO Sars



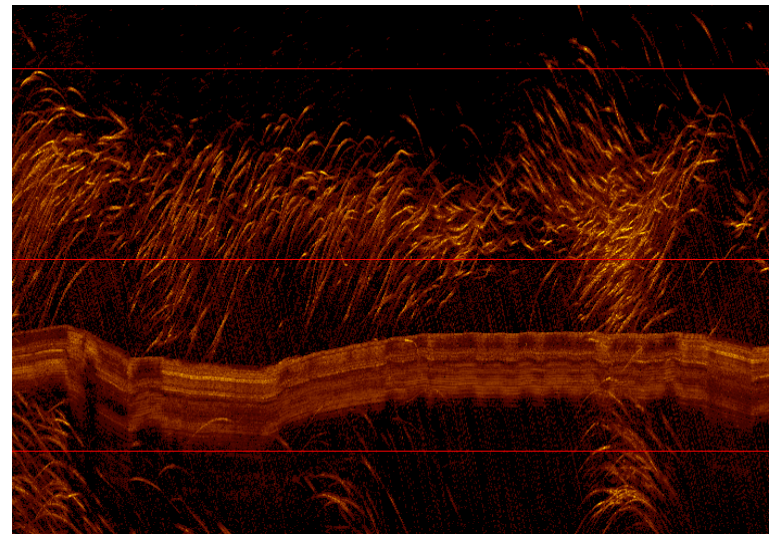
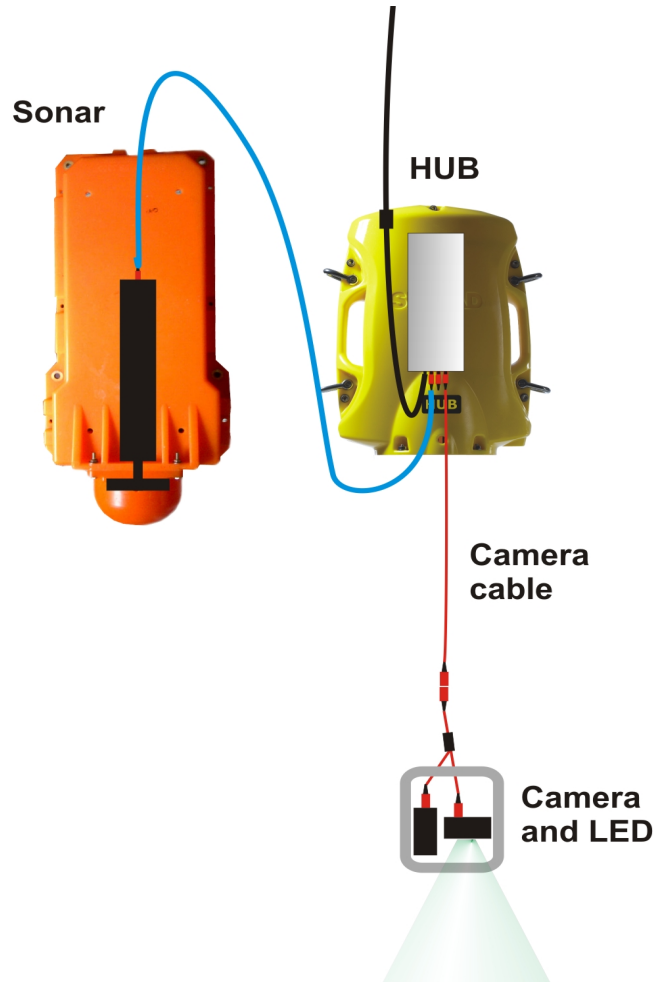
Photo by Harald M. Valderhaug. Used with permission.



Courtesy of
IMR

Real time Catch Monitoring for Trawl

Camera and sonar combined

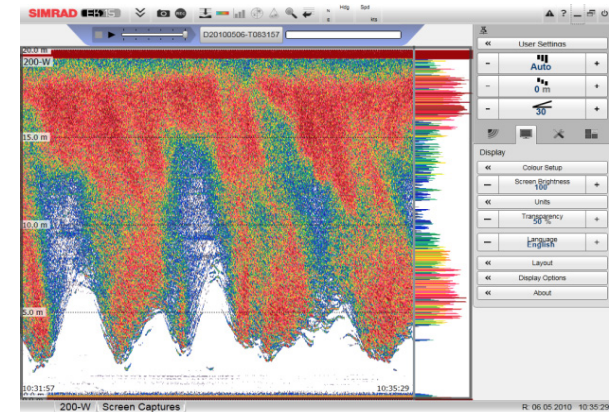
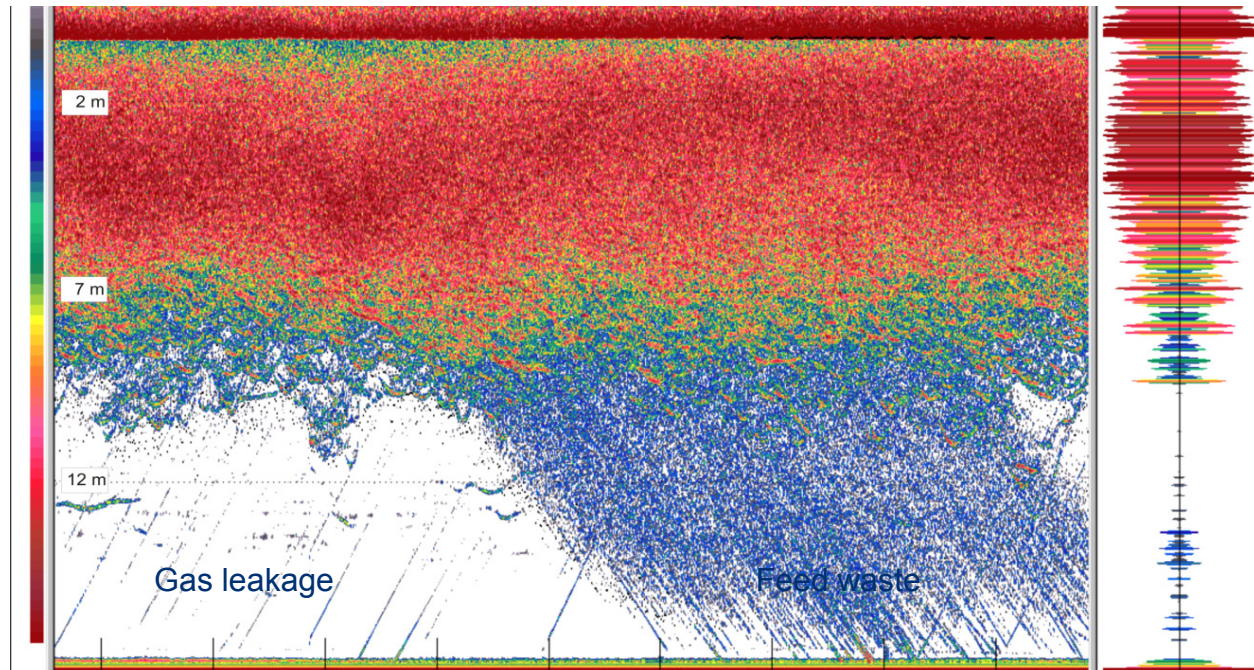


Sea Cage Monitoring

- Feed waste
- Environment
- Behaviour
 - Sickness
 - Algae invasion
- Escape warning

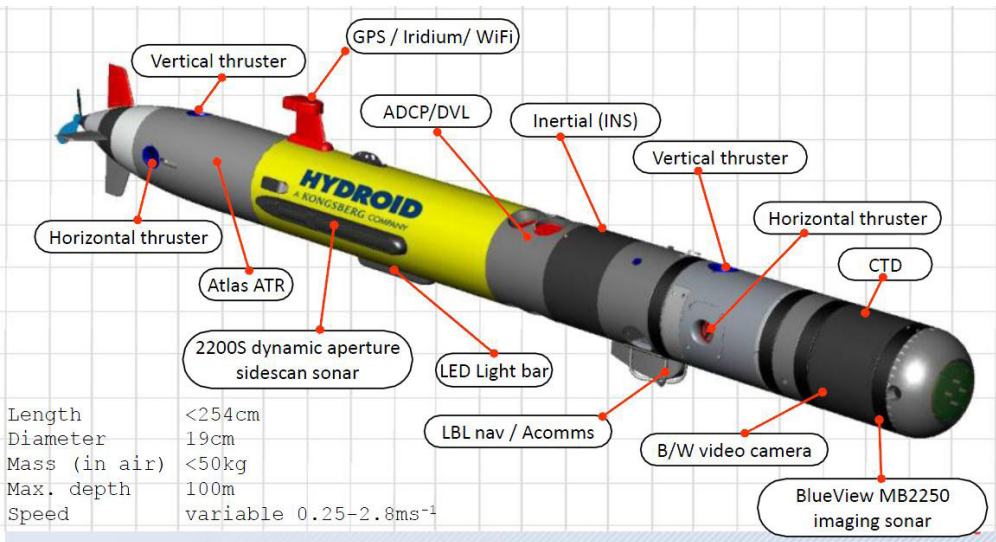


EK15-new compact and rugged echosounder





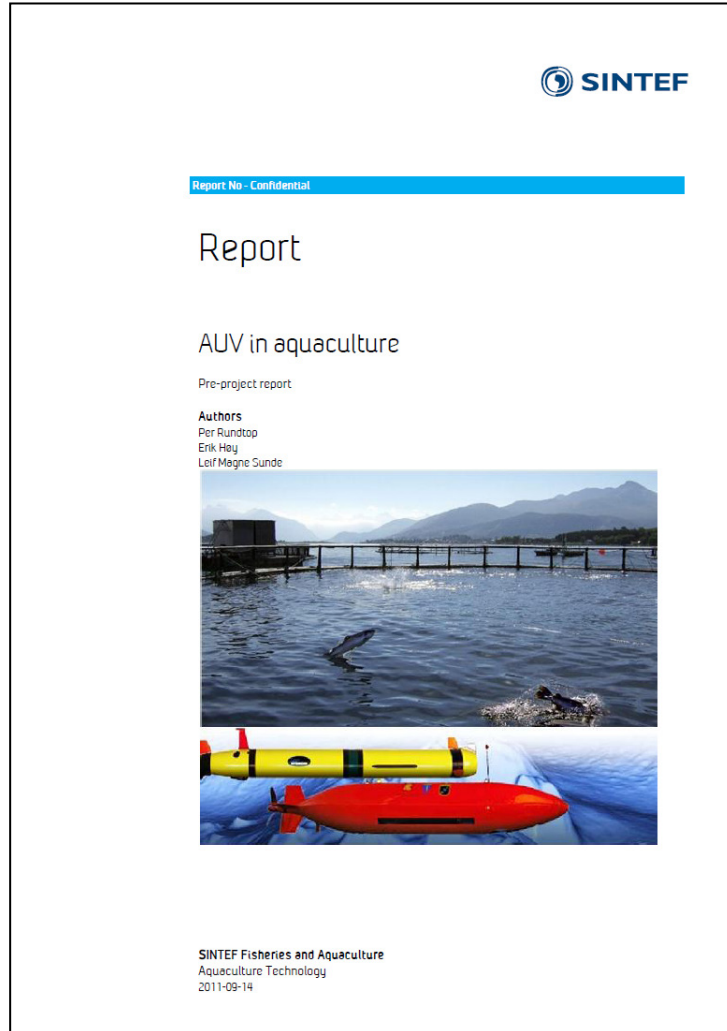
AUV for Aquaculture



Pre-project Report on AUV in Aquaculture

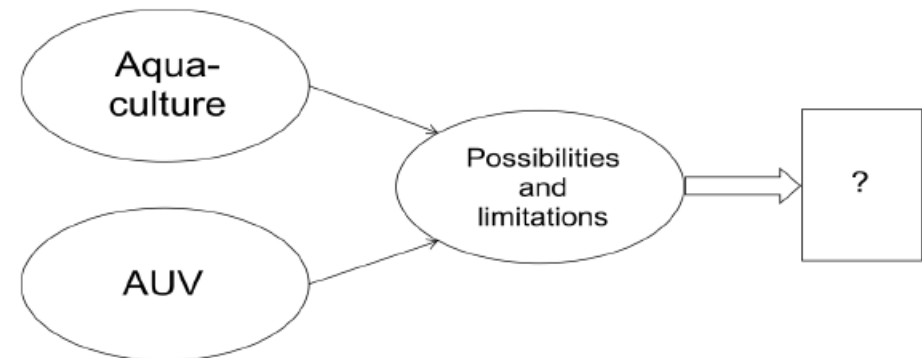


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Partners

- Kongsberg Maritime (project owner)
- SINTEF Fisheries and Aquaculture (project leader)
- SINTEF Information and Communication Technology
- Egersund Net
- AKVAGroup
- Aquaculture Engineering
- Aanderaa Data Instruments
- NTNU

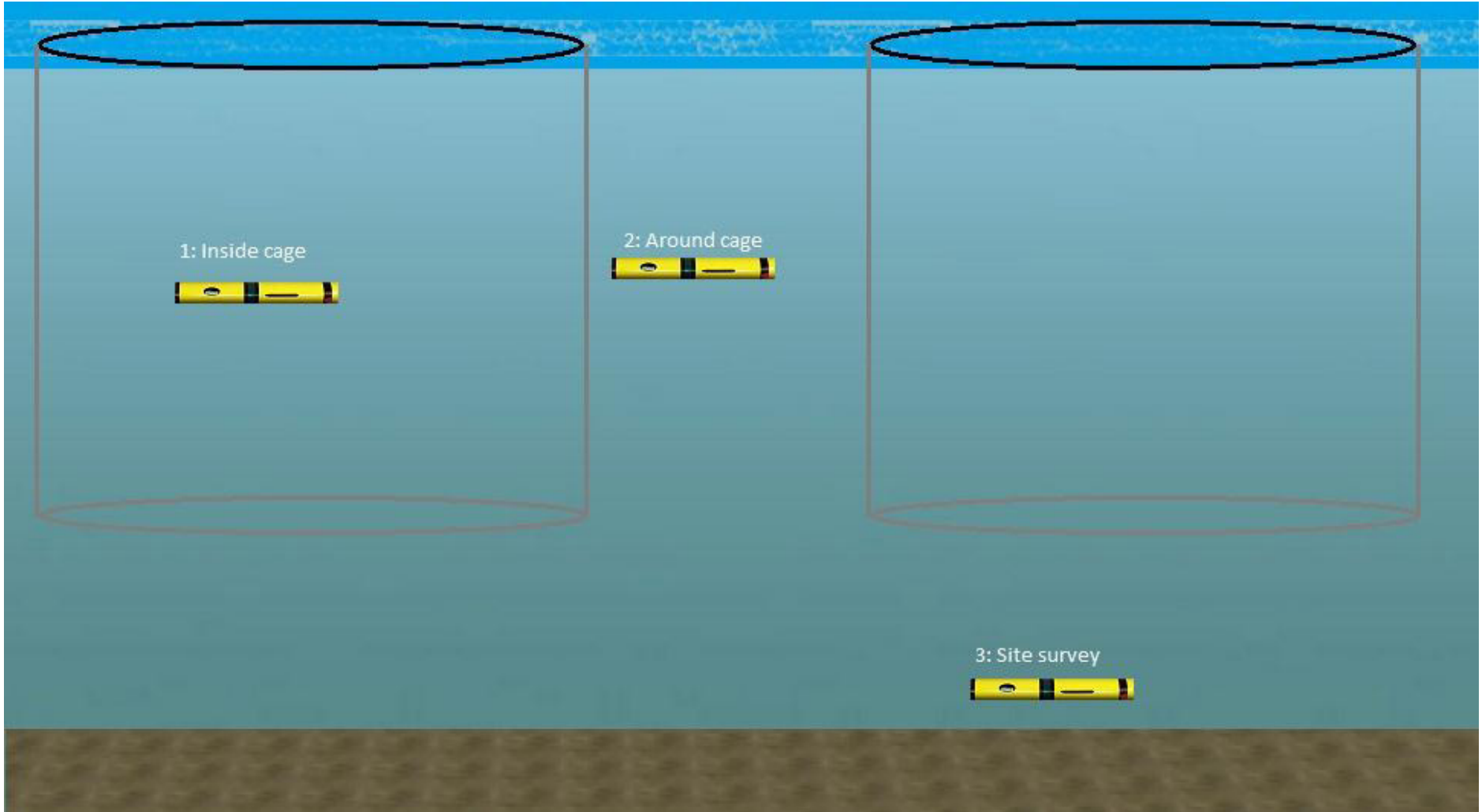


Pre-project has been technology driven

AUV Use Cases



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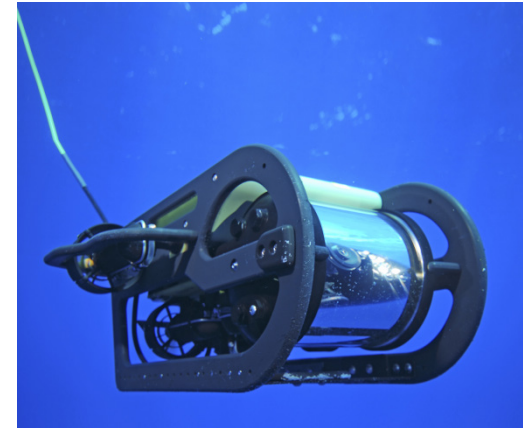


Application area	AUV needed
Net integrity inspection	Yes
Biofouling inspection	Yes
Net cleaning system	Yes
Monitoring of water quality	Yes
Fish behavior	Yes/no
Biomass estimation	Yes
Dead fish situation	Yes
Sea lice counting	Yes/no
Sea lice infection pressure	No
Optimization of feeding	Yes/no
Inspection of mooring components	Yes
Inspection of seabed	Yes
Pre-production survey	Yes

Selection of application areas:

1. Net and biofouling inspection
 - Efficient and regular inspections
2. Monitoring of water quality
 - AUV inside cage
 - Optimization of production environment and fish welfare
3. Biomass estimation
 - Accurate biomass estimation in combination of AUV and echo sounder
4. Pre-production survey and seabed inspection (existing AUV application)
 - Reduce risk and improve environmental sustainability

Autonomous Underwater Vehicle (AUV) versus Remotely Operated Vehicle (ROV)



AUV	ROV
Untethered	Tethered
Battery	Power through umbilical
Autonomous	Operator control through umbilical
Emerging	Established

Summary and Further Work



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- Use of AUV in aquaculture is very interesting from a technological and farm management point of view
- More information and evaluation of market potential is needed
- A development project should probably include:
 - A partner from fish farming industry
 - A partner from service industry
 - AUV vendor
 - Sensor vendor
 - Research institute

Acknowledgement

- SINTEF Fisheries and Aquaculture for initiating the AUV in aquaculture study
- Per Rundtop, Erik Høy and Leif Magne Sunde for authoring the pre-project report
- Project partners for participating in project workshop and meetings





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