TG-Noise status

Three chairs of TG-Noise

Peter Sigray
Fabrizio Borsani: heading drafting group of the setting TVs for continuous noise
Florent le Courtois: heading drafting group of the setting TVs for continuous noise

Current focus on setting of TVs for noise

The essence of the MSFD D11: To avoid impact that leads to significant effects on population level

Major sources of impulsive noise:
- Piling
- Airguns
- Underwater explosions
- Sonars

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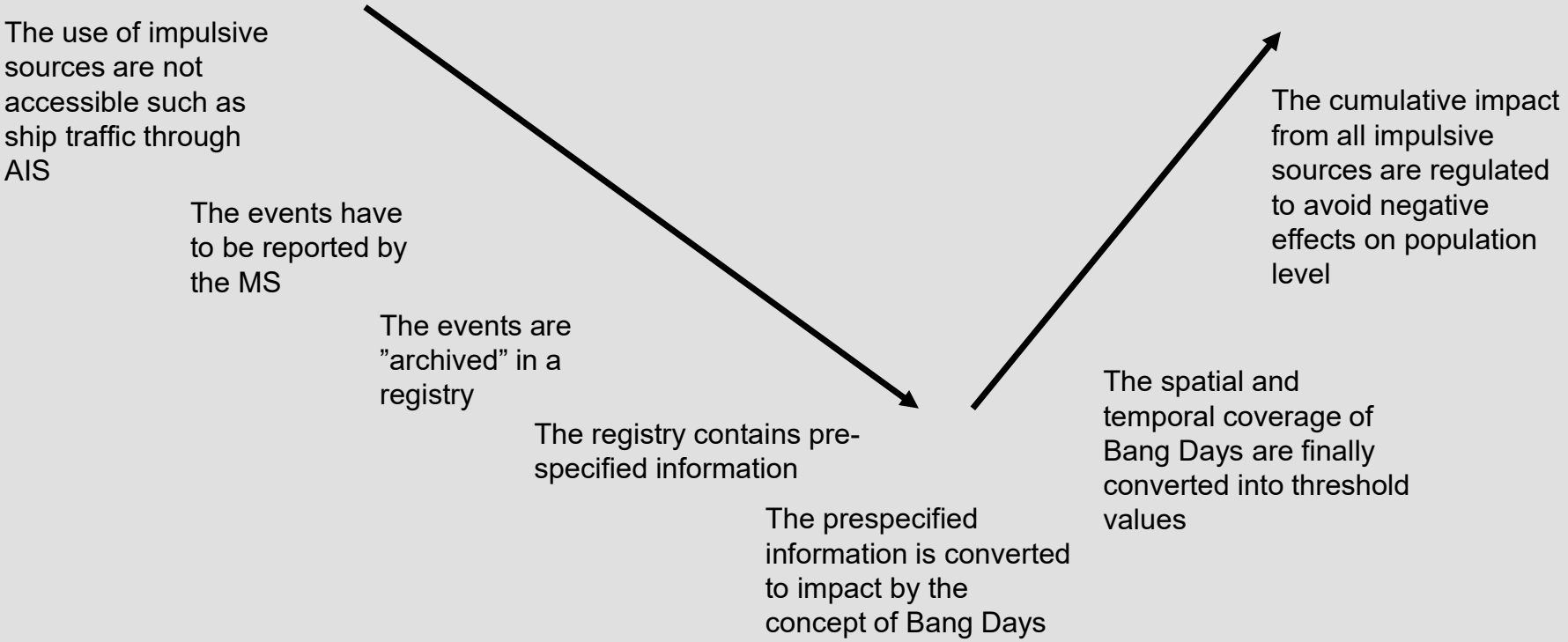
Seismic Airguns in the MSFD

Sesimic airguns fall into the handling of impulsive noise



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Reporting data of Seismic Airguns

Data	Units and/or comments	Priority
Position	geographic position (lat/long) or pre-defined block/area which can be identified through a coding system (single identifier for each block used)	Required
Dates	Start and end day	Required
Source intensity	Source level or proxy, unique levels or in bins (see Annex 5.3 for corresponding tables of values in bins)	Required
Source spectra	Frequency range	Additional
Duty cycle		Additional
Duration of transmission	Actual time/time period	Additional
Directivity		Additional
Source depth		Additional
Platform speed	For moving sources like seismic surveys	Additional

Noise source type	Thresholds for inclusion of noise events in the register
Explosive	mTNTeq > 8 g
Airgun	SLz-p > 209 dB re 1 µPa m
Low/mid freq sonar	176 dB re 1 µPa m
Low/mid freq acoustic deterrent	176 dB re 1 µPa m
Other pulse	186 dB re 1 µPa² m² s

- Airgun arrays (zero to peak source level, rounded to nearest decibel):
  - Very low: 209-233 dB re 1 µPa m
  - Low: 234-243 dB re 1 µPa m
  - Medium: 244-253 dB re 1 µPa m
  - High: above 253 dB re 1 µPa m

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Preliminary results from the Harmonize project

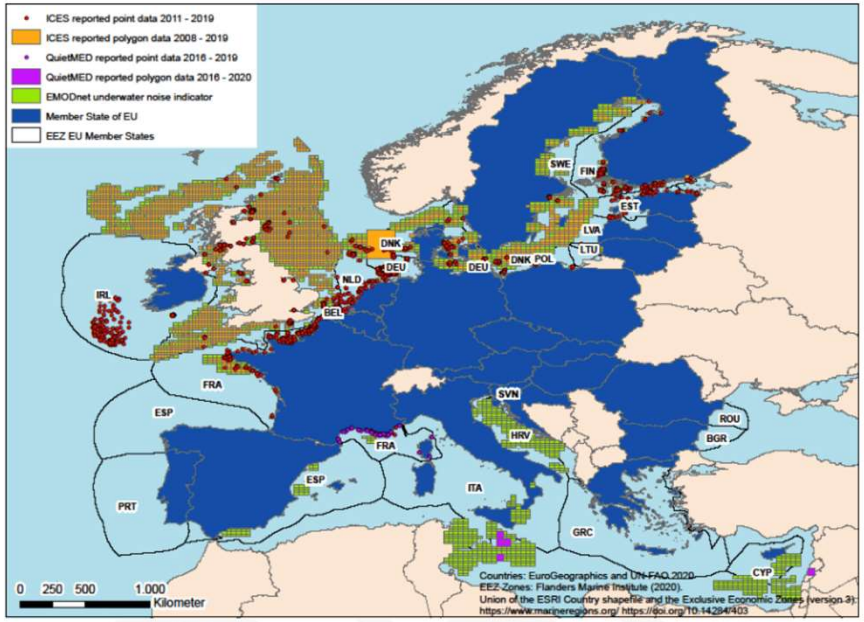

Figure 2: Data reported within the publicly available datasets.

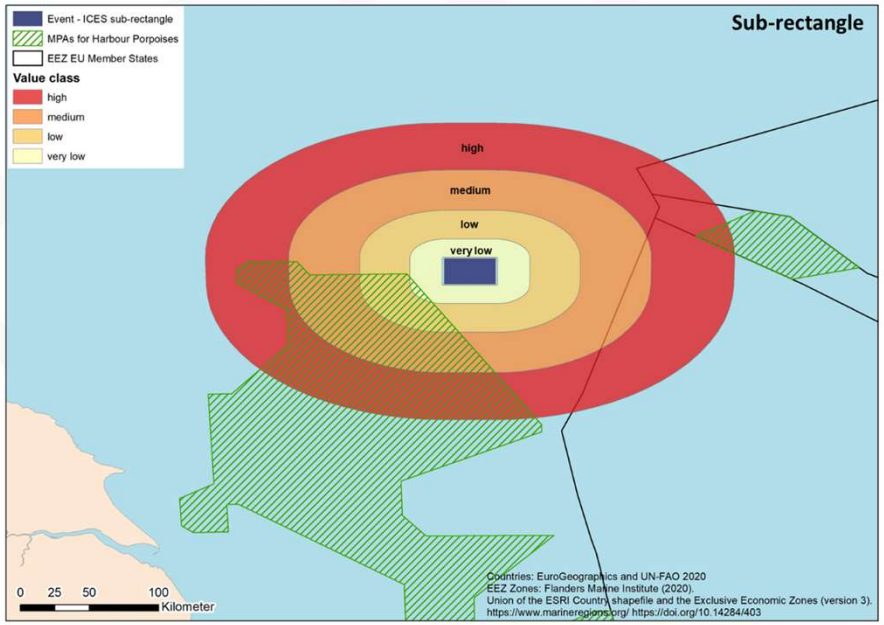

Figure 3: Exposed area for the different classes (here pile-driving in North Sea).

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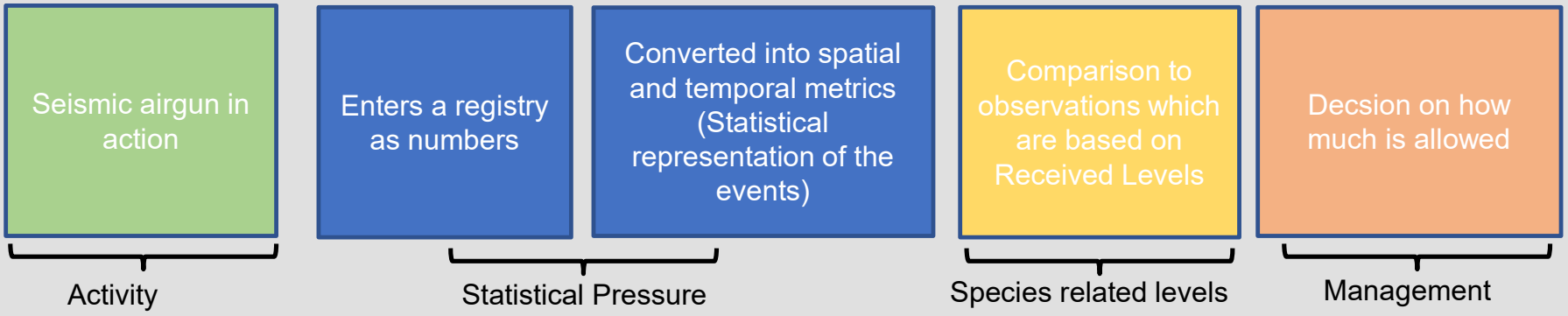
Registry data available 2016-2020

The effect range for different classes of piling (the same principle for airguns)

How to merge disjunct metrics into manageable quantity



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Challenges to be solved

- The entrance of events into the registry uncomplete
- MS is reporting in polygons, which results in large uncertainties
- The overall uncertainties suggest that it does not make sense to use of high-resolution models. How to increase certainties or advice on using analytic propagation models
- How to chose indicator species (and allowed RL)
- How to chose the received level that is assumed to cause significant effects on population level

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Studies of effects of airguns 2021

Rev Fish Biol Fisheries (2020) 30:245–268
https://doi.org/10.1007/s11160-020-09598-9

REVIEWS

Predicting the effects of anthropogenic noise on fish reproduction

Karen de Jong · Tonje Nesse Forland · Maria Clara P. Amorim · Guillaume Rieucau · Hans Slabbekoorn · Lise Doksæter Sivle

(continuous vs intermittent and regular vs irregular)

Effects of stress during spawning

Effects of masking on parental care

Effects of stress on parental care

Effects of masking on settlement on spawning grounds

Effects of masking during spawning

Effects of masking on sexual development

Conclusions

The vulnerability of a species to noise-induced stress will mainly depend on:

(1) its potential to reallocate reproduction to more quiet times or locations,

(2) its vulnerability to masking and hearing-loss mainly on the function of sound communication in its reproductive behaviour.

The study suggests that irregular continuous sound (e.g. heavy ship traffic) may have the most pronounced effect on stress, masking and hearing-loss, which indicates that it may also have themost pronounced effect on fish reproduction.

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Studies of seismic airguns 2021

Behavioural effects of seismic dose escalation exposure on captive mackerel (Scomber scombrus)

Sivle Lise Doksæter; Tonje Nesse Forland, Rune Roland Hansen, Mathias Andersson, Endre Grimsbø, Markus Linne, Hans Erik Karlsen

Schools of penned mackerel (three batches) were exposed to impulsive sounds from a 90 cubic inch seismic (airgun) source towed behind a research vessel, in a dose-escalation design. Received sound pressure levels (RL) and sound exposure levels (SEL) ranged from 146 to 171 dB re 1µPa and 123 - 149 dB re 1µPa2s, respectively. Sound particle acceleration, the relevant stimuli of the fish inner ear, was measured in the range 0.02 - 0.15 m/s2 (zero-peak amplitude), and corresponding acceleration exposure levels (AEL) 62 - 80 dB re 1µm2/s3, at thefish pen

Conclusion

No abrupt change of behaviour
No startle response

Subtle behavioural changes, observed as a gradual increase in school coordination, which culminated around the time of closest point of approach (CPA).

Subtle change in increased shoal density

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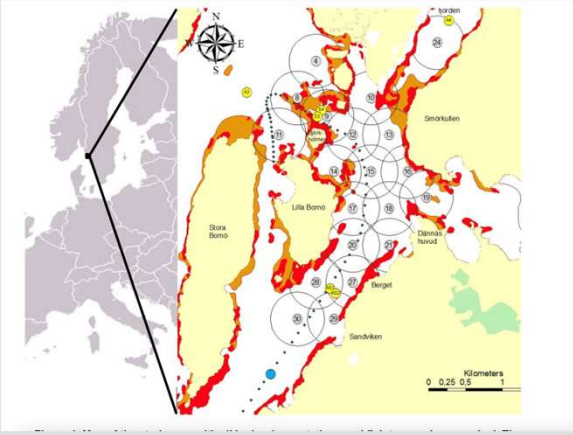
Studies of ship noise 2014

Conclusion

tagged cod in the fjord Gullmarn were subjected to very loud noise generated by a ship. Some fish reacted to the noise by swimming away, towards the ship or down and along the bottom. These reactions could be linked to a received level of about 120 to 140 dB
re 1 µPa (10-500 Hz). 140 dB re 1 µPa corresponds to 115 dB re 1 µPa and 131 dB re 1 µPa for the 1/3 octave bands 63 Hz and 125 Hz respectively.



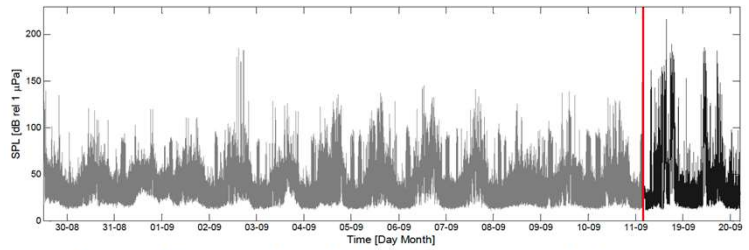


Figure 6. Recorded SPL presented in 125 Hz 1/3 octave band recorded by DSG 10 on Rig 2 at 75 m depth for the 29th August to 19th September 2014. Recording started at 10:14 on the 29th of August but all labels Day/Month on the x-axis denote 00:00. Grey is time before the ships disturbance and black the days when the ship KBV 032 passes the area. There is a gap in the recordings (red line) between the 13th- 18th of September due to some technical problems with the recorder.

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Studies of impulsive noise 2022

Environmental Pollution 300 (2022) 118913

Contents lists available at ScienceDirect

Environmental Pollution

journal homepage: www.elsevier.com/locate/envpol

Effects of pile driving sound on local movement of free-ranging Atlantic cod in the Belgian North Sea☆

Inge van der Knaap[a,b,*], Hans Slabbekoorn[a], Tom Moens[b], Dries Van den Eynde[c], Jan Reubens[d]

Supports the results in paper by Mueller-Blenkle et al., 2012

The turbine foundations were constructed at a distance ranging between 2.3 and 7.1 km from the cod, which resided in a nearby, existing wind farm in the southern North Sea. Local fish remained in the exposed area during and in-between pile-driving activities. The tagged cod did not increase their net movement activity, but moved closer to the scour-bed (i.e. hard substrate), surrounding their nearest turbine, during and after each piling event.

A Novel Field Study Setup to Investigate the Behavio Fish Related to Sound

Christina Mueller-Blenkle, Andrew B. Gill, Peter K. McGregor, Mathais H. Andersson, Peter Sig Victoria Bendall, Julian Metcalfe & Frank Thomsen

Conference paper

1333 Accesses | 1 Citations

Part of the Advances in Experimental Medicine and Biology book series (AEMB,volume 730)

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