

Guidelines and recommendations on noise and vibration reduction

Per W. Nieuwejaar, IMR

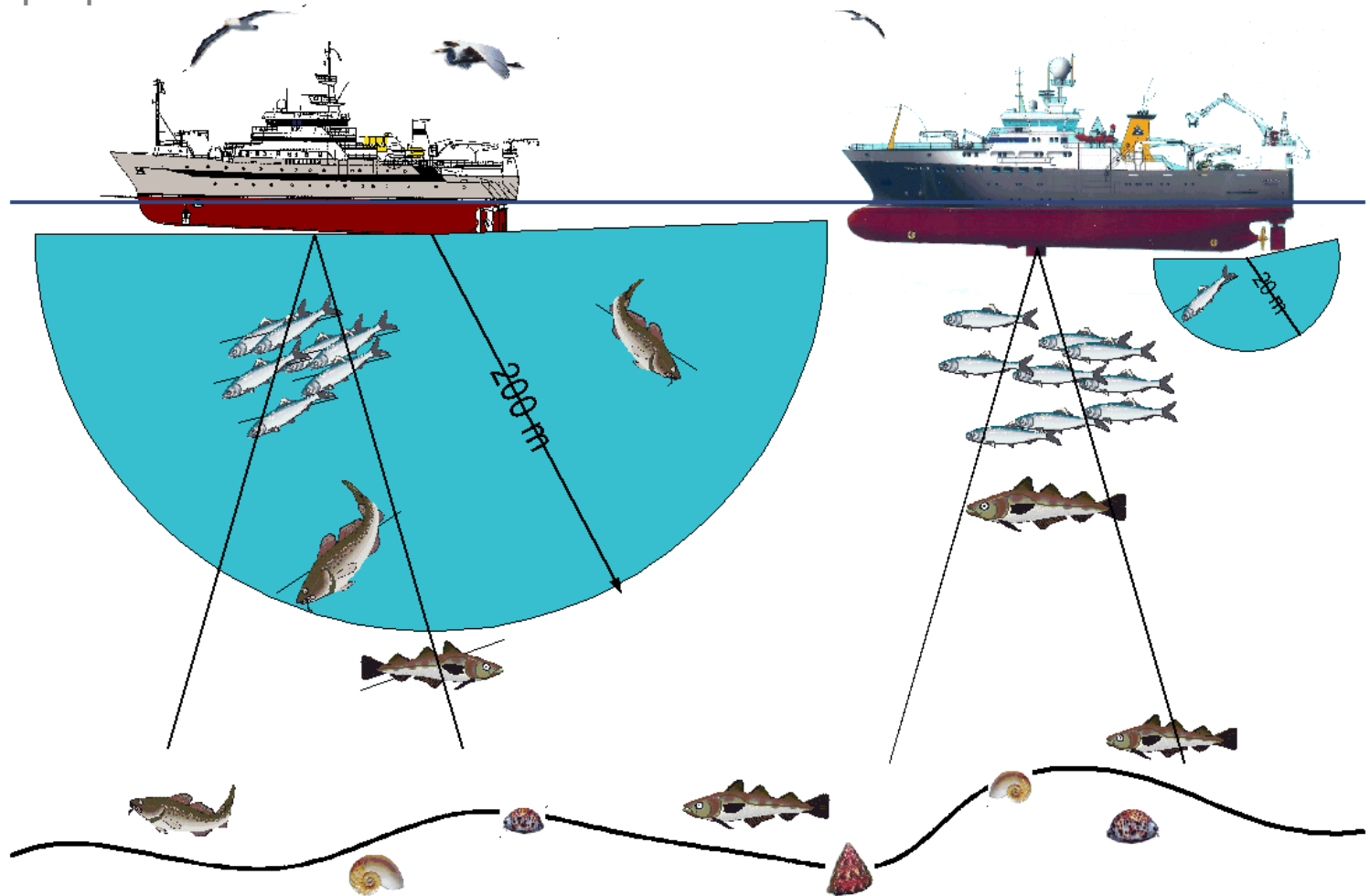
Capri, Italy – 10 October 2016



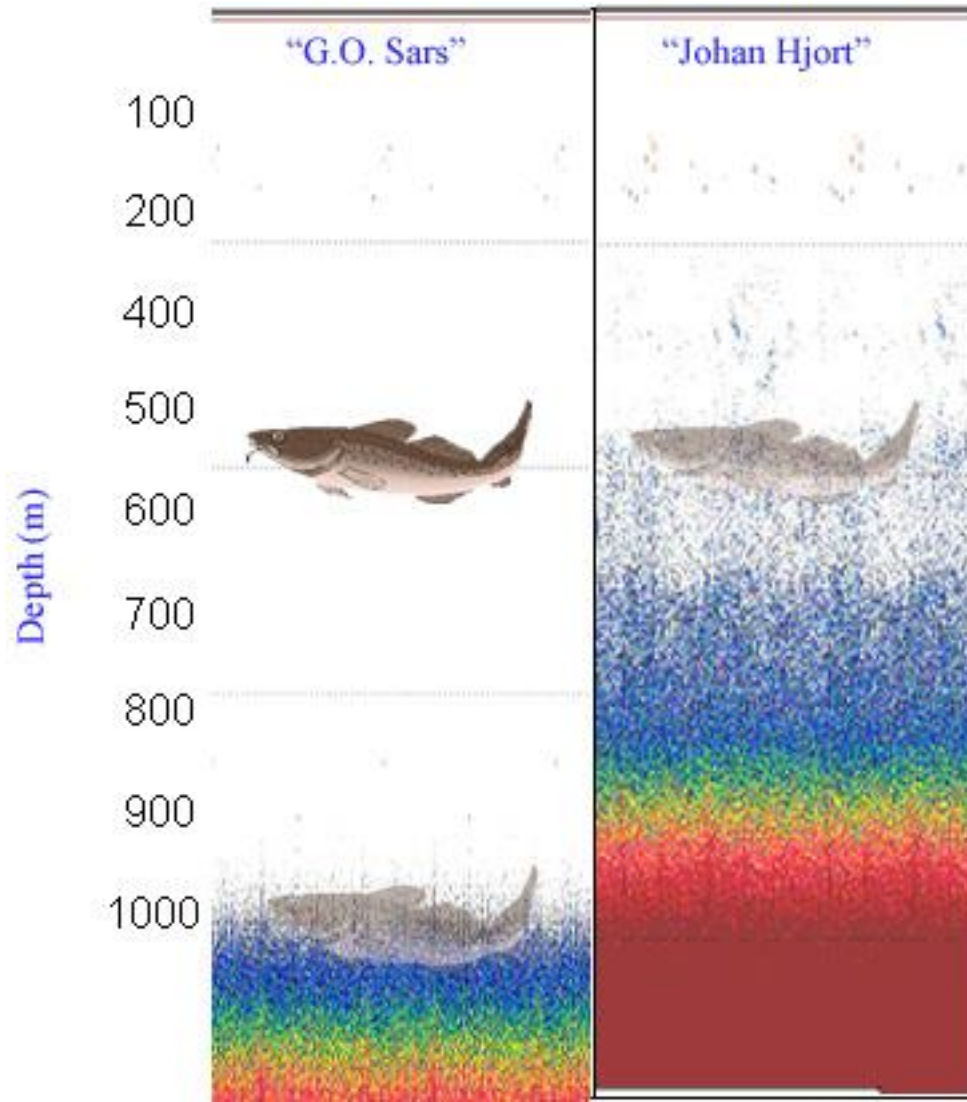
Vessel noise

Conventional propulsion

Dieselelectric propulsion



Benefits from reduced noise

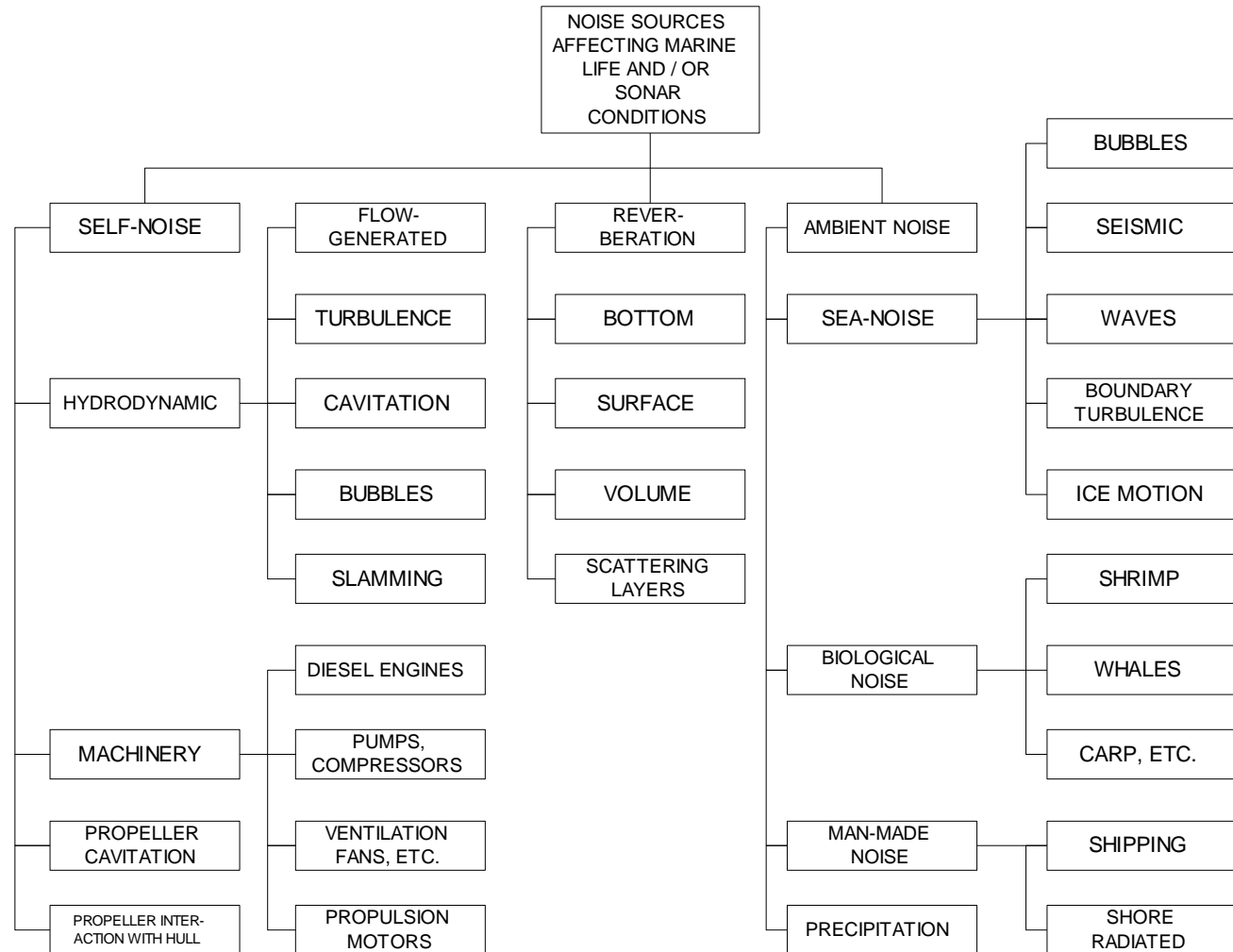


References

- Guidelines and recommendations for ship design on noise and vibration reduction, 03 December 2014, version 1.3
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- ICES Cooperative Research Report 209 – Underwater Noise of Research Vessels, May 1995
[http://www.ices.dk/sites/pub/Publication%20Reports/Cooperative%20Research%20Report%20\(CRR\)/crr209/CRR209.pdf#search=ICES%20Cooperative%20Research%20Report%20209%20%E2%80%93%20Underwater%20Noise%20of%20Research%20Vessels](http://www.ices.dk/sites/pub/Publication%20Reports/Cooperative%20Research%20Report%20(CRR)/crr209/CRR209.pdf#search=ICES%20Cooperative%20Research%20Report%20209%20%E2%80%93%20Underwater%20Noise%20of%20Research%20Vessels)
- AQUO - Achieve QUIeter Oceans by shipping noise footprint reduction FP7 - Collaborative Project n° 314227, 2015
http://www.aquo.eu/downloads/AQUO_D5.8_rev1.0_final.pdf
- DNV GL Silent notation, 2010
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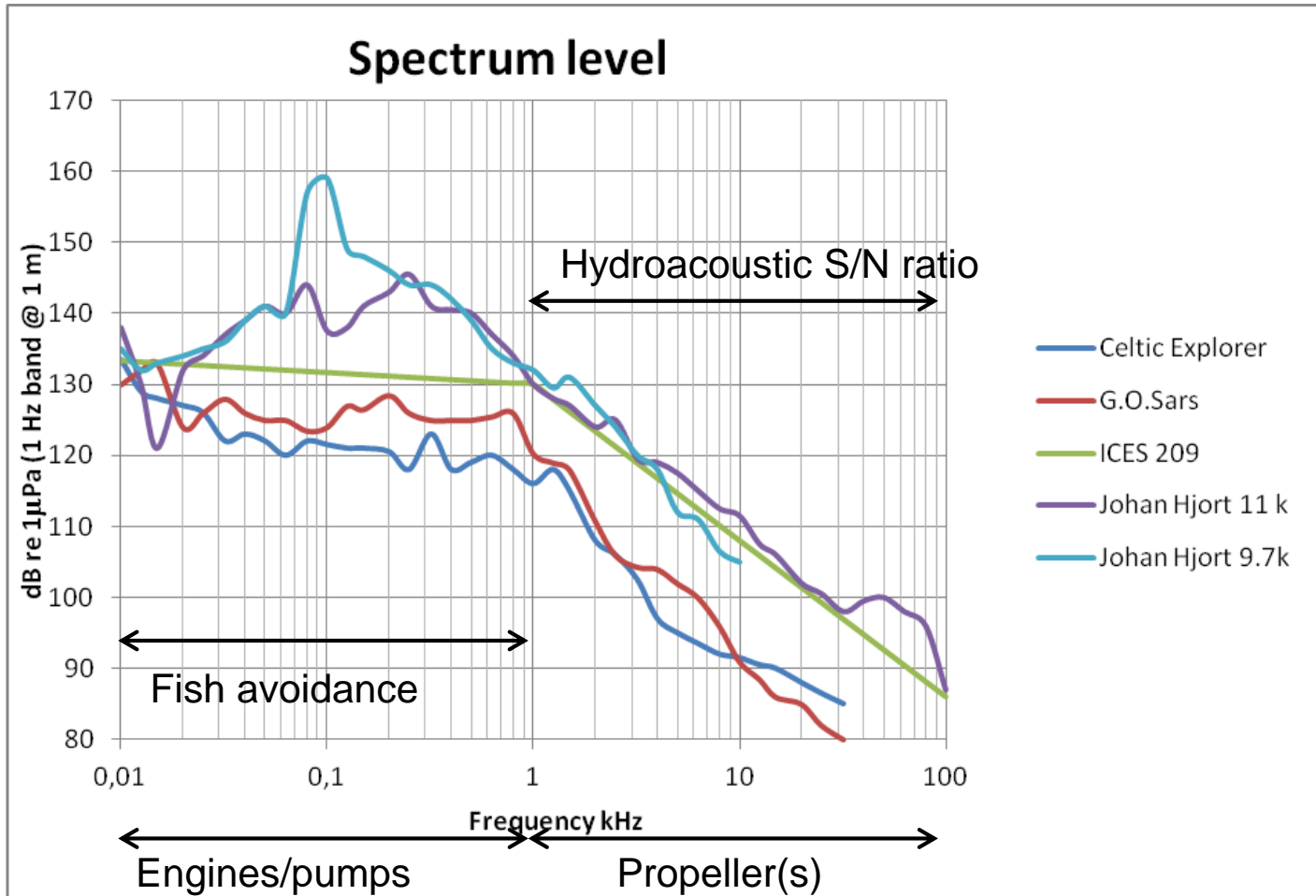
Underwater noise sources



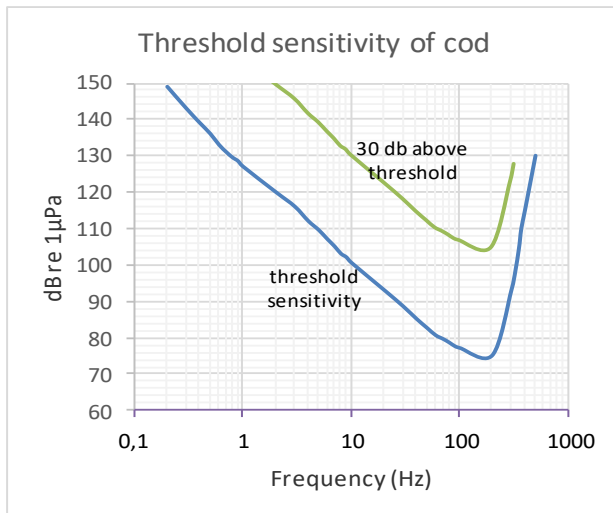
DNV GL model



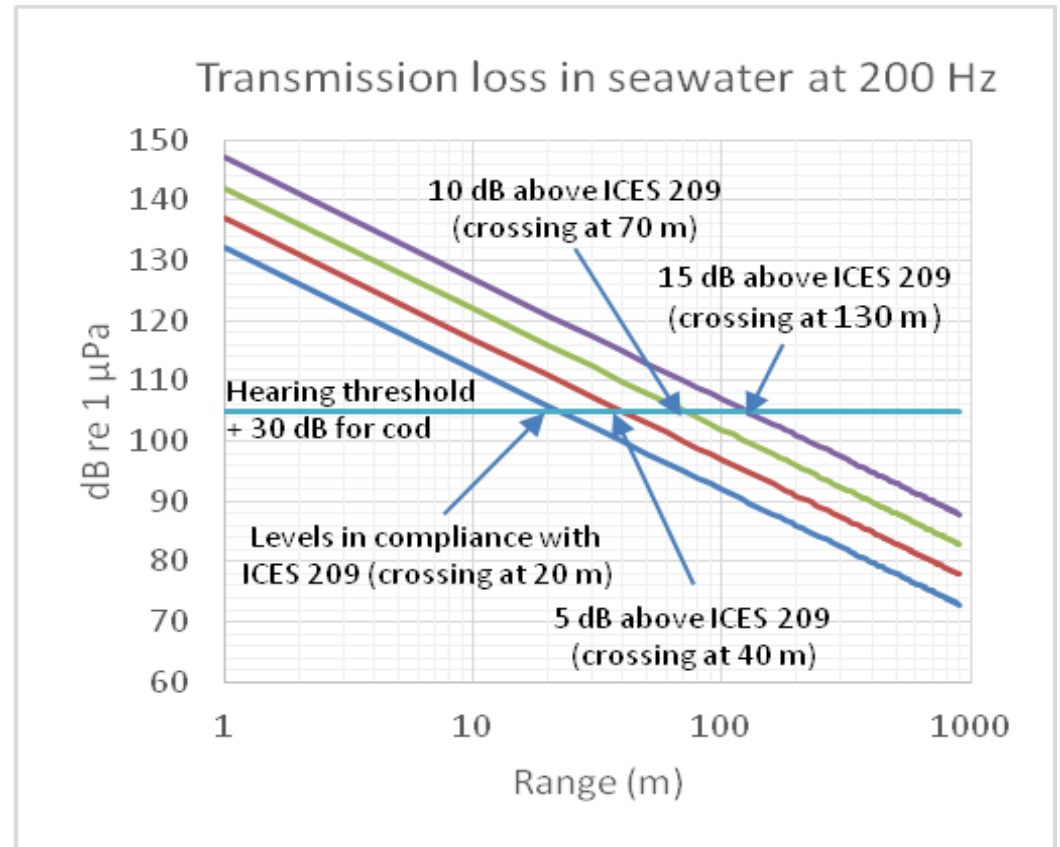
Vessel URN signatures compared with the ICES CRR 209



Is it absolutely necessary to comply with ICES CRR 209?

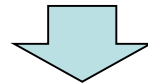


Threshold sensitivity of cod



Update of ICES CRR 209?

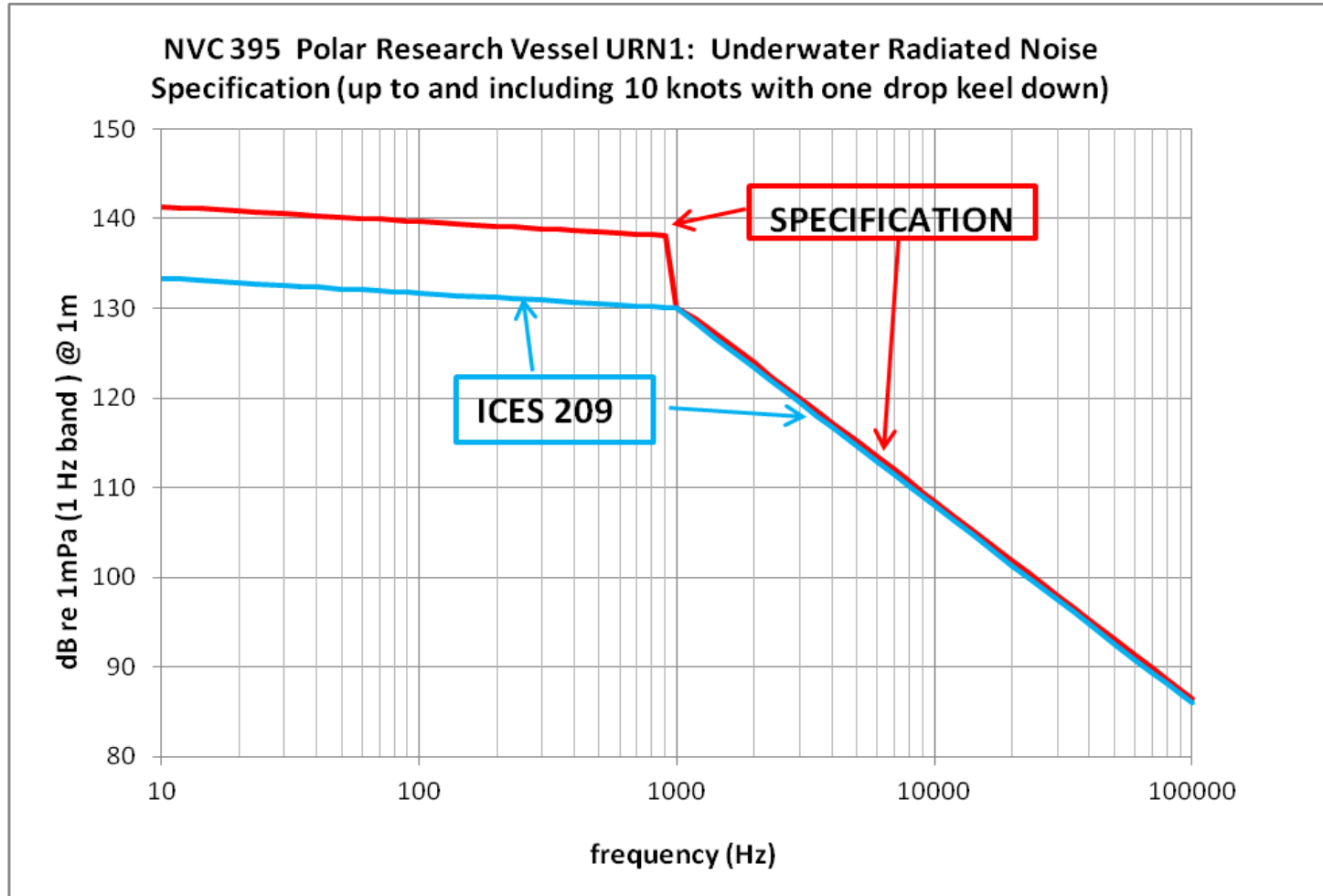
- ICES CRR 209 curve is for 11 knots only. Why not 10, 9 or 8 knots?
Many non-ICES 209 vessels will probably meet the curve at slightly lower speed
- Very little (if any) evidence that reasonably quiet vessels actually disturbs fish
- Cost of meeting ICES CRR 209 requirements for 10 Hz – 1 KHz spectrum is estimated to increase a research vessel building cost with 5-10%
- Reduction in vibrations due to motion damping of engines, pumps, pipes etc improves working and living conditions on board, which is very important for scientific staff on board research vessels. "Comfort class" requirements for new vessels also require reduction in noise and vibration.
- The main achievement of ICES CRR 209 is the improvement in hydroacoustic signal to noise ratio, resulting in a large increase in echosounder and sonar range, accuracy and resolution. These aspects are not adressed in ICES 209 CRR.



ICES CRR 209 should be updated and made more "flexible" depending on what kind of data collection and sampling the research vessel is made for.

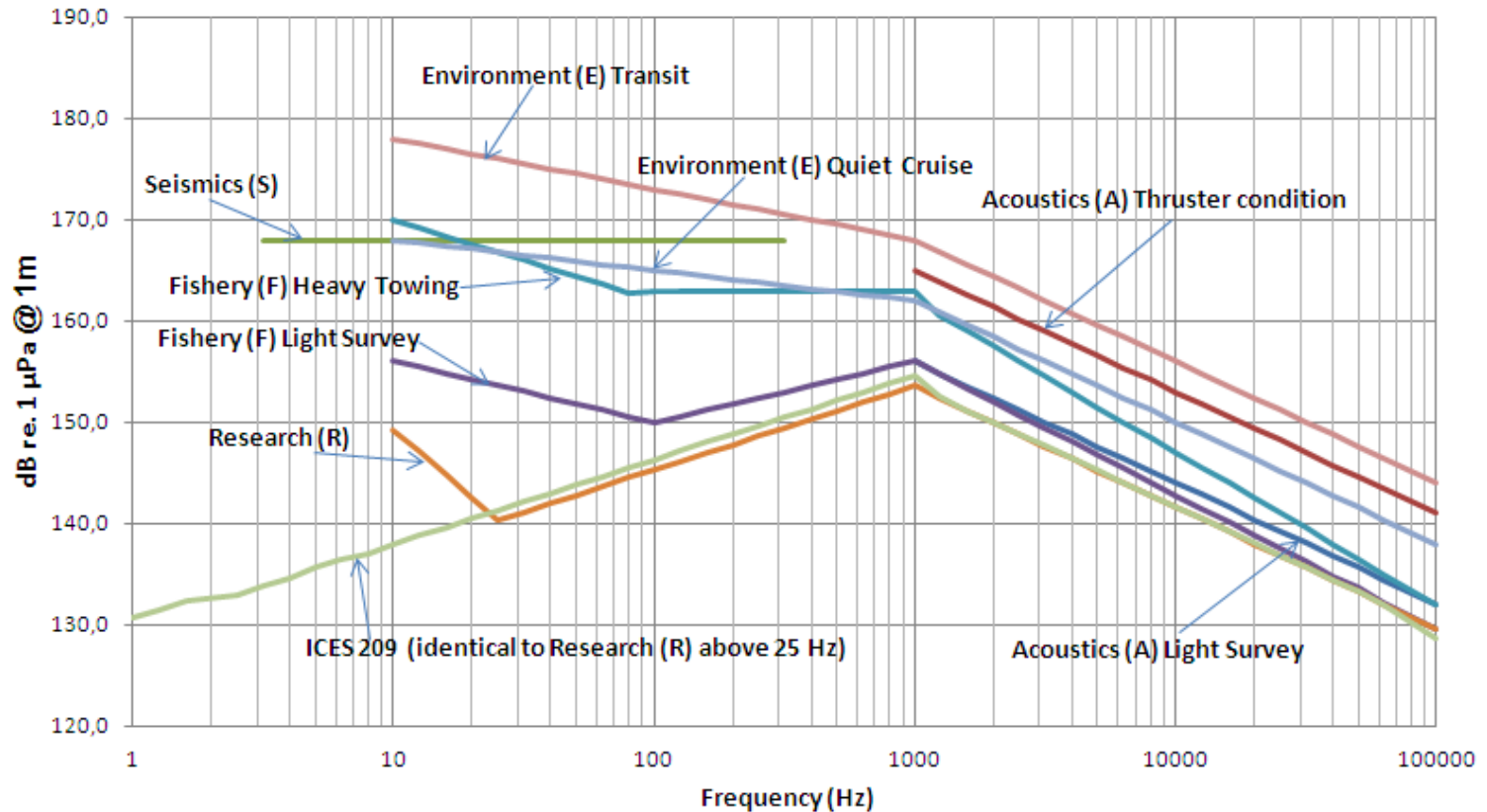


New Norwegian Polar Research Vessel (AC el.motors and Z-drives)



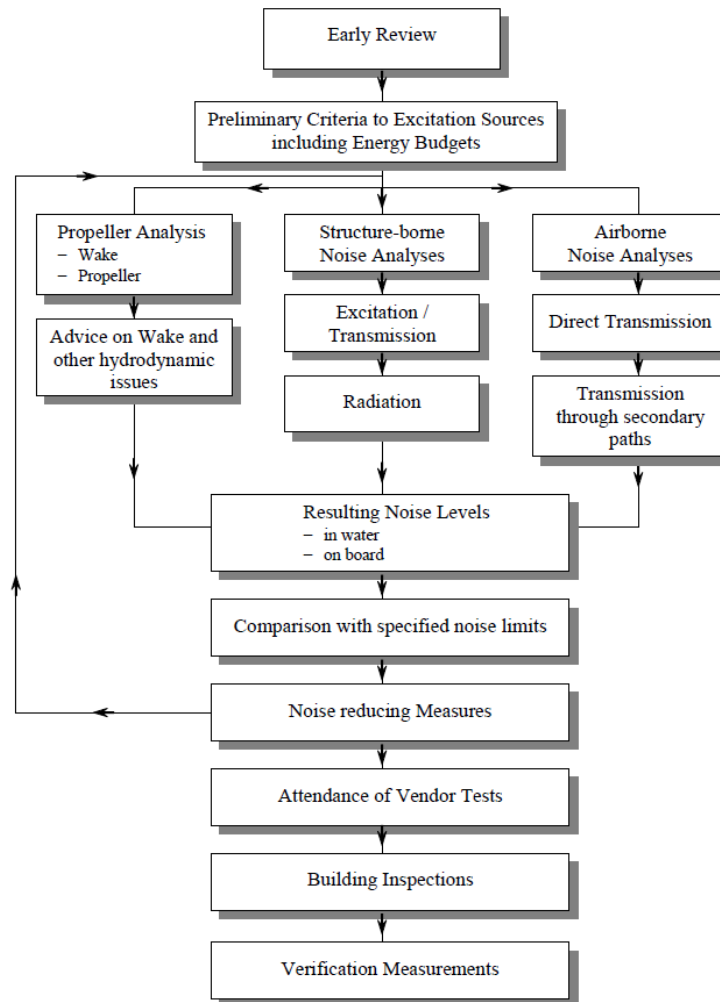
DNV GL Silent notation

DnV Silent class notations, summary of criteria, band levels



URN planning and priorities process

DNV GL model



Eurofleets2 report recommendations

- **Recommendation 1, Upper limit for acoustic profile**
In the contract with the shipyard, the yard should commit itself to build the vessel in compliance with a predefined noise level (ICES CRR 209, ICES CRR 209 mod, Silent R, other)
- **Recommendation 2, Definition of recommendations for the design and building of the ship in order to meet the URN requirements**
 - Vibration. Use resilient mounts, avoid sharp bends for pipes
 - Internal airborne noise. Avoid vibrating structures
 - External airborne noise. Design of exhaust pipes and silencers
 - URN. Specify acceptable noise levels for respective frequency ranges
 - Self-noise. Minimize generation of noise by cavitation, vortex shedding and turbulent flow from the hull
 - Echo-sounder detection capabilities. Define speed/noise requirement for acceptable equipment range
 - Measurement of URN. Specify URN measurement method/standard
- **Recommendation 3, Practical considerations for the operation of the vessel**
 - Divide the engine power load on two or more of the diesel engines
 - Lower the speed
 - Run on one propeller instead of two



Questions?

