



**TEDEN SREDOZEMSKO OBALE
IN MAKROREGIONALNIH
STRATEGIJ**

Izola, Slovenija
16. – 20. september 2024

**MEDITERRANEAN COAST
AND MACRO-REGIONAL
STRATEGIES WEEK**

Izola, Slovenia
16 – 20 September 2024



**Consultation within TSG 3:
Construction Activities in the Sea and on the Seashore and Achieving good
environmental status of the Sea**



**2021
2030** United Nations Decade
of Ocean Science
for Sustainable Development

Effects of anthropogenic noise on large marine vertebrates

Jure Železnik,
Morigenos – Slovenian Marine Mammal Society
Aarhus University – Department of Ecoscience, section for Marine
Mammal Research



Izola, 19. 9. 2024



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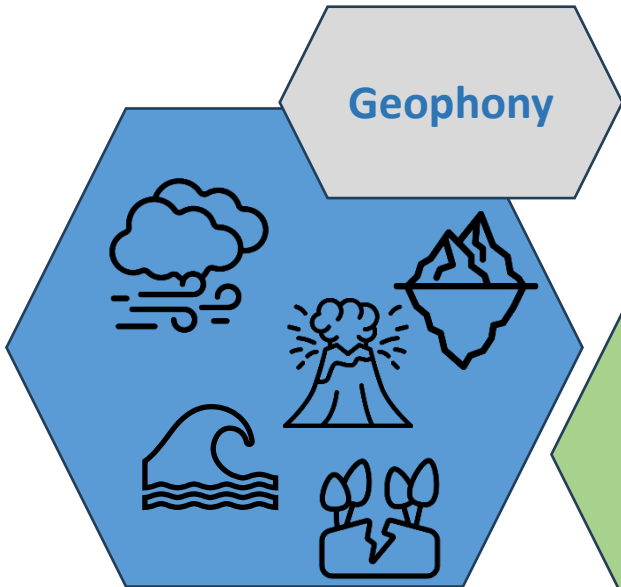
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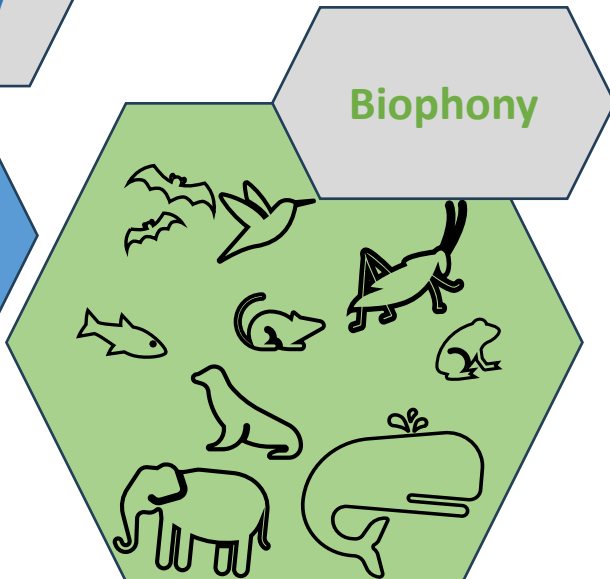


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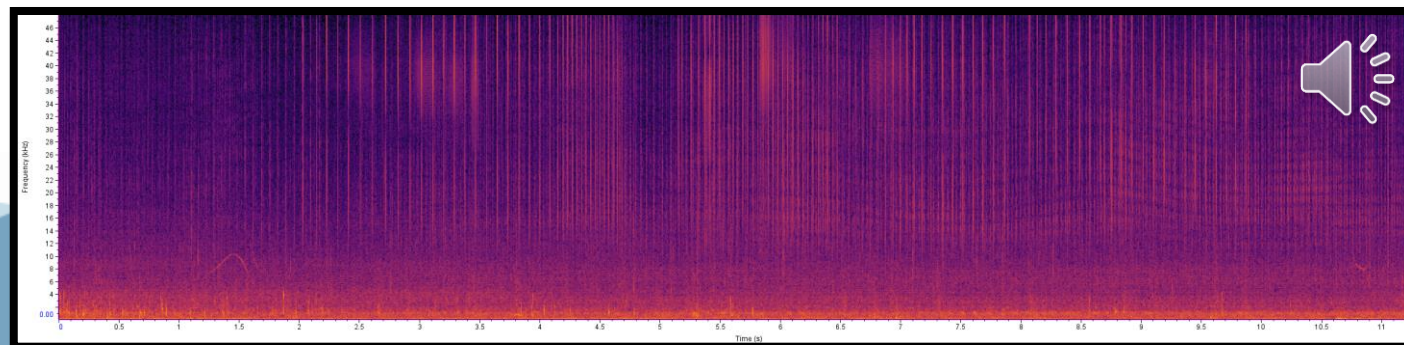
Geophony



Biophony



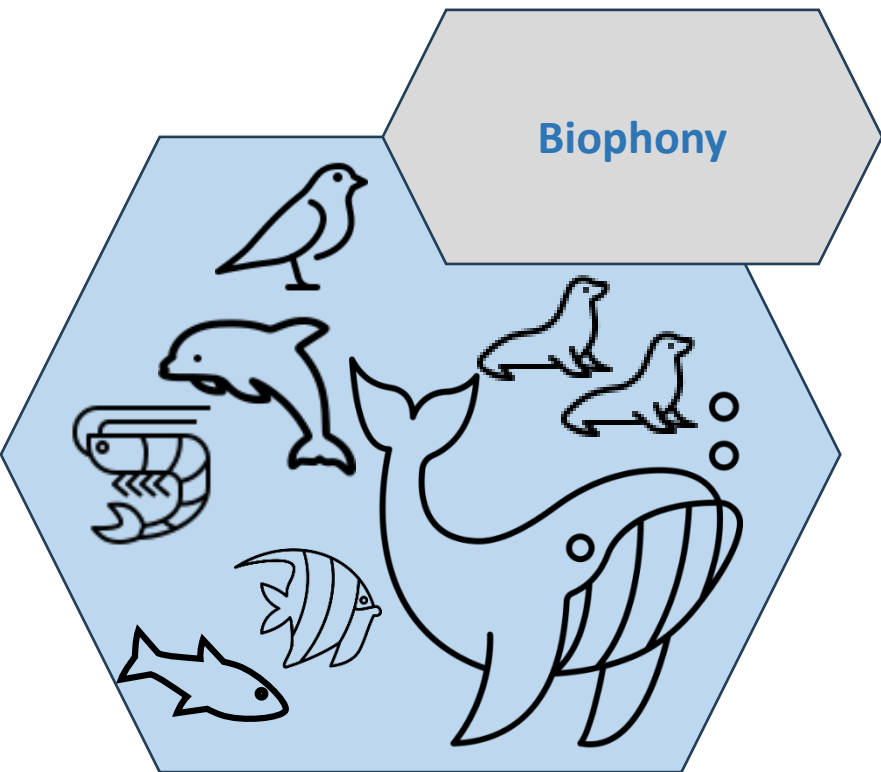
Anthropo-
phony



Soundscape Ecology: The Science of Sound in the Landscape ^{FREE}

Bryan C. Pijanowski, Luis J. Villanueva-Rivera, Sarah L. Dumyahn, Almo Farina, Bernie L. Krause, Brian M. Napoletano, Stuart H. Gage, Nadia Pieretti Author Notes

BioScience, Volume 61, Issue 3, March 2011, Pages 203–216, <https://doi.org/10.1525/bio.2011.61.3.6>

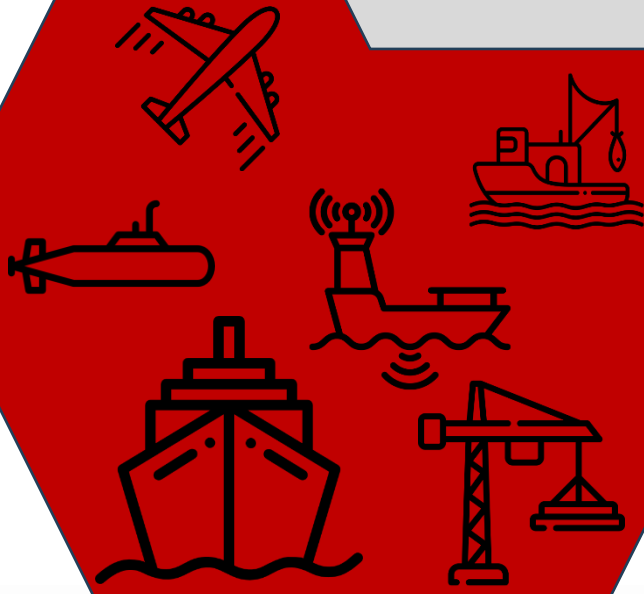


- Sounds produced by wildlife
- Highly effected by signal-noise-ratio (SNR)
- Biophony is an important indicator of biodiversity and the health of an ecosystem



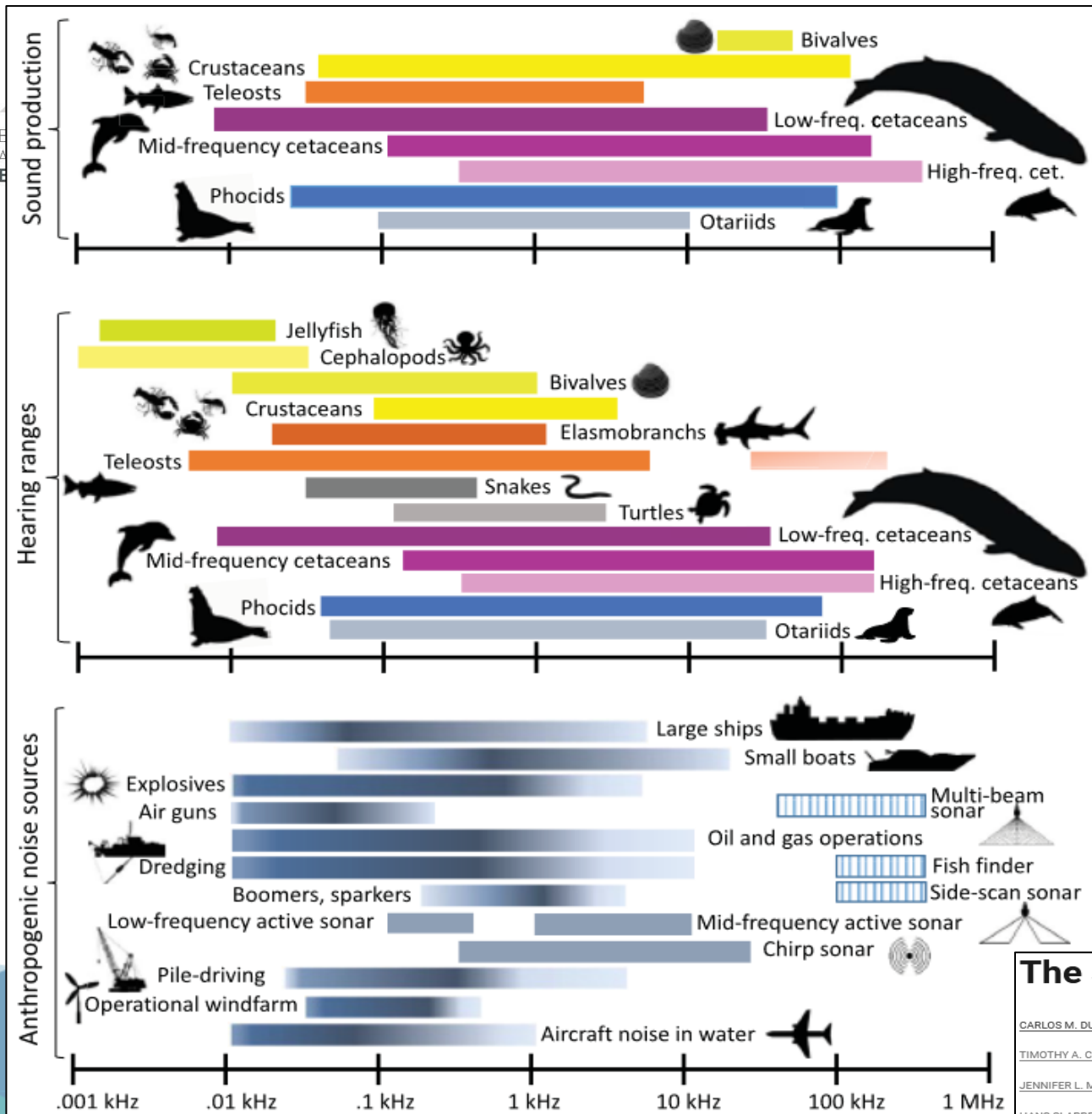


Anthropophony



- Human activities
- Globalization
- Impulsive or non-impulsive (continuous)
- **Interfering with life functions of animals**





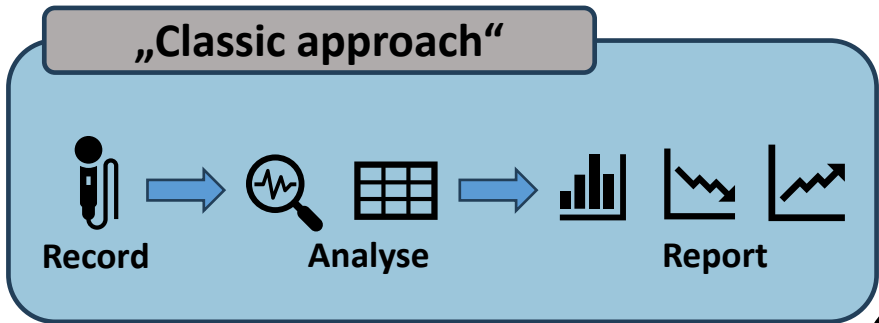
The soundscape of the Anthropocene ocean

CARLOS M. DUARTE , LUCILLE CHAPUIS , SHAUN P. COLLIN , DANIEL P. COSTA , RENY P. DEVASSY , VICTOR M. EGUILUZ , CHRISTINE ERBE ,
TIMOTHY A. C. GORDON , BENJAMIN S. HALPERN , HARRY R. HARDING , MICHELLE N. HAVLIK , MARK MEEKAN , NATHAN D. MERCHANT ,
JENNIFER L. MIKSIS-OLDS , MILES PARSONS , MILICA PREDRAGOVIC , ANDREW N. RADFORD , CRAIG A. RADFORD , STEPHEN D. SIMPSON ,
HANS SLABBEKOORN , ERICA STAATERMAN , ILSE C. VAN OPZEELAND , JANA WINDEREN , XIANGLIANG ZHANG , AND FRANCIS JUANES [fewer](#)

[Authors Info & Affiliations](#)

SCIENCE • 5 Feb 2021 • Vol 371, Issue 6529 • DOI:10.1126/science.aba4658

Needs to be long-term.
But what is long-term?



Cost effective
Predicting impacts on marine life
Assessing and interpreting acoustic data
Evaluating cumulative and long-term impacts



Limited by funding and technology... (mostly funding)



Methods

- Behavioural observations
- Acoustic monitoring
- Physiological measurements
- Tagging and tracking
- Strandings and necropsies

Multifaceted approach

Combining methods
provides a comprehensive
understanding

Modelling



DEPONS - Disturbance Effects on the Harbour
Porpoise Population in the North Sea
<https://depons.eu/news/>



Negative effects

- Acoustic masking
- Behavioural changes
- Physiological stress
- Hearing loss
- Increase of energy expenditure

Males miss and females forgo: Auditory masking from vessel noise impairs foraging efficiency and success in killer whales

Jennifer B. Tennessen^{1,2} | Marla M. Holt² | Brianna M. Wright³ |
M. Bradley Hanson² | Candice K. Emmons² | Deborah A. Giles⁴ |
Jeffrey T. Hogan⁵ | Sheila J. Thornton⁶ | Volker B. Deecke⁷

Dolphins simplify their vocal calls in response to increased ambient noise

Leila Fouda¹, Jessica E. Wingfield¹, Amber D. Fandel¹, Aran Garrod¹,
Kristin B. Hodge², Aaron N. Rice² and Helen Bailey¹

Anthropogenic noise affects risk assessment and attention: the distracted prey hypothesis

Alvin Aaden Yim-Hol Chan, Paulina Giraldo-Perez, Sonja Smith and
Daniel T. Blumstein

Effects of ambient and boat noise on hearing and communication in three fish species living in a marine protected area (Miramare, Italy)

Antonio Codarin^a, Lidia E. Wysocki^b, Friedrich Ladich^b, Marta Picciulin^c

Underwater temporary threshold shift induced by octave-band noise in three species of pinniped

David Kastak; Ronald J. Schusterman; Brandon L. Southall; Colleen J. Reichmuth



J. Acoust. Soc. Am. 106, 1142–1148 (1999)
<https://doi.org/10.1121/1.427122> Article history

Anthropogenic noise increases fish mortality by predation

Stephen D. Simpson, Andrew N. Radford, Sophie L. Nedelec, Maud C. O. Ferrari, Douglas P. Chivers,
Mark I. McCormick & Mark G. Meekan

The common murre (*Uria aalge*), an auk seabird, reacts to underwater sound



Kirstin Anderson Hansen; Ariana Hernandez; T. Aran Mooney; Marianne H. Rasmussen;
Kenneth Sørensen; Magnus Wahlberg



Different problems require different solutions

- „Thinking about how to transition to green energy“
- „Quiet zones“ (can't be achieved everywhere)
- Bubble curtains during construction
- Speed reductions of marine vessels
- Investing in technological advances: quieter ship design and propulsion systems
- Establishing noise standards

Quiet(er) marine protected areas

Rob Williams ^{a b}  , Christine Erbe ^c, Erin Ashe ^{a b}, Christopher W. Clark ^d

Development of an air bubble curtain to
reduce underwater noise of percussive
piling

B. Würsig ^a  , C.R. Greene Jr. ^b, T.A. Jefferson ^c

Small reductions in cargo vessel speed substantially
reduce noise impacts to marine mammals

CHARLOTTE R. FINDLAY ¹, LAIA ROJANO-DOÑATE ², JAKOB TOUGAARD ³, MARK P. JOHNSON ⁴, AND PETER TEGLBERG MADSEN ⁵ [Authors Info &](#)

[Affiliations](#)

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Thank you for your attention!

Jure Železnik

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Jure Železnik



Izola, 19. 9. 2024